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## PARASITE X-FILES

Mark Armitage, Azusa Pacific University

As if lifted from the script pages of a previously aired installment of the popular Friday night "istherelifeoutthereism", one group of microscopic parasitic trematodes will puncture, overrun and terrorize not one, not two, but three distinct and disparate hosts to survive and breed. Known as the *Ascocotyle* complex of trematode worms, these well-designed hitch-hikers sport a crown of one (Figure 1) and sometimes two rows of 15-20 spines surrounding a very muscular oral sucker (Figure 2), as well as a ventrally placed body sucker and a full complement of smaller, but sharp, body spines (Figure 3), which they employ to prevent easy dislodging from their intended host. The life cycle for these brackish water travelers begins in a brood sac developing within amnicolid snails (such as *Cerathidia*) which graze the bottom of tidal marshes and ingest the trematode eggs. Once developed into a swimming cercarial stage, the *Ascocotyle* bursts from the snail and swims towards the open mouths of killifishes (such as *Gambusia* and *Fundulus*), where they puncture and penetrate the gill filaments and set up shop by shedding the tail and forming a hardened, clear cyst within the gill (Figure 4), or by traveling to the heart, liver or brain to encyst there (Figure 5). Some researchers have noted that a heavy heart infection can enlarge the heart some 20 times, until it resembles a bag of marbles. It is at this point that development of the metacercarial stage is arrested, since the final adult stage (Figure 6) can only be reached in the gut of, you guessed it, a fish eating endothermic vertebrate. Herons, egrets and raccoons, which come to feed at these tidal troughs become the definitive, unsuspecting hosts as they eagerly gobble up these baiffish. Once inside the warming confines of the stomach, the worm begins the process of digesting the multi-layered cyst from the inside, even as the stomach acid does the same from the outside. As it is gently moved through the digestive system, the trematode matures into a fully functional hermaphroditic adult, compete with ovaries and testicles, capable of producing hundreds of thousands of eggs which are ejected into the host gut and dropped with fecal material into the marsh ready to begin the cycle with another snail.

As destructive as parasitic organisms appear to be to us, by the way they seem to maim and infest their hosts, their presence is more of an indicator of the health and well-being of an ecosystem than is their absence. All the distinct pieces of the amazing life cycle puzzle of the *Ascocotyle* must be present in order for them to survive. The snail must be there to take up the egg and provide sanctuary for the redial sac, the fish (and not just any fish) must be there to provide housing and transport to the final stage of development, and piscivorous birds and mammals must frequent the mud flats for the adult to be free of its confining cyst and to produce offspring.

As far as we can tell, these organisms have little or no pathogenesis. The snail may suffer the most, and the fish (amazingly) suffer no effect or actually seem to do better with an infection. And there seems to be no effect on the vertebrate!

The next time you stand and appreciate the serene beauty of a tidal bird sanctuary, consider that on a microscopic level, harmony is not what it first appears to be. ■

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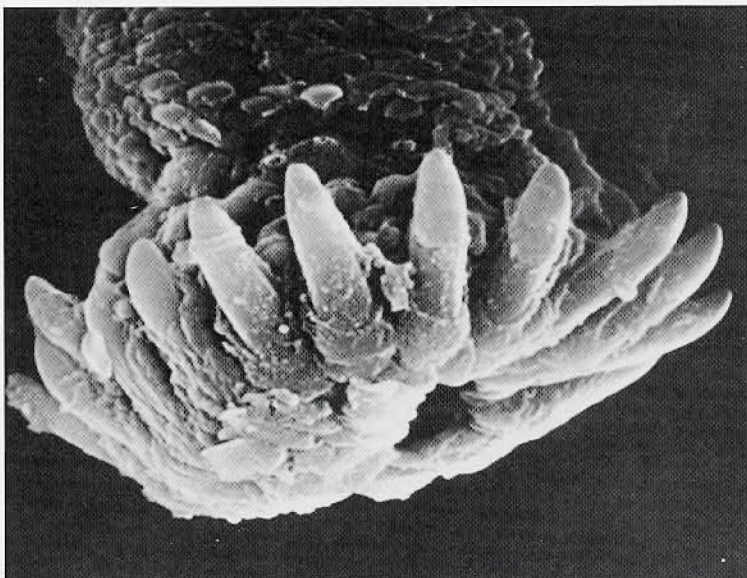


Figure 1: *A. angrense*, SEM 2000X from *Gambusia* gill, Newport Beach, CA

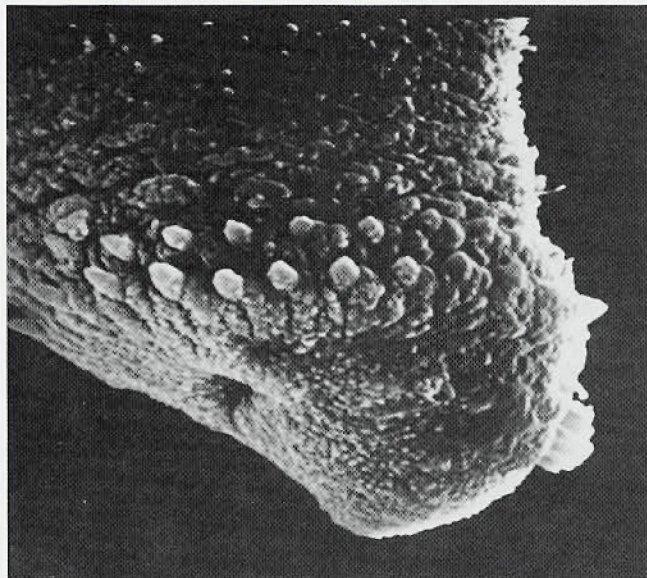


Figure 2: *A. pachycystis*, SEM 2000X from *Cyprinodon* heart, Ocean Springs, MS.

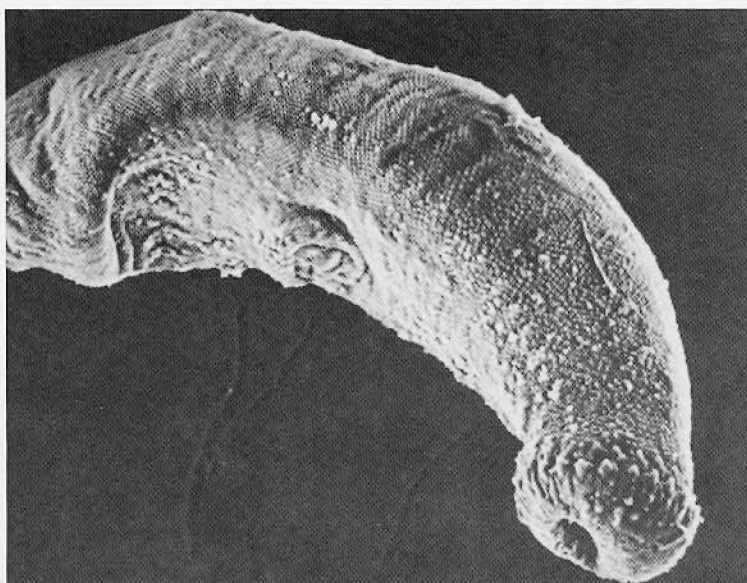


Figure 3: *A. pachycystis*, SEM 1000X from *Cyprinodon* heart, Ocean Springs, MS



Figure 4: *A. angrense*, L. Micrograph of cyst from *Gambusia* gill, Newport Beach, CA

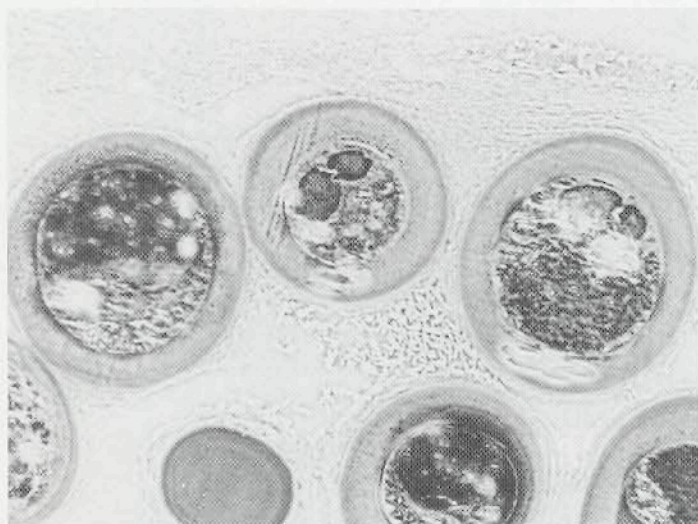


Figure 5: *A. pachycystis*, L. Micrograph of heart cross section from *Cyprinodon* heart, Ocean Springs, MS.

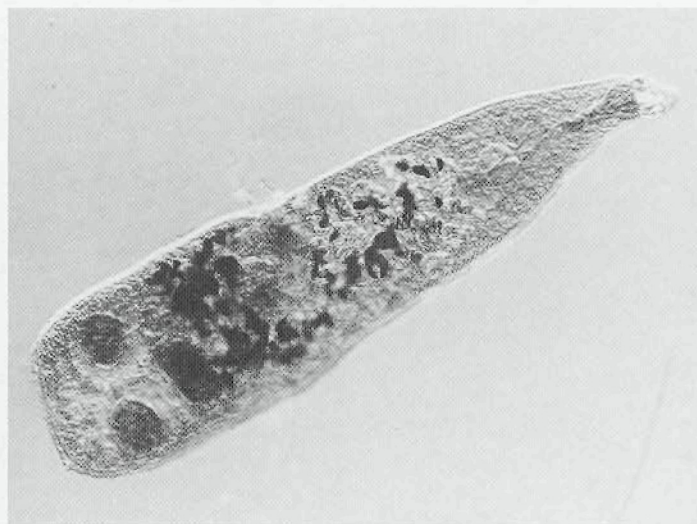


Figure 6: *A. mcintoshi*, Light micrograph, showing ovaries, testes and eggs