X. Discussion.

In relation to the sense organs and their distribution on the antennae, the female mosquito differs in behaviour from the male. Females possess many thin-walled sensilla on the flagellar segments which undoubtedly are the organs responsible for their attraction to man. Males carry less sensilla of these types (only on the last two antennal segments) and a whorl of rigid, thick-walled fibrillae on all flagellar segments except the terminal one.

Since the male mosquito is harmless to man and the thin-walled sensilla are restricted to the last two flagellar segments, little attention was paid to their function in males by workers in this field. The long fibrillae play an important role in the mating process during flight. ROTH (1948) wrote that when the males of *Anopheles quadrimaculatus* are sexually active, their antennal fibrillae are extended away from the shaft to receive the sound stimuli of the females while they are flying.

The sense organs in female mosquitoes have received much attention from scientists for their importance in the attraction to man and analytical investigations of the nature of the attracting stimuli have shown that body odour, temperature and moisture are the main stimuli involved (see second chapter). When one of these factors was tested against the normal unoperated mosquitoes it had a very low effect on the activity of mosquitoes. DETHIER (1947) recognized the fact that no one attractant alone performs the service of guiding an animal to its proper habitat or mate or food. On this basis, LAARMAN (1955) says that there seems to be not the slightest reason to assume that one single factor would be capable of leading an Anopheles specimen to its host and causing it to suck blood. It is far more probable that the insect's need of a blood meal leads to an "appetitive behaviour" and that finally the animal, at the end of a chain of reactions, each released by a particular stimulus, satisfies its appetite.

By the technique we followed, cutting the antennae at different levels and testing the behaviour of the amputated mosquitoes towards the different stimuli in an olfactometer, it has been shown that the antennae are the main sites of the distance chemo-, hygro- and thermoreceptors. WIGGLESWORTH (1953) reviewed that the sense of smell in insects is located chiefly in the antennae, as is the sense of temperature in insects which suck the blood of mammals, such as the mosquito Anopheles, the lice Pediculus and Haematopinus. Also BATES (1949) stated that the ability of orientation to the source of food by the chemoreceptor organs in the paired antennae is shared by so many different insects that it

can safely be assumed to exist in mosquitoes in spite of the lack of direct experimental evidence. WIGGLESWORTH & GILLET (1934) and WIESMANN (1960) have shown that the antennae are the main sites for smell, temperature and humidity in *Rhodnius prolixus* and *Musca domestica* respectively. The antennae in female *Aedes aegypti* do function as directional distance thermoreceptors (ROTH, 1951; RAHM, 1958), as well as hygroreceptors (ROTH & WILLIS, 1952; RAHM, 1958; BAR-ZEEV, 1960).

By combining the studies of morphology, histology and distribution of sense organs with the reaction intensity of mosquitoes with different numbers of these sense organs missing towards the testing stimuli, it was possible to reach indirect conclusions as to the possible functions of the types of sense organs. According to this:

1) Sensilla coeloconica are the possible chemoreceptors. The reviews of SNODGRASS (1935) and WIGGLESWORTH (1953) support such a conclusion. Every pit in each sensillum contains only one single seta, but in other dipterous insects several setae were found in each pit (ROEHLER, 1906; SMITH, 1919; HSÜ, 1938; BEGG & HOGBEN, 1946; WIESMANN, 1960), whereas the pit is either in the form of simple or compound cavities. Although this type is present in the antennae of *Anopheles maculipennis* and several dipterous insects, they do not exist in Culicini mosquitoes. NAGEL, according to MCINDOO (1918) and SMITH (1919), did not find pits in the antennae of *Culex pipiens*, nor did ROTH (1949) and ROTH & WILLIS (1952) in *Aedes aegypti*.

2. Sensilla basiconica are the possible hygroreceptors. They are concentrated mostly on the terminal segments in contrast to the coeloconic sensilla which are concentrated on the basal flagellar segments. These sense organs are receptors for mediating wet reactions because we used only 75-85% R.H. and since our experiments did not deal with the effect of dryness on the behaviour of the mosquitoes, we cannot conclude that these receptors serve as well to mediate dry reactions. In some insects it has been shown that there exist two types of receptors which mediate a wet and a dry reaction. These two types of receptors may exist on different parts of the body (BEGG & HOGBEN, 1946; ROTH & WILLIS, 1951 b) or on the same appendage (ROTH & WILLIS, 1951 a, b, 1952; BAR-ZEEV, 1960).

3) Concerning sensilla campaniformia, there are two probabilities for its possible function. Each one has its supporting evidence. From the fact that they are present in the antennae of both males and females it can be assumed, as many authors have found, that this type is for perceiving mechanical stimuli.

The second probability is based on the experimental results. The avoidance of relatively low temperature (25-26°C), in combination with other factors, by female mosquitoes is upset if the last terminal segment is removed, and as long as half of the campaniform sensilla exist on this segment and few of the other types, it is strongly possible that it possesses an inhibiting character for relatively low temperature. With regard to our experiments, this leads us to think that temperature under 28°C is not only unattractive to mosquitoes (BATES, 1949) but even inhibits them. But we are not in a position to decide whether the campaniform sensilla possibly perform one of these two functions (and if so, which) or both together.

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