

(1) protection from mosquitoes such as repellents, nets, screening, selection of healthy camp sites; (2) DDT residual spraying of adults by airplanes and by spray guns in tents and other types of housing for soldiers; and (3) antilarval measures consisting of draining, filling, flooding, oiling, use of Paris green and DDT, and prevention of man-made and animal-made breeding places. He then launches into a discussion of the control of the malaria parasites. Such methods consist of two principal drugs—quinine and mepacrine. Although for over a century quinine has been the chief standby, Sinton states that from the experience gained in World War II, mepacrine for military purposes is superior to quinine in that it does not interfere with the mental and physical activities of troops, gives longer protection, can be easily tolerated in larger therapeutic doses, causes few undesirable effects over prolonged ingestion, and if continued for a month after leaving malarious areas, it radically cures all malignant (and probably many benign) tertian infections.

He points out that the control of malaria during the second World War was so stimulated that it may be possible by these new methods to exploit to an undreamed of extent, the great natural resources of the tropics for the benefit of all mankind.

(Helen Sollers, U. S. Department of Agriculture, Bureau of Entomology and Plant Quarantine.)

DDT, THE SYNTHETIC INSECTICIDE. By T. W. West and G. A. Campbell. London, 301 pp., 1946.

A valuable book on DDT has been written by these two English chemists who summarize the results of many experiments in various parts of the world. To this detailed treatise they have added much of their own research. They outline the history and development of this insecticide, discuss its toxicity, use in paints, textiles and paper, and its value in controlling numerous pests of man and animals.

In the chapter on mosquitoes DDT is compared with phenothiazine, pyrethrum, and Paris green. The employment of DDT in larvicidal oils, airplane sprays, as a dust, in emulsions, suspensions, and as a residual spray for adults is discussed. In one test in this chapter DDT and pyrethrum are compared as to their effectiveness against larvae and pupae of *Chaoborus punctipennis* Say which is termed a mosquito. Actually this species belong to the family Culicidae but it is a non-biting gnat and reference to it in this part of the book seems a little out of place.

This publication is a good reference work which anyone dealing with mosquitoes would want in his library.

"The Truth About DDT" is a 64-page booklet

published by West and Campbell and is an abbreviated summary of the book. Many new pictures, however, are introduced in this publication.

(Helen Sollers, U. S. Department of Agriculture, Bureau of Entomology and Plant Quarantine.)

AN ANNOTATED BIBLIOGRAPHY OF PAPERS RELATING TO THE CONTROL OF MOSQUITOES BY THE USE OF FISH. By John B. Gerberich. American Midland Naturalist, vol. 36, no. 1, pp. 87-131. July 1946.

"Man's interest in the control of mosquitoes has increased greatly during the second world war. In large measure this is due to his numerous contacts with them in tropical areas. Various control measures have been tried. Of these probably the most permanent and cheapest mosquito control method is the use of fish. The natural habits of both fish and mosquito larvae must be taken into consideration in selecting a species of fish to be used for the destruction of larvae. The problem of attacking the varied species of *Anopheles* is complex. They are commonly found in pools containing much vegetation and may be almost completely hidden by the surroundings. Keeping in mind the habits of the larvae the fish used must be a species that will search for food not only in the shallow water but amid dense vegetation.

"In pools, ponds, swamps and other natural bodies of water an adequate supply of food and the breeding habits of the fish become very important points for consideration. For satisfactory control the fish used must breed rapidly in order that large numbers of them will be present at all times when larvae are apt to occur. Carnivorous fish are preferred to omnivorous feeders. Surface feeders are considered to be most satisfactory, although sun-perch and goldfish under some conditions may be effective. Indigenous fish as a rule are easier to maintain than imported fish.

"Dr. S. F. Hildebrand<sup>1</sup> states that many of the species used in containers at one time or another are utterly worthless in open bodies of water. Virtually any hardy sluggish fish is suitable for mosquito control in containers. In fact, herbivorous species are used with success in barrels and cisterns because they generally are sluggish and will not jump out of the containers. Little or no plant food being available, the vegetarians will feed on wiggle tails. The problem is altogether different in nature, for there any useful species must normally by choice feed on mosquito larvae.

"All available literature dealing with this subject published since Howard, Dyar and Knab's 'The Mosquitoes of North and Central America and the West Indies' up to and including 1942 has been reviewed. The comments given under the references are observations of the respective

<sup>1</sup> S. F. Hildebrand, Fish and Wildlife Service, U. S. National Museum.

authors in connection with fish as a controlling factor. Two hundred and ninety-eight articles are listed. A summary of the facts presented reveals that two hundred and sixteen species of fish have been used in the control of thirty-five species of mosquitoes in forty-one countries. The chief publications used as sources for titles are: 'Review of Applied Entomology, Series B,' and 'The Use of Fish for Mosquito Control' (Rockefeller Foundation, 1924)." (Author's introduction.)

This appears to be a fine job of bringing together in one place a summary of what has been done with fish, and may have the very beneficial effect of inspiring more work along

that line. All of us who have been in mosquito control appreciate the great benefit we constantly receive as the result of fish activity, even though the control in nature is rarely 100 per cent complete, and even where *Gambusia* are not present. Yet there seems to be little information to rate the effectiveness of our native temperate zone fishes, and even less to indicate how they may be manipulated in a practicable way to our advantage! (An outstanding exception, of course, being the use since the days of Dr. John B. Smith of salt marsh minnows in connection with ditching, for mosquito control on the open marshes.)—T. D. M.