on which work was started early in June, has been completed. The arc passes through Benton Harbor, South Haven, Holland, Grand Rapids, Muskegon, Hart, Ludington, Manistee and Traverse City. This work constitutes a link in the Federal Government's project of triangulation authorized by Congress. Already more than 30,000 miles of arcs or chains of triangles have been extended over the country to furnish starting points for surveys connected with topographic mapping, location of state and county boundaries, surveys in cities and even for the location of monuments on private property. Each triangulation station on this Michigan arc was marked in a permanent manner with a block of concrete into which was set an inscribed metal tablet. A second monument was placed at a distance of about 400 yards from each station to serve as an azimuth mark for local engineers, the true bearing, or azimuth, of this mark being determined by observations during the field work.

DISCUSSION

ST. CROIX'S RAINIEST YEAR CAUSES AN EPIDEMIC OF MALARIA

THE year 1931 will stand out prominently in St. Croix's history. During this time a maximum annual rainfall over a period of 80 years occurred, and the island suffered one of the worst outbreaks of malaria it has ever experienced. Curiously enough, these two phenomena were closely related.

St. Croix, like the other United States Virgin Islands, of which it forms a part, lacks sufficient elevation to provide an important barrier across the path of the northeast trades; and without mountains to elevate these winds and produce rain, the precipitation is undependable. The convectional rain, which reaches a maximum at the time of the high sun, is uncertain in occurrence. The hurricane control, a major influence of the rainiest period, is likewise exceedingly variable. Hence, it is small wonder that annual rainfall, which averages 45.54 inches (80 years), has ranged from a low of 29.48 inches in 1873, 16.06 inches below normal, to a high of 69.81 inches in 1931, 24.27 inches above normal.[1]

An abundance of moisture, producing ideal breeding grounds for millions of mosquitoes, is one of three most basic factors involved in malarial areas of the tropics. The other two are the presence of the anopheles mosquito and persons suffering from malarial fever.

The first factor is vital, for all anopheles are harmless during the greater period of their lives. For instance, out of each 100 anopheles mosquitoes, only a few will have a chance to bite a human being during the period in which his blood contains malarial parasites in the infective stage. Of those which do bite such a person, only a limited number will live the twelve days necessary for the plasmodium to attain its full development in the insect, and of those in which the twelve-day cycle is completed, some may die before they have an opportunity to attack a susceptible person.[2] Thus, it is seen that as regards the epidemic spread of the disease there are interrelated critical points in the amount of rainfall necessary to provide favorable breeding places for the mosquitoes, the number of mosquitoes which are produced, the number of these insects susceptible to infection with the parasite, and the number of human carriers of that parasite. All factors must rise above those critical points if there is to be an epidemic.

From 1918 to 1930 only fifteen cases of malaria were reported in St. Croix, and with one exception, all were confined to persons who had acquired the infection in Puerto Rico. Yet during this thirteen year period it was known by actual tests that anopheles mosquitoes were in the island.[3] The rainfall was not sufficient, however, to furnish them breeding places for rapid multiplication.

The year 1931 gave the proper weather conditions. The malaria epidemic started in July in the most swampy part of Christiansted, the district of Gallows Bay. Before it was checked it spread through the island. A final count showed over 900 cases received medical aid and 22 deaths were the result of its ravages.[3] Probably many additional fatalities were induced by its weakening influence, the victims being left more susceptible to some other serious disease. Moreover, losses from sickness and death were not the only unfavorable results. There was an economic loss to laborer and employer in the number of days the workers were absent and in the lowering of the efficiency after their return. Again, St. Croix has been attempting to build up a much-needed tourist industry to supplement its declining sugar production. Word of the epidemic reached national dailies in the eastern United States, and passengers from

[1] Rainfall statistics are an average for three major stations, Christiansted, Kings Hill and Fredericksted. Data were furnished by the U. S. Weather Bureau, Washington, D. C., and the Agricultural Experiment Station at Christiansted.

[2] Weston P. Chamberlain, "Twenty-Five Years of American Medical Activity on the Isthmus of Panama," p. 12, The Panama Canal Press, Mount Hope, C. Z., 1929.

[3] This information was obtained from Dr. J. I. Knott, government physician at Christiansted, St. Croix.

more than one boat refused to stop at the island for fear of incurring infection.

St. Croix's uncertain rainfall régime will bring heavy precipitation years again. This in turn will increase the malaria hazard. Yet by exercising extreme care through draining her low-lying areas and by inaugurating other preventive measures so successful in the Canal Zone, the island can minimize possibilities of another serious outbreak.

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LIMESTONE CAVERNS

AN interesting confirmation of some of the points set forth by W. M. Davis in his paper on "The Origin of Limestone Caverns" was found in the course of field work in southern Kentucky. Davis elaborates the principle that caverns are opened by solution below the ground water table and later are exposed and subjected to corrasion by the lowering of the ground water. The discovery of a cavern opening below the lowest level of the Cumberland River seems to give evidence at least of the possibility of active solution below the water table.

The cavern in question is located on the recently published Burnside Quadrangle of the U. S. Geological Survey. It lies about a mile southeast of Sloans Valley station in the northeast part of the map. This is a part of the Cumberland Plateau, near the western margin. Sandstone and conglomerate strata overlie a series of limestone formations of various degrees of solubility. In this part of the plateau the streams have uncovered the top of the limestone strata in the valley bottoms, and typical karst forms have been developed—dolines and ponors leading to caverns, underground drainage, etc. The Cumberland River flows through marked intrenched meanders, still youthful, and incised below an erosion level probably continuous with the level of the Highland Rim country immediately to the west. Low water in the present river, therefore, represents the lowest level to which the ground water table in this area has fallen, at least in the later chapters of the local physiographic history. Cavern openings below the lowest water level, such as may be observed on the southwest bank of the Cumberland River on Haynes Bend, confirm the principle that these openings may have been produced below the water table.

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EFFECT OF AN IODIDE FERTILIZER ON IODINE CONTENT OF A FOOD PLANT

OWING to the possible therapeutic value of iodine-containing foods, some interest attaches to a preliminary experiment on the effect of an iodide applied to the soil on the iodine content of turnips. White egg turnips were grown under uniform conditions, except that one half the plots received potassium iodide at the rate of two kilograms per hectare, while the other plots received a chemically equivalent amount of potassium chloride. The potassium salts were applied in the row. The yield of roots and tops was slightly, but not significantly higher with the chloride than with the iodide. However, the small amount of iodide added produced significant differences in the iodine content of the turnips. The iodide-treated plants contained 441 and 950 parts per billion of iodine in the roots and tops, respectively, against 165 and 441 parts in the chloride-treated plots. Whether these quantities of iodine in food have therapeutic value is not known to the writers, but the experiment indicates the possibility of large relative increases in iodine content of root crops by the application of iodides.

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THE THOMAS SAY FOUNDATION GETS UNDER WAY

THE idea behind this unique and penniless foundation is that by the sale of technical monographs on insects to members of the Entomological Society of America (and to others) money will be obtained for publishing additional books, and the list will grow and be cumulative. It has begun to grow. The first volume issued was a monograph of the Dipterous genus Sacrophaga, by J. M. Aldrich; the second, a monograph of the Stoneflies (order Plecoptera) of North America, by Needham and Claassen; and third, recently issued, a monograph of Stonefly Nymphs, by P. W. Claassen (C. C. Thomas, publisher). With the issuance of this volume the series is well under way.

Stoneflies have no great beauty that collectors should desire them, and they have little economic importance. Hence their study has been greatly neglected. Volume two of this series, treating of adults, and this third volume treating of the immature stages, together constitute the first gathering up of knowledge of our fauna in this most primitive order of winged insects. Both are pioneer descriptive treatises, indispensable for further work upon our Plecopterous fauna. Five families are now recognized in our fauna, one of them, Peltoperlidae, being new.

Contrary to the statements current in some repu-