Mesothoracic hair 5 usually with 3 branches on one or both side, arising near the base.—*sundaicus*

Mesothoracic hair 5 usually with 2 branches or simple, if with 3 branches on one side (rarely on both) the third branch is small, arising about half way along the hair.—*subpictus malayensis*

The larvae examined come from various parts of Malaya; those of *subpictus* from fresh water near Kuala Lumpur, and from near the sea in Province Wellesley and on Penang Island: those of *sundaicus* from Selangor and Perak on the west coast, and Tioman island off the east coast.

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—J. A. Reid, Institute for Medical Research, Kuala Lumpur, Federation of Malaya.

FRESHWATER PLANARIANS (FLAT-WORMS) AS PREDATORS OF MOSQUITO LARVAE. In this Institute the early stages of the mosquito *Mansonia (Mansonioides) uniformis* are raised in a guinea-pig dung infusion in large glass jars, with the larvae and pupae attached to the roots of the water hyacinth *Eichornia crassipes* (Wharton, 1957). The plants are removed and washed when about 10 days old, and the larvae are counted and placed in a new jar with fresh infusion. On one occasion very few larvae were found and a search for the usual predators, may-fly and dragon-fly larvae, was unsuccessful, but several planarians (flat-worms) were found. They were placed in clean water with a few *Culex pipiens fatigans* larvae which they killed, withdrawing the body contents and leaving only crumpled, tangled larval skins. Authorities on planarian worms state that they will eat any animals they can capture but that they are unable to capture active swimming animals although the latter may sometimes get entangled in the mucous trials left by the planarians and thus fall victims. Further observations showed that the larvae were in fact usually trapped in this way but occasionally a larva at the surface of the water was directly attacked and captured. One Stage II larva of *C.p. fatigans* was seen to be caught in this way, the planarian attaching itself by a lateral extension of the head. The larva and planarian then fell to the bottom of the dish and while the planarian was sucking out the body contents two more larvae became entangled in the mucous trails and were drowned.

Predation by planarian worms on mosquito larvae has been reported previously by Lischetti (1919), who observed in Brazil that 6 planarians disposed of 106 out of 108 *Culex* larvae in four hours. In the present observations the planarians were less efficient, but still disposed of quite large numbers of larvae. In one experiment with one planarian to five larvae, 10/20 Stage IV and 13/20 Stage III *C.p. fatigans* larvae were eaten in a period of 24 hours. Since *Mansonia* larvae remain attached to the roots of plants one might expect them to be more susceptible to the attacks of roving planarians. However, in experiments similar to those with *C.p. fatigans* it was found that only 7/20 and 5/20 Stage III and IV *M. uniformis* larvae attached to the roots of *Pistia* plants were killed. Van den Assem (1958) has recently shown that *Mansonia* larvae are less subject to attacks by insect and fish predators when they are attached to the roots of plants than are the more motile larvae of *C.p. fatigans*. Direct observation showed that the *Mansonia* larvae "freeze" when a planarian is nearby and one was seen to pass over such a larva without attacking it. Predation by these flat-worms was therefore unlikely to have been the cause of the reduction in numbers of larvae which led to these observations.

The flat-worms varied in size from about 4 to 7 mm. in length, the largest when fully extended being about the size of a Stage IV *C.p. fatigans* larva. I am indebted to Dr. S. H. Chuang of the University of Malaya who identified specimens as belonging to the genus *Planaria*. As suggested by Dr. Libbie Hyman to whom the observations were referred, the predatory habits of the planarians are of little practical significance. If they could be established in breeding places such as treeholes they might reduce the output of mosquitoes, but the few observations which were made with planarians in bamboo pots showed that adults of *Aedes albopictus* continued to emerge despite their presence.

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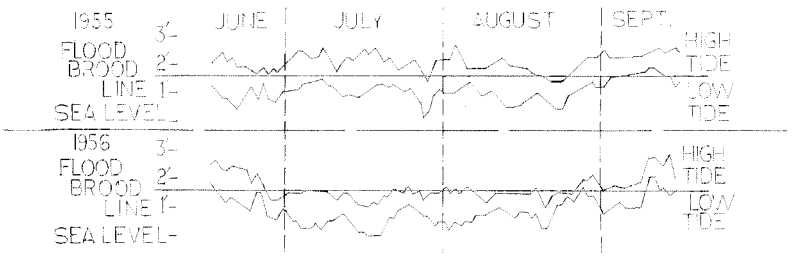
—R. H. Wharton, Institute for Medical Research, Federation of Malaya.

A NOTE ON SALT-MARSH MOSQUITO BREEDING. During the past several years, the Jefferson County (Texas) Mosquito Control District has maintained graphs correlating the results of light trap catches, rainfall, wind direction, wind velocity and tides. It was noted that during the summer preceding a heavy flight of salt-marsh mosquitoes, the general tide level was significantly lower than during the summer preceding limited salt-marsh flights.

FIGURE 1




By inspection of the graphs a line was drawn. The line was located just above the high, high tide level of those years having heavy, fall, salt-marsh mosquito flights. In our particular case, the "flood brood" line is at 1.6 feet above mean sea level.

The elevation given for our coastal marshes in Coast and Geodetic Survey quadrangles varies from one to two feet above mean sea level.

The "flood brood" line exists only as an abstraction on paper. Work is underway in three plots in our marshes to establish it in the marshes, if possible.

The tide gauge from which the readings are obtained is located on the ship channel at Port Arthur, and is maintained by the Corps of Engineers. The gauge is about fifteen miles inland from the Gulf of Mexico, and about six miles upstream from the mouth of Sabine Lake.

