

Anopheles predominated slightly during the season in the Herron plots, forming 54 per cent. of the season's catch. Culex predominated at Lloyd's, forming 68 per cent. of the total catch of the season.

Breeding along levees, forming 64 per cent. of the total, exceeded that in midfield in the Herron plots, but at Lloyd's breeding was about equal in the two locations.

Anopheles larvæ were relatively most abundant in June and July. In the latter month, Culex gained ascendancy in the Lloyd plots and retained the lead the entire season.

Insect larvæ are relatively abundant, being nearly as numerous, in some cases, as are mosquito larvæ.

Both the fuel oil and the two-plus-one oil mixture failed to spread through rice when applied by drip can, but uniform distribution with satisfactory larvicidal action without harm to rice was secured by the use of oil-saturated sawdust.

Plot E at Lloyd's, containing 1,400 top minnows, shows immediate reduction of larvæ with satisfactory duration of this good result. Plot E at Herron's, with 800 top minnows, shows poor results apparently, but most of the larvæ found were very small and may have escaped the fish only temporarily. In many of these experiments the practical absence of pupæ and any larvæ except small ones must be looked on as indicating effective control, and not in the light of production in public health quantities.

In the same plot insect larvæ were so few (relatively) as to indicate probable depredations by fish.

CONCLUSIONS

1. Intermittent flooding as a control measure is probably not feasible, owing to the additional cost of water and to the usual impossibility of the transferal of larvæ beyond flight distance.

2. The preference shown by top feeding minnows for the deeper, flowing water along levees and their evident avoidance of the midfield make them a doubtful control measure. Nevertheless, they have demonstrated under experimental conditions what has been observed under field conditions in Arkansas, Louisiana and California, that their presence means a considerable reduction in mosquito larvæ.

Roadside ditches containing top feeding minnows usually show larvæ very few or absent. The ditch, however, is not comparable with the rice field as an environment because of great differences in area, in abundance of obstructions for fish, and in amount of light.

3. Oil of the various varieties used in these experiments by drip can methods proved a failure. The results obtained when used with sawdust are such that they offer future hopes for ultimate mosquito control in rice fields within reasonable flight distance of communities and a corresponding reduction of incidence of malaria.

Effective Malaria Control in a Rice Field District. J. C. Geiger, W. C. Purdy and R. E. Tarbett, U. S. Public Health Service, Washington, D. C. *Journal of the American Medical Association*, March 22, 1919, Vol. 72, pp. 844-847.

This article covers in full detail the control of malaria in a rice district. The results recorded are remarkable, for malaria has been entirely eliminated among the civilian population, in spite of the fact that for the previous summer the history incidence index demonstrated the prevalence of chills and fever in twenty-nine out of every 100 inhabitants.

METHODS OF CONTROL

The principal methods adopted to control the disease were: (1) sterilization of carriers to prevent infection of mosquitoes; (2) screening, to prevent the access of mosquitoes to men; and (3) limitation of the production of mosquitoes as far as was found practicable.

Of great interest was the experiments on flights and the observations recorded of Anopheles quadrimaculatus, the only Anopheles breeding in the area. The authors especially put stress on the importance of these observations since they were carried out with engorged Anopheles, the majority being females, and possibly infected. The conclusions were as follows:

1. Malaria has been eliminated from a typical rice field district.

2. The question of flight of Anopheles quadrimaculatus may of necessity be regarded from two angles, that of experiment and that of observation. In one, the largest experiments of its kind ever undertaken in the United States, we have a record flight of 1 mile. In the other observation there has been recorded continuously and on different occasions a flight of 1 7/10 miles.

3. The use of 10 grains of quinine sulphate by mouth for sterilization of the blood of malaria carriers is evidently efficient for one malaria season if used actively over a period of thirty days.

4. The completely negative clinical history of the nineteen malaria carriers discovered on microscopic examination indicates, on the one hand, an immense difficulty in obtaining complete malaria control, but emphasizes, on the other hand, the importance of the detection of the human carriers.

The Cost of Malaria: A Study of Economic Loss Sustained by the Anderson-Cottonwood Irrigation District, Shasta County, California. Harold Farnsworth Gray, Sacramento, Cal. *Journal of the American Medical Association*, Vol. 72, No. 21, May 24, 1919, p. 1533.

Endemic malaria in a community means not only a reduced vitality and a lowering of resistance to infections, but is also the cause of a considerable economic loss. An investigation by the writer, by means of a house-to-house canvass in a California irrigation district, showed that in 1918, in 260 families comprising 1,081 persons, malaria cost, for three items (medicine, medical attendance, and lost labor by the wage-earning members of the family), an average of \$31.70 per family, or \$7.66 per person. In one section of the district the loss on these three items was \$75.10 per family. These losses do not cover the entire economic loss caused by malaria in the district as a number of other factors can not be readily evaluated. The greatest single item is undoubtedly depreciation of property values, which was conservatively estimated at