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## CHANGES IN THE MOSQUITO-FAUNA OF PANAMA.

BY FREDERICK KNAB, *Bureau of Entomology.*

That the changes in the physical features of the Panama Canal Zone brought about in the course of constructing the interoceanic canal would have a marked effect upon the life of the region has been repeatedly pointed out. It is unfortunate that no thorough study of the Panama fauna was made before radical changes in the character of the country had been brought about, so that their effect on its animal life might be determined.

The aquatic forms are the ones that must be particularly affected by the topographic changes in the Canal Zone. Streams have been changed in their courses, swamps have been drained and new bodies of water created. The mosquito life of the Canal Zone, with its many species (considerably over 100 are known from the region) and great diversity of breeding habits, must be particularly affected by these changes. Many species of peculiar habits, such as the many forms breeding in the water between

the leaves of various water-bearing plants, or in water in hollow trees and bamboo stumps, must have been eliminated with the clearing away of the forest. Others, particularly those breeding in smaller pools, undoubtedly have found increased opportunities for breeding within the zone of operations and multiplied proportionately—at least at times and in places. These opportunities for breeding must have fluctuated greatly with the progress of the work, involving as it does the constant creation of new breeding-places and their elimination or control. If it were possible to make a comparative study of the mosquitoes now existing on the Canal Zone with those found by Messrs. Busck and Jennings a few years ago, considerable changes could probably be shown to have occurred.

Imperfect as our information is, I have data which show that such changes have actually occurred. It would seem that with the creation of Gatun Lake a new element has been introduced into the mosquito fauna, or at least brought into prominence. Among the most important, considered as an annoyance, of tropical American mosquitoes, are the members of the genus *Mansonia*. *M. titillans* particularly is very widely distributed, occurring from Argentina to southern Florida, and is an aggressive biter. It is locally sometimes very abundant and troublesome. In working over the mosquito material from the Canal Zone collected by Messrs. Busck and Jennings from 1907 on, the absence of this characteristic species was most striking. Mr. Busck reported it from only one locality, Lion Hill, and Mr. Jennings did not send it in at all. Of a related species, *Mansonia fasciolata*, Mr. Busck obtained only a single specimen in the Zone, also at Lion Hill.

Another characteristic tropical mosquito of very wide distribution appeared to be absent from the Zone altogether. This is *Aedeomyia squamipennis* which ranges from Cuba to Argentina. Like *Mansonia titillans*, it is local and this local restriction only became comprehensible when the larvæ of the two species were found by Mr. H. W. B. Moore of Georgetown, British Guiana. The larvæ of both *Mansonia titillans* and *Aedeomyia squamipennis* occur associated with the aquatic plant *Pistia* belonging to the Araceæ. This plant floats in shallow water, its leaves spreading out at the surface, and to its roots the *Mansonia* larvæ are attached, extracting their supply of air from them. Just how intimate the association is in the case of *Aedeomyia* we do not yet know.

In lots of mosquitoes, taken recently and sent for determination by Mr. James Zetek, the entomologist of the Canal Zone, both *Mansonia titillans* and *Aedeomyia squamipennis* appear in considerable proportion. The former is second only to *Anopheles albimanus* in a catch from traps employed to capture mosquitoes attempting to enter habitations. The *Aedeomyia squamipennis*

all came from Gatun. *Mansonia titillans* occurred also in a lot from Miraflores. The explanation of the appearance of these mosquitoes in numbers is that the creation of the lakes at Gatun and Pedro Miguel has furnished an extensive habitat for *Pistia* and thereby abundant opportunity for *Mansonia* and *Aedeomyia* to breed.

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In the discussion of Mr. Knab's paper Mr. Busck said that the eradication of certain species of mosquitoes as well as of many other insects on the Canal Zone was no more than could be expected as a natural result of the canal work and the sanitary measures in connection therewith. As the large trees with their host of water-bearing, mosquito breeding plant parasites are cut down and the bamboo swamps are drained, the shady habitat and characteristic breeding places of very many species of mosquitoes are entirely abolished and the extermination within the Canal Zone of such species is necessarily effected.

It is more noteworthy that certain other species of mosquitoes hitherto absent, or at least rare on the Zone, should have become established and abundant in spite of the constant warfare against mosquitoes by the Sanitary Department. But such is certainly the case with the two species *Mansonia titillans* and *Aedeomyia squamipennis*.

The reason for this lies in their peculiar biology, closely associated with and dependent upon the water-plant, *Pistia*, which make the larvæ of these species practically unaffected by any of the hitherto used control measures.

The *Pistia* formerly occurred only sparingly and in small colonies, mainly in the so called "Black Swamp," but the plant has now enormously increased, due to the greatly enlarged open areas of water, especially by the formation of the Gatun Lake, which now covers the Black Swamp. Large floating islands of *Pistia* now occur and afford unlimited breeding possibility for the two mosquito species which attach themselves to the roots of the *Pistia*. The effect was particularly noticeable on the part of the lake which was formerly the Trinidad River and where *Aedeomyia squamipennis*, unknown hitherto from the Canal Zone, this summer came by the hundreds every night, attracted by my acetelyn lamps and white sheets.

In combating these species the Sanitary Department on the Zone will have a new problem and it will probably be necessary to fish up or otherwise destroy these large floating islands of *Pistia*.

Under the heading of short notes Mr. Schwarz exhibited specimens of the Curculionid *Anthonomus irroratus* Dietz and berries of *Eugenia buxifolia* collected by him on the island of Key West, Florida during the month of April. These berries resemble good-sized peas and the *Anthonomus* was bred in some number from such berries which are slightly deformed. Upon further investigation it was found that the author of these deformations is a Cecidomyid. It appears that the *Anthonomus* larva destroys in some way the Cecidomyidous larvæ. Mr. Schwarz remarked that this is not the first instance known where species of *Anthonomus* are reported as being inquilineous in Cecidomyidous galls as instanced by *A. sycophanta* Walsh, and *A. aeneolus* Dietz. Finally Mr. Schwarz stated that *A. irroratus* is manifestly synonymous with *A. costulatus* Suffrian, described from Cuba and that the latter specific name has priority.

#### MEETING OF DECEMBER 5, 1912.

The 263rd regular meeting of the Society was entertained by Mr. C. L. Marlatt at the Saengerbund Hall, 314 C Street N. W. on the evening of December 5, 1912. There were present Messrs. Baker, Barber, Busck, Caudell, Cory, Craighead, Cushmann, Duckett, Dyar, Ely, Fisher, Foster, Gahan, Heidemann, Heinrick, Hood, Howard, McIndoo, Quaintance, Rohwer, Sanford, Sasser, Scott, Schwarz, Shannon, Viereck, Walton, and Wood, members; and Mr. G. E. Bodkin and Dr. G. F. White visitors. President Quaintance occupied the chair. The minutes of the preceding meeting were read and corrected.

Mr. Rohwer read his report as Secretary-Treasurer. The chair appointed Dr. Dyar and Mr. Caudell as Auditors. Mr. Schwarz moved that the Society extend Mr. Rohwer a vote of thanks for the efficient manner in which he has conducted the financial affairs of the Society during the past year. Carried.