

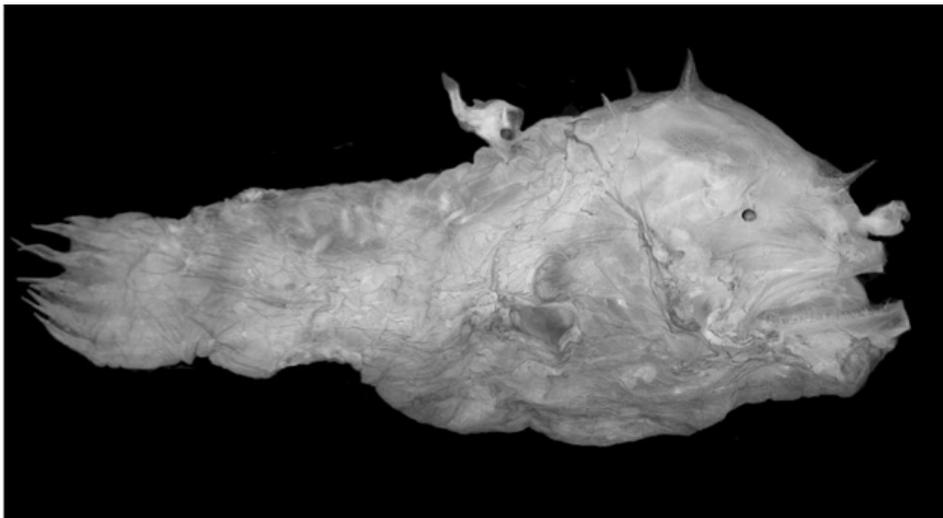
Male Parasitism in Angler Fish

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Adaptation is the reason that a given behavior is still present in a population. In other words a behavior that propagates in a population must provide some selective advantage or be paired with another behavior that does (spandrels). Since the behavior provides selective advantage, asking the question 'what is the adaptive value?' is equivalent to asking what fitness does the behavior provide.

Male parasitism in the context of ceratoids makes perfect sense. Since ceratoids are deep sea living creatures and are quite sedentary, they hardly ever run across another member of the species (Pietsch 2005). Thus fitness is gained insofar as sexual recombination can be maintained while remaining in their niche of deep sea predation. The behavior allows for anglerfish to be widely dispersed and yet still be able to mate whenever it is energetically beneficial to do so. What is interesting about the chimeric nature of the ceratoid is that there does not appear to be any chance for female predation traits to be selected. This is so as the only interaction a male has with his environment is that of hunting down a mate and attaching himself. These behaviors have no intuitive connection to a female's fitness (outside of attracting a male and choosing when to mate) and thus there seems to be no way to select for good female traits. In fact, it seems plausible that no sexual selection occurs at all and that the sexual dimorphism is merely a means to find small fish in a big ocean (Volrath 1998). Pictured below (top middle) is possibly the world's smallest sexually mature vertebrate at 6.2 mm. Its testes are 22.6% the length of its body (Pietsch 2005). The fact that these minuscule fish manage to chemically locate a female in the deep ocean and latch on is astounding.



Mechanism

Do you take this man? (Finding a host)

Male anglerfish have huge nostrils, used to track down female specific pheromones in the vast emptiness of the deep. After finding males will bite her with his specialized jaws, and within five minutes there is a complete fusion of the tissues at the area of attachment (Munk 2000), becoming permanently attached parasites. From this point on the male will receive all of his nourishment from the female. He will continue to live and grow with her, becoming larger than his free-swimming brethren, until she dies. In exchange he will provide sperm to his gigantic host, resulting in repeated matings. Some species are monogamous, though some have found to exhibit polyandry, in which a female will host multiple sperm-providing parasites.

To have and to hold. (Attachment)

In order to initiate the fusion, the male first penetrates the female epidermis with two specialized spines, protruding from his snout and lower jaw. A “plug” of female skin may be folded into his mouth, meanwhile the entire dorsal portion of his head becomes flush with her skin and fuses. The exact method by which the dermis of the two fuses is unknown, but it has been shown that there is no sharply defined boundary between the two. Indeed, in the area of attachment there is no epidermis to be found at all. (Munk 2000).

In sickness and in health (Parasitism)

Though it is known that the male receives his nourishment from the female bloodstream, there are currently two models through which this may happen. In the first model the circulatory systems of the two fish actually fuse. This has currently only been demonstrated in one specie. Munk (2000) found that vascularization from both organisms can be found at the zone of attachment, supporting the theory. The other model is that the male fish receives feeds using a placenta-like structure, with no actual merging of the circulatory systems. Evidence for this model has been claimed, but not substantiated. Norman and Greenwood (1975)

After attachment a number of physiological changes occur in the male. His eyes degenerate, as they are no longer useful. His digestive system no longer serves much purpose. His testes grow to occupy a large portion of his abdominal cavity, and will continually produce spermatozoa for the female.

http://academic.reed.edu/biology/professors/srenn/pages/teaching/web_2010/MGWB_Angler/phylogeny.html

