

## Mosquito Eggs XX

Egg Parasitism in Anopheles with a Further Note on Armigeres

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The parasite of eggs of Armigeres dentatus, described in previous papers in this series<sup>222,238,281</sup>, is now known to be a Phycomycete (Lagenidiales, probably Lagenidium sp.). It was recognized as a fungus by Dr. R. A. Ward who received a Tunga penetrans, parasitized by a similar organism, at Walter Reed at about the same time that my description was published. Prof. Couch made the further identification and the available material has been sent to him for description. Dr. Ward and I hope to publish a joint note elsewhere.

This was at first thought to be the first mosquito egg parasite to be described but Prof. Marshall Laird has drawn my attention to an earlier record. It concerns a parasite of eggs of various species of Anopheles in the Philippines. A specimen was sent to Prof. Laird in Singapore as a (?) nematode with a request for identification. He and Dr. Colless examined it and were of the opinion that it was not a nematode but might possibly be a hymenopterous larva. They withheld any definite identification until further material was sent but such material could not be obtained owing to guerrilla activity. A description was subsequently published<sup>282</sup> but the parasite remains unidentified even to major group. The description was published in a journal which is nowhere available in this country. I am obliged to Dr. De Meillon for a copy which he obtained for me through the WHO Regional Office.

The parasite has been found only in unlaidd eggs. It is apparently lethal to gravid females which are unable to lay infected eggs though able to lay uninfected ones in the same batch. It was first observed during dissections for malaria parasites before the second World War and was again repeatedly recovered after the war though not published until about 1960. Since then it may, I think, fairly be described as having been lost in the literature. It is apparently quite widely distributed, having been recorded from Macatan Island (Cebu) and several localities in different provinces in Luzon. In all it was recovered from 788 mosquitos, out of 5380 examined, belonging to all eleven species dissected (An. litoralis, lesteri, indefinitus, peditaeniatus, minimus, filipinae, mangyanus, tessellatus, vagus, kochi and barbirostris s.l.).

Pagayon's figures are reproduced here, as Fig. 1, as accurately as I can from a rather indifferent photograph. No morphological structures could be seen even in mounted specimens. Average dimensions are given as 1.15 mm. long, width at widest end (thought to be posterior) .078 mm., width at middle 0.125 mm., distance between middle and widest portion 0.109 mm. and width at narrowest end .078 mm. It will be seen that these are internally inconsistent as well as disagreeing with the

illustration. Eclosion of the parasite took place two or three minutes after extraction of the egg, accompanied by explosive disruption of the egg shell. The parasite moved very slowly and took about 15 minutes to complete its emergence. The narrower end usually emerged first, except when the egg was ruptured in the middle (Fig. 1a) and was presumed to be the head since it was associated with a visible current in the surrounding fluid inwards towards the parasite. Infected eggs, when mature, could be recognized by their milky appearance and infected mosquitos by the soapy exudation which appeared when the end of the abdomen was nipped. Numbers of infected eggs per individual, in 135 mosquitos examined (mainly An. litoralis), ranged from 2 to 112 with a mean of 13.5.

The immediate question prompted by these data is whether the infection is an "accidental" one in the sense that the mosquito is a dead end host or whether it is one in which the mosquito is involved in transmission. If the latter then how does the parasite escape from the unlayable egg? One is reminded of Manson's early theories regarding contamination of drinking water by dead, wuchererious Culex fatigans<sup>283</sup>. A compromise is possible if one invokes a filarial parasite, a portion of whose larvae become "egg-bound" while the remainder transform successfully. Pagayon mentions finding "a kind of long, thin worm that was usually curled in complete circles, ranging from 5.68 mm. - 7.25 mm. in length; 0.12 mm. - 0.17 mm. in width when stretched." These might, perhaps, be the mature larvae of the parasite but he does not say whether the two forms were found in the same mosquito. My own guess, pace Laird, would be that this is in fact an immature nematode larva, possibly filarial. If so it seems unlikely to have much value for control. This is guesswork, however, and it certainly deserves fuller investigation if only by reason of its remarkably high incidence in the anopheline population (31.29% in the 441 An. minimus dissected). If it is a blood parasite it could yield valuable quantitative data as to the incidence of feeding on non-human hosts.

#### References

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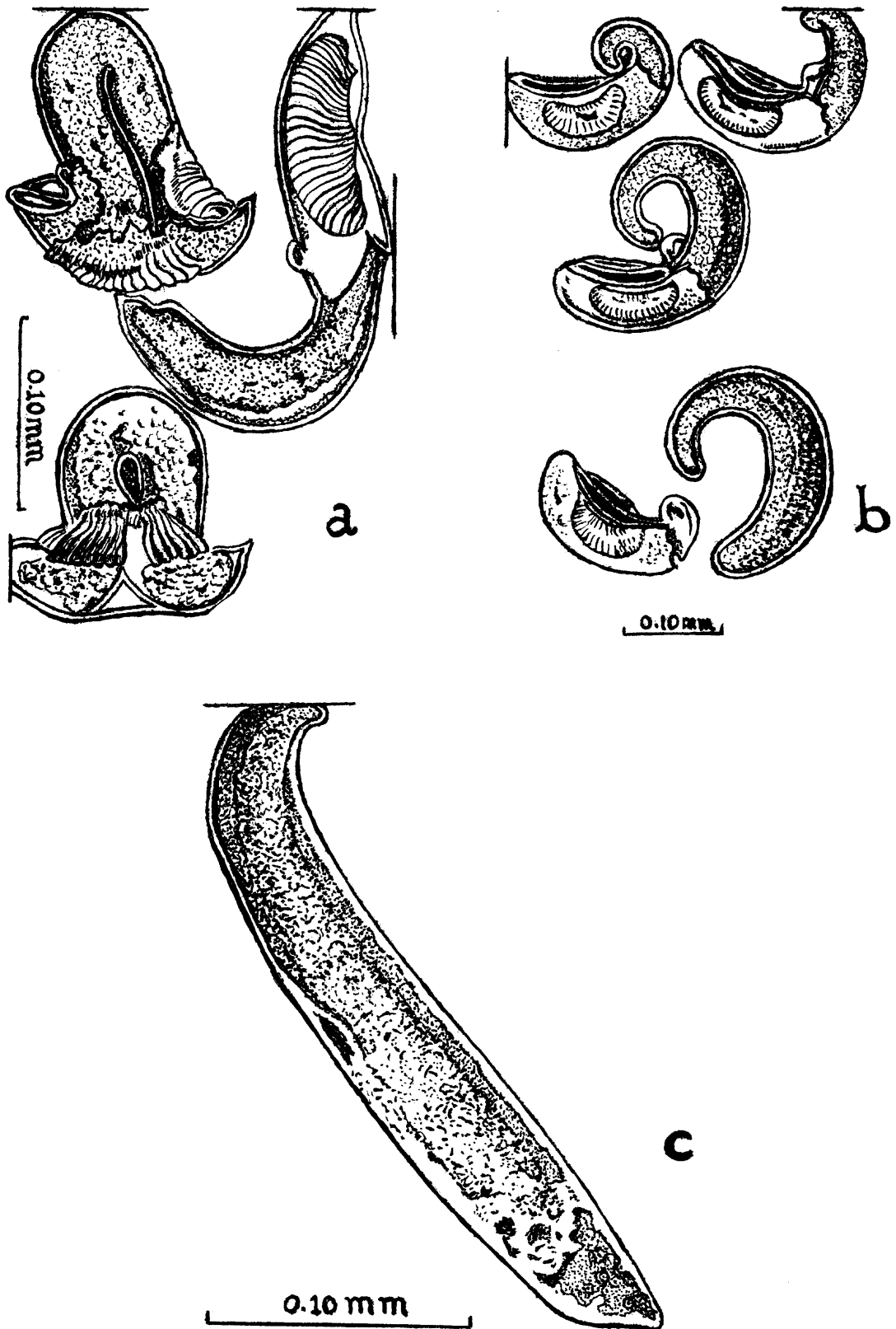


Fig. 1. Parasitized anopheline eggs. a. *An. mangyanus* (S. Pablo, Laguna Prov.), b. *An. litoralis* (Mactan I.), c. Fully expanded parasite. (All after Pagayon).