

December 10, 1937

REPORT NO. 445

THE FISH-CULTURIST'S LIBRARY

by

Albert S. Hazzard
Institute for Fisheries Research,
Michigan Department of Conservation

In the past, the fish-culturist had little opportunity or incentive to study the various phases of biology associated with his profession. All he was expected to do was to raise more fish on the same amount of food and in the same troughs and ponds than his predecessor.

But times have changed. Today every hatchery employee from apprentice to superintendent must know quite a bit of fisheries biology in order to handle his job with credit. Our hatcheries have become education institutions as well as fish "factories." Thousands of school children are brought out each year to one hatchery in southern Michigan to see the hatching trout eggs, the swarms of young bass or bluegills in the ponds and to observe just how fish are raised. At this same hatchery there are seldom less than a dozen cars in the parking space during the summer season, and on week-ends all our hatcheries have a steady stream of local and out-state visitors. These visitors ask questions which are not always easy to answer intelligently without a book or two handy and without some previous study of such books.

Then too, the fish-culturist is now expected to have other interests than simply raising fish. He must know quite a bit of fish ecology--what sorts of waters are best suited to different species of fish; what are the food, shelter and spawning requirements of each age class of the fish he plants; and, most difficult of all, which lakes and streams are in greatest need of stocking.

When most fish were planted as fry, losses from disease and problems of nutrition were few. Now that fish are held longer, the fish-culturist must be able to diagnose the common diseases as soon as they appear and know what treatments will be effective. In those good old days of fry planting, the food problem was much simpler and the cost of liver was not a major item, but now the bill for food is usually the chief operating expense at the modern trout hatchery. If he is to keep down expenses, the fish-culturist must know what meat substitutes have given the best results elsewhere and he must be on the look-out for a cheap, local source of such food. He must experiment with various combinations and methods of feeding for the different species, since the temperature and chemical content of his water supply will determine to a considerable degree what combinations will produce the most vigorous and rapid-growing fish at the lowest cost.

It is doubtful if it would pay the fish-culturist to become an authority on animal genetics but he should be familiar with the results obtained from breeding experiments with trout in this country so as to put into practice the most advanced methods for improving his brood stocks.

These changes practically demand that the progressive fish-culturist have a library close to his desk for reference not only to correctly answer questions of the ever-increasing number of hatchery visitors but also to help him in his own problems. This library need not be large and it need

not be expensive. By adding a few books and bulletins (many of which may be had for the asking) he will soon build up a useful source of dependable information.

Some of the most frequently used books in his library will probably be:

American Food and Game Fishes by David Starr Jordan and Barton W. Evermann, published by Doubleday, Doran & Co. Inc., Garden City, N. Y., price \$5.00. This book is illustrated with 100 photographs, 200 drawings and 10 color plates of fishes. Keys by which the more important fish can be identified, and considerable information on the life histories and range, are given. An authoritative chapter on fly fishing adds to the interest of the book.

Fishes by David Starr Jordan, published by D. Appleton and Company, New York City, price \$5.00, has many of the same illustrations found in the first book on the list. It has chapters on the structure of fishes, how they hear, see, breathe, etc., their coloration, geographical distribution, etc. A discussion on methods of collecting and preserving fish specimens is included but there are no keys to identification such as are found in the first volume.

The man whose chief interest centers in pond culture of bass, bluegills and other warm-water species, especially if he is located in the Mississippi drainage basin, will find Fishes of Illinois by Forbes and Richardson (published by the Natural History Division, Urbana, Illinois, price \$4.00) one of the best references he can secure. It has color plates and numerous black and white drawings of all the principal species of warm-water fishes and plenty of sound information on their habits. Keys for identifying these fishes are included.

Another excellent reference on the life histories of warm-water fishes is The Ecology and Economics of Oneida Lake Fish by C. C. Adams and T. L. Hankinson, Bulletin of Roosevelt Wildlife Experiment Station, Syracuse, N. Y. (For price, write the Director of this station.)

The more inquiring fish-culturist wants to know the names of the common water plants and how they reproduce. If he is a fly fisherman-- and he should be--he will have a double incentive to learn something about the food organisms which he finds in the waters or in the stomachs of his catch. Field Book of Ponds and Streams by Ann Haven Morgan, published by G. P. Putnam's Sons, New York City, N. Y., price \$3.50, has 325 illustrations, many in color, of water plants and animals. The chapters on aquatic insects give life histories of principal fish foods such as mayflies, stoneflies, caddis, etc. It is a compact little book that fits in the pocket.

If trout stream insects are a hobby with the fish-culturist, he will find 3rd Edition 1935 Guide to the Study of Fresh-water Biology by J. G. Needham and P. R. Needham especially useful in keying out the aquatic stages. Much of the identification can be done from the drawings. It is also possible to key out to genera many of the other stream and pond animals. With the aid of a hand lens many of the semi-microscopic plankters can be identified with the aid of this guide. This is published by the Comstock Publishing Co., Ithaca, N. Y. and sells for \$1.00

For general and easy reading in limnology, Life of Inland Waters by Needham and Lloyd, published by Charles C. Thomas, Springfield, Ill., price \$3.50, is the best book I know. It discusses the life and living conditions of the principal aquatic plants and animals in an interesting and not too technical way. While not as useful in the field as Dr. Morgan's

book, it is ideal for long winter evenings.

Animal Ecology by Charles Elton, The MacMillan Co., New York City, \$1.50, discusses the principles of animal relationships in a way which can be understood and enjoyed by anyone.

Outline for the Development of a Stocking Policy by G. C. Embody, privately printed by the author (Cornell University, Ithaca, N. Y.), can be purchased from Dr. Embody for about 25¢ per copy. It outlines the essential factors to be considered in working up a stocking plan. The various reports of the New York Conservation Department's statewide survey of streams and lakes are developed from this outline and illustrate how the data are secured and used to formulate stocking policies. The average cost of such reports as are still available is about \$2.75. Inquiries concerning these should be addressed to Dr. Emmeline Moore, Director of the Survey, Conservation Department, Albany, N. Y.

Methods for the Improvement of Michigan Trout Streams by C. L. Hubbs, J. R. Greeley and C. M. Tarzwell is Bulletin No. 1 of the Institute for Fisheries Research of the Michigan Department of Conservation, price 50¢. This bulletin describes stream requirements of trout and how such requirements ^{which} ~~as~~ are deficient or lacking may be supplied by the use of environmental improvements. A bulletin on the improvement of lakes is being printed and should be available shortly. It treat~~s~~es the needs of lake fishes and how improvements can be effected. It will be available for purchase through the Institute.

Of more immediate and practical use to fish-culturists in the business of raising fish are the following:

Care and Diseases of Trout by H. S. Davis. This is Investigational Report No. 22 of the U. S. Bureau of Fisheries and can be obtained from the Superintendent of Documents, Washington, D. C. at a cost of 10¢. Probably the most useful booklet ever written for the hatcheryman, this document has been widely distributed both in this country and abroad (where it has been translated into several foreign languages). Proven methods of trout culture are discussed together with more advanced feeding and breeding practices. The well illustrated section on common fish diseases, their recognition and treatment, make this book indispensable to the fish-culturist.

For the fish-culturist who is chiefly concerned with lowering the cost of feeding trout through the use of meat substitutes, the annual reports of the experimental work at the Cortland Hatchery, obtainable from the New York Conservation Department, Albany, New York, are invaluable. Real progress has been made by this state in reducing the cost of rearing trout through the use of meat substitutes.

The New York State Fish Hatchery Feeding Chart, Its Purpose and Mechanics of Operation by Charles R. Deuell, David C. Haskell and A. V. Tunison (summarized in The Progressive Fish Culturist for May, 1937) describes the bookkeeping methods used by this state in recording the costs of feeding trout in the various hatcheries. This report is worthy of considerable study by fish-culturists and fisheries administrators. It can be obtained by writing to the Conservation Department, Albany, N. Y.

Pondfish Culture by Percy Viosca, Jr., The Pelican Publishing Co., New Orleans, La., \$4.00, is a new text on this subject. While written primarily for the amateur fish-culturist, the professional will enjoy this book, especially the concluding chapters on productivity and fish culture in inland public waters.

The Bulletins, Documents and Investigational Reports of the U. S. Bureau of Fisheries published at intervals from 1872 to the present contain many articles of interest and value to fish-culturists. Partially complete sets can occasionally be picked up at little cost by the alert fish-culturist. A list of the more recent issues, their contents and cost can be secured by writing directly to the Commissioner of Fisheries, Washington, D. C.

The Status of Fish Culture in Our Inland Public Waters and the Role of Investigation in Maintenance of Fish Resources by W. C. Kendall is a challenge to fish-culturists the world over and a copy should be in every hatchery especially for consultation by the superintendent after a particularly successful season. This is a bulletin of the Roosevelt Wildlife Station, Syracuse, N. Y. The price can be obtained by writing the Director of the Station.

Every fish-culturist should be a member of the American Fisheries Society. Since its formation in 1870 it has been the official organization of fish-culturists in North America. The transactions of its annual meetings are published and distributed to active members. The annual dues (\$3.00) entitle members to these volumes. The majority of technical and popular contributions of value to fish-culturists have appeared in these transactions. Volumes for the past five years are obtainable at \$3.00 each; earlier issues still in print at \$1.00 each. Application for membership or requests for volumes should be addressed to Seth Gordon, Secretary, American Fisheries Society, Pennsylvania State Game Commission, Harrisburg, Pennsylvania.

A man who raises fish is expected to know where and how they may be caught. The first question can only be answered by familiarity with the fishing waters of his district; the second he can answer either from personal experience (all too infrequent for most hatcherymen) or from reading or, preferably, both. A great many excellent books on angling have been written but most of them are specialized--either on the art of catching one group of fishes or on fishing in one particular section of the country. Just Fishing by Ray Bergman, Penn Publishing Company, Philadelphia, Pa., price \$5.00, is a general treatise on equipment and methods of angling. While the author's notes on the life history of a number of species are inaccurate, the directions for fishing are clear and given in an interesting style.

Streamcraft by George Parker Holden, D. Appleton and Co., New York, price \$3.00, has much information on angling methods as well as some excellent chapters on fly tying and repair of tackle. I have found it a most useful book.

For the more ambitious the following list may prove useful:

Field-book of Insects by Frank Lutz, G. P. Putnam's Sons, \$3.50. This is particularly useful in identifying land insects found in fish stomachs.

Freshwater Biology by H. B. Ward, G. C. Whipple and collaborators, John Wiley and Sons, price \$7.00, is a comprehensive technical key to aquatic life.

College Zoology by Robert Hegner, The MacMillan Co., New York City, price \$3.50, is an excellent and easily read treatise on general zoology.

Limnology by Paul S. Welch, McGraw-Hill Book Co., New York, \$4.00, will be found useful by the advanced student of inland waters.

Standard Methods for the Examination of Water and Sewage by the American Public Health Association, Boston, Mass., \$2.50, is the standard reference for the man concerned with determining the chemical conditions of waters.

Laboratory Manual for Chemical and Bacterial Analysis of Water and Sewage by F. R. Theroux, E. F. Eldridge and W. L. Mallmann, published by McGraw-Hill Book Co., New York City, \$2.50, is more elementary than the preceding and is easier for the man with little chemical training to follow. All the chemical reactions and reasons for various steps are explained.

This list of books for the fish-culturist's library is by no means complete. It merely represents a nucleus of ~~such a library~~ which will expand according to the special needs or interests of the individual. The important thing is to start such a library, keep it where it can be consulted constantly and do enough reading in it to discover its possibilities. Books can never take the place of experience and intelligence in fish culture but if a fish-culturist is to be truly progressive he must keep up with advances in his field and be ever adding to his store of information basic to his science.