The Private Life of Spiders

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HILLYARD, PAUL. 2008. The Private Life of Spiders. Princeton University Press, 41 William Street, Princeton, NJ 08540 USA. 160 pp. Hard back, Oversize. ISBN 978-0-691-13552-6. $29.95.

The Private Life of Spiders is beautifully illustrated with more than 100 color pictures and informative text. Nearly every page has a color picture, and there are many full-page close-up views of spiders. Paul Hillyard is the former curator at the Natural History Museum in London, and an authority on spiders. There are 9 chapters, with the first chapter introducing the body structure of spiders and their general biology. In successive chapters, Hillyard covers spiders that hunt, build webs, and live in holes in the ground with trap doors including tarantulas. Additional chapters cover silk formation, mating and breeding, and venom and its medical and insecticidal roles. The penultimate chapter is on social spiders, followed by the final chapter entitled "Spiders and Man." There is an extensive Glossary to aid those who may be less familiar with scientific jargon, a list of additional readings and web sites about spiders, and an index. Hillyard says that there are 38,000 identified species of spiders, and suggests that an equal number remain to be identified. Spiders appeared about 400 million years ago (page 13 in Hillyard), about the times that insects also began to appear. Many fossilized spiders have been found in amber.

Although spiders are not insects as many nonscientists seem to think, many entomologists have an interest in spiders for their beauty, biology, and no doubt, because insects are one of the main food items of spiders. Spiders are important biological control agents of insects (Riechert & Lockley 1984). In turn, some wasps hunt and paralyze spiders as food for their developing young (text and picture on page 25). Tom Eisner (Eisner & Eisner 1991; Eisner et al. 2008) and his colleagues have often used spiders to test for palatability of prey by offering the spider suspect insects or other small arthropods. Spiders and insects share a number of structural characteristics. Some spiders have a tracheal system to deliver oxygen to their tissues, some have both tracheae and book lungs, and some have only book lungs. Many spiders produce silk. Spiders do not have compound eyes like insects, but their eyes are more like the ocelli of insects.

My interest in spiders was piqued by the second graduate student that I helped advise, John F. Anderson, in the mid 1960s. John came to Florida to study spiders with Howard K. Wallace, an authority on certain spiders, and chairman of the Zoology Department at the University of Florida. I was a faculty member in the Zoology Dept. during the 1960s and John expressed an interest in the physiology of spiders, which is how I came to be part of his advisor committee. Among the many fascinating bits of information I learned from John is the fact that spiders do not have extensor muscles for their 8 legs. The legs are extended by a relatively high blood pressure, and flexor muscles bend the legs for the next step. Hillyard mentions this on page 10 and defines hydraulic extension in the Glossary as "Straightening of the legs due to the internal pressure of body fluid." Insects have both extensor and flexor muscles to move their legs.

The varied ways that spiders hunt and capture their (typically) insect prey is described and illustrated in Chapter 2. Hunting spiders usually do not build webs, but wait for their prey to come near. I found the spitting spiders (family Scytodidae) described with an illustration on page 43 fascinating. They spit venom and glue at their prey and as the glue tangles the legs, they move in to bite the victim and inject more venom. At least one spider, *Argyroneta aquatica*, lives entirely underwater and feeds upon small minnows and insects. Its hairy body acts like a plastron allowing it to capture an air bubble at the surface for restocking a submerged silken diving bell (page 41 with illustration).

The many different kinds of webs that web building spiders construct are described in Chapter 3 with additional material in Chapter 5 entitled The Silk Factory. A single strand of spider silk is thin but strong. The beauty of certain webs early in the morning with dew on them can't help but appeal even to arachnophobes, a topic dealt with in Chapter 9 entitled Spiders and Humans. Orb weavers typically have a number of spinnerets to secrete silk, and some are able to regulate the size of the spinneret openings to spin silk of different thickness and strength.

Trapdoor spiders and tarantulas are the subject of Chapter 4. Tarantulas are relatively gentle spiders that seldom attack humans. Their venom is not very toxic, but some have urticating hairs that can irritate the skin. A beautiful photographic sequence of a trap door spider emerging from its hole in the ground spans pages 70-71.

Mating and breeding are described and illustrated in Chapter 6. Spiders have several mechanisms for attracting mates. Although many spiders have relatively poor visual acuity, some have excellent eyesight, and in those courtship behavior is often extensive and complex. Some females deposit pheromones on the silk threads of their web to attract and lead males to find the female (Gaskett 2007). As many as 25% of spider families have members that produce sounds (page 97), including drumming, buzzing, hissing, and body and leg movements that vibrate the vegetation on which the spider rests. Male spiders produce sperm that are transferred to a small pad of silk that is taken up by the male's palps. A successful male transfers sperm by inserting the palps or a duct from the palps into the genital opening of the female (page 94, photograph of mating of male black widow with the female). Male spiders are often smaller, sometimes much smaller, than the female that they must mate with, and are in danger of being dinner before or after mating. Some have evolved specific strategies to avoid this unhappy ending, and attempt to mate only when the female is distracted, as when she is eating a captured insect. Several other strategies that males have evolved to avoid being eaten are described. Some female spiders guard their eggs until they hatch (pages 104-105).

In Chapter 7, The Use of Venom, Hillyard describes and illustrates some of the more venomous (meaning injection of venom) and poisonous (meaning toxic venom) spiders, which often are the ones associated more closely with humans. There are a number of relatives of the American black widow spider in various parts of the world, and about 50 species of recluse spiders, of which the American species is the brown recluse spider, or *Loxosceles reclusa*. *Atrax robustus*, a funnel-web spider, in Sydney, Australia is particularly aggressive and said to be particularly dangerous to children (page 117). The Brazilian Wandering Spider, *Phoneutria nigriