

Letter From the Desk of David Challinor
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Despite being the predominant form of animal life on our planet, invertebrates generate less interest than vertebrates among humans. We and our spined kin treat them as something to either avoid or eat when hungry. Such a gross generality, however, is unfair because there are spunky invertebrates that catch and eat vertebrates, such as the 3" (9cm) long bird-eating spider. This month's letter is about invertebrates and how humans of different cultures perceive, categorize and react to them.

Except for entomologists who devote their professional careers to studying insects, most of us generally think of bugs as either "good" or "bad." In our self-centered way, "good" connotes being helpful to us by being available for our pleasure: eating, watching or otherwise exploiting them.

To illustrate this point, consider the hymenoptera, an order whose insects have two pairs of membranous wings. The wings are transparent, with the forewing being considerably larger than the hindwing. Amazingly, there is a series of tiny hooks at the adjacent edges of the wing pairs that attach "Velcro-like" before flight to form a single wing surface. This large order includes bees, wasps and ants, over a hundred thousand species of which have been identified. There are doubtless tens of thousands more, especially in the tropics, waiting to be labeled. The obvious "good guys" are the bees, particularly the honey bee, which has been domesticated for millennia. It not only copiously produces harvestable honey, but also bees' wax; even more beneficial for us, it is a major pollinator. Wasps and hornets are considered "bad" and avoided by humans because they sting. Honey bees also sting but, like wasps, only when disturbed. The female bees and wasps have stingers—a hollow spine-like structure that in some wasps is used as an ovipositor (a tube through which females deposit eggs). Wasps retain their stinger after use, but female honey bees' leave their stingers in their victims. When you are stung on the hand by a bee, you can actually watch the small bulb attached to the stinger pump venom that is more toxic per unit weight than that of a rattlesnake. Fortunately, the dose is so small that it is seldom lethal. Once the bee has stung, however, she dies, because of the damage to her abdomen, part of which is attached to her stinging unit.

Bumblebees sting, but they are usually too busy gathering nectar and pollinating flowers to do so. Their furry yellow-and black-banded bodies make them easy to identify as one of the "good bugs." The ichumenid wasps are also good guys because many species in this family lay their eggs in the larvae of various bark-burrowing insects that attack forest trees; the "infected" larvae then die. One large European ichumenid (1 1/2" or 4cm long), *Rhyssa persusoria*, can drill its ovipositor through as much as 6 cm (2 1/2") of solid wood to lay its egg in the wood-boring larvae of horntail wasps. The

directionally controlled drilling can take a half-hour or more, and it is astonishing that she can drill through that much solid wood and still hit her target as well. When the egg hatches, the larva feeds on the grub it has parasitized and causes its death. Preying on wood-boring insects qualifies ichumenids as good insects that work for our benefit.

Among beetles there are a few outstanding good guys. Ladybugs, with their shiny red, black-spotted elytra (the hard forewings that cover and protect the delicate hindwings used for flying), are easy to spot. Indeed, they long ago acquired folklore status—"Ladybug, ladybug fly away home...." Its less visible nymph stage, however, is valuable to us as an aphid predator, welcomed by gardeners and farmers to control the damaging sap-sucking prey. A related but less conspicuous human benefactor is the dung beetle that lives in both the new and old worlds. They neatly make balls of fresh dung and, walking on their two pairs of forelegs, straddle the ball with their hindlegs, rolling it backwards to their nest hole as food for their larvae. Not only do they remove dung (generated by any mammal from primate to elephant), but they move it underground where it eventually becomes plant fertilizer.

Earthworms, the subject of my April 2002 letter, are certainly farmers' helpers, but pinworms, tapeworms and related mammalian parasites are definitely "enemies." One worm-like invertebrate, the leech, generates mixed reactions. From my own experience, the worst pests are the land leeches (about 50 species) that live in southern and southeast Asia, Oceania, Madagascar and tropical South America. They travel like an inchworm by looping, and live in the damp foliage of the forest understory from where they drop on to passing warm-blooded hosts. Such opportunities for blood meals are rare and leeches have adapted to intervals of up to a year without feeding. Once the leech attaches its mouth to the skin of its host, it cuts a small shallow hole and releases an anti-clotting compound from its salivary glands. Its body cavity is designed to hold 10 to 15 ml of blood, several times its empty weight. Digestion often takes as long as six months, and the stored blood is preserved from decay by specialized bacteria in the leech's gut. Even after six months, if no new blood is available the leech can survive, albeit barely, by living off its own body tissue, thereby making it one of the only animals that does not appear to suffer from hunger.

I was bitten by terrestrial leeches in Madagascar. The bite does not hurt, but it is messy. You first notice feeling wet and squishy around the bite. By that time the leech has generally fallen off and you are left to stem the flow of blood as best you can. The leech's anti-clotting compound is extraordinarily effective and, as I remember, it was well over an hour before I finally stopped bleeding.

The leech's bloodsucking ability has been put to good use by physicians in phlebotomy (bloodletting), a common practice a century or more ago, but still useful today in reducing the swelling of large hematomas. The species used is the medicinal leech (*Hirudo medicinalis*); they were so overcollected from the wild, especially in the

mid-nineteenth century, that they became extremely rare. Although thought to be extinct in Britain, a small population was found in southeast England in the late 1970's. The scale of collecting them was staggering; in 1833, France imported 42 million, most of which came from Hungarian marshes. The United States at that time was importing about 30 million annually from Europe because *H. medicinalis* extracted much larger amounts of blood than the local American species.

The idea was that leeches would remove "bad blood" from the patient and thereby help him/her recover. We know today that "bad blood" does not cause illness by itself; nonetheless, medical doctors are increasingly relying on medicinal leeches to assist in plastic surgery and are using them to restore circulation to tissues that have been grafted. Leeches evidently use exactly the right amount of suction to restore the flow of blood after such delicate operations as skin grafting.

Although leeches can help us heal our bodies, myriad other invertebrates can enhance our spirits by their aesthetic appeal, especially the innumerable species of lepidoptera, whose brightly patterned wings bring joy to all who behold them. The world would be markedly poorer without butterflies in our gardens. Consider, too, the satisfaction afforded our senses when luxuriously dining on such tasty invertebrates as shrimps, lobsters, crabs, oysters, clams, etc. Rejoice in the spineless fellow occupants of our planet, whose total number and volume far exceed that of our vertebrate kin! Give the "creepy-crawlies" their due and remember how crucial their extraordinary diversity is in maintaining the health of our planet.

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