Parasitism Evolved at Least 223 Times Among Animals

By Alex Berezow — August 4, 2016

As Kramer [1] from Seinfeld demonstrated, sponging off of other people can be a successful life strategy. The same is true for many members of the Animal Kingdom. In a new study [2] published in Biology Letters, researchers Sara Weinstein and Armand Kuris from the University of California-Santa Barbara show that parasitism independently evolved many more times than originally thought.

To conduct their analysis, Weinstein and Kuris examined how often parasitism evolved from non-parasitic ancestors. They concluded that it evolved at least 223 times, far more than the previous estimate of 60. As shown below, parasitism arose more times in certain phyla (e.g., arthropods, nematodes, flatworms, and mollusks) than in others.

Parasitism evolved on at least 143 occasions in the arthropods, not because there is something unique about them but most likely because this phylum includes a very large number of species. Indeed, arthropods comprise ocean critters (e.g., crabs and shrimp) as well as land-dwelling creepy-crawlies (e.g., scorpions, spiders, ticks, centipedes, and insects). In the image below, the arthropod Cymothoa exigua has eaten the tongue of a fish.

(Warning to Reader: The images only get worse from here.)
Among the nematodes, parasitism arose 18 times. One of them, Guinea worm (*Dracunculus medinensis*), has been targeted for eradication by Jimmy Carter and Bill Gates. The disease it causes, dracunculiasis, is particularly disgusting.

*Platyhelminthes* (flatworms) saw parasitism evolve 13 times. Liver flukes and tapeworms belong to this phylum. Unless you would like to host a 20-foot-long tapeworm like [this guy from China](#), it is best to avoid raw beef and pork.
Counterintuitively, the authors' analysis revealed that parasitism is not an evolutionary dead end, as many biologists suspected. Being a parasite requires a certain level of specialization, which is not always conducive to speciation. However, when compared to their non-parasitic cousins, parasites spawned new species at the same frequency.

This explains why roughly half of all animal species today qualify as parasites. Of the 35 animal phyla, 15 have given rise to them. A closer look at these parasites also reveals that many have evolved similar traits despite being totally unrelated. This is a phenomenon known as convergent evolution. For instance, it is probably not an accident that flatworms and nematodes, though only distantly related, share a similar body shape.

Though parasitism is extremely common among the lower animals, there are few examples of true parasitism among higher animals and none among mammals. Vampire bats come close, but they technically do not fit the definition [5] of parasitism, which is restricted to only those organisms that live in or on a host. The pearlfish [6] does, however, fit the definition, as it lives inside of sea cucumbers and munches away at their reproductive organs.

Parasitism is not just in vogue with animals (metazoans). There are also single-celled (protozoan) parasites, like malaria, as well as parasitic plants, such as mistletoe. It would seem, therefore, that parasitism is a more respectable lifestyle than we give it credit for.