Sabine Lake is a large, shallow, salty lake that is about twenty miles long by eight miles wide. The ship channel and Sabine Lake are fed by the Neches and Sabine Rivers. It can be seen readily that the tide gauge does not reflect the extreme tides that would be registered if the gauge were in the Gulf of Mexico. There is also the possibility that the tide gauge is influenced by rainfall from the Neches and Sabine River water shed areas.

The two rivers involved drain a triangular area roughly bounded by Dallas, Texarkana, and Port Arthur. However, Sabine Lake serves to absorb floods and helps to stabilize the water in the ship channel. There is no definite correlation between tide levels and local rainfall.

In the accompanying graphs (Fig. 1) you will note that throughout the summer of 1955 the high tide line remains essentially above the "flood brood" line. In 1956 the high tide drops below the "flood brood" line on June 27 and remains below the line until August 26. In 1955 there were only limited salt-marsh flights. In 1956 there were bad swarms of salt-marsh mosquitoes through September and into October.

The years 1955 and 1956 were picked as typical examples. Similar conditions exist for each year, the records beginning in 1950.

The author is indebted to Professor Emeritus E. S. Hathaway and Mr. Austin W. Morrill, Jr. for their assistance. Correspondence relative to the "flood brood" line is earnestly invited.—George A. Thompson.

A SWATH MARKER FOR SPRAY PLANES USING OIL SPRAYS. The pilot for the Jefferson County Mosquito Control District observed that the major difficulties encountered where (1) judging drift and (2) swath width in marshes and wooded areas. Due to the lack of significant land markers in many areas where the District is forced to spray, it was often difficult to space properly the swaths to achieve maximum efficiency. In some areas the swaths are ten miles in length. The inaccessibility of the marshes to ground personnel denies to the pilot the use of flag men. The lack of ground observers places the entire responsibility of judging swath width, drift, and fall-out on the pilot.

The District uses oil sprays at the rate of one quart per acre which leaves a swath that is invisible to the pilot after executing a turn. In order to improve operations a small thermal aerosol generator was developed. At the end of a swath run the pilot injects a small amount of oil into the exhaust stack of the Piper, leaving behind a marking cloud of white fog.

The apparatus is quite simple to build and easy to install. Normally there is no call to use the fog markers except when the plane is spraying. Therefore, it was decided to use the spray mixture for producing the fog. This arrangement provides ample pressure and obviates a special fog oil supply. A pipe fitting was secured to the spray boom under the belly of the ship. From this fitting a quarter-inch copper tube runs to a point on the pump brackets where it enters a quick operating, self-closing, oil type, valve equipped with a pull lever. From the valve the copper tube continues into a spray nozzle fitted into a 15-inch extension secured to the regular exhaust stack of the Lycoming 150 engine which powers the airplane.

The spray nozzle is a non-clogging type such as is used in Buffalo Turbines and has a 1/32 inch opening. The pump mounting on our particular ship is so designed that the copper tube from the

spray boom to the valve is conveniently supported by the pump bracket. The distance from the valve to the exhaust stack is short and the tube requires no additional bracing.

It is advisable to provide a 360° loop in the line between the valve and the exhaust stack to absorb vibration. A standard automobile type flexible dashboard choke control is brought up through the belly of the ship and the handle mounted conveniently in the cockpit. The self-closing valve relieves the pilot of the task of closing the valve after he marks his swath, and also prevents accidentally leaving the fog generator operating. The pilot has found that in addition to marking his swaths the smoke provides him with an excellent indicator of drift. By laying down about a 100 yard line of smoke he can observe the inversion of the air where he is working.

The Jefferson County District operates a Piper PA 18A, 1958 model, equipped with the Sorenson spray system. It is believed the same principle can be applied to any spray plane using oil sprays.—W. C. Grayson and G. A. Thompson.

## EDITORIAL

Once again the Editor wishes to take editorial space to mention current contributions which he feels merit especial attention.

First, all AMCA members should read the minutes of the Annual Meeting, pages 105–123. Attachment #15, p. 118, which is the report of the Committee on Research and Development contains, by implication, a frightening list of things about which we know too little.

The Editor is constantly stressing the fact that we try to keep *Mosquito News* a balanced publication, with articles which pertain to every type of activity concerned with mosquitoes and their control. This issue carries three papers in as many fields, which because of certain outstanding or unusual features, are worthy of special mention. All three were presented at the annual meeting. The first, "The Mosquitoes of Utah" by Lewis T. Nielsen and Don M. Rees, is a model of its kind in content, presentation and particularly in the illustrations which, unfortunately, cannot be reproduced here. The color transparencies which illustrated the paper as presented were not only exactly right to show the habitats of the species, but were pictorially so beautiful that they elicited enthusiastic comment, concurred in by all, from Dr. Louis Williams.

The second paper which we wish to cite is the one by Dr. W. M. Hoskins, "Factors Involved in the Development of Resistance to Insecticides and Some Measures to Reduce Its Effect," (p. 52). Dr. Hoskins has succeeded in making an exceedingly complex subject seem understandable and reasonable. Whether or not we are directly involved in the subject, it is one on which we should all be informed, and Dr. Hoskins' paper is one of the most clearly stated expositions of the subject that has come to our attention.

The third paper, "Increased Efficiency Through Use of Barge to Float Dragline or Clam Shell Crane," is by V. S. Minnich. The Editor has repeatedly asked for more contributions directly from the field of control operations, and Sam Minnich's contribution is cited as an example of an exceptionally lucid and complete description of an aid to control operations. Like the first paper mentioned above, it was illustrated by fine color transparenices which, with Sam's side remarks, make this paper, too, a model of its kind.—D.L.C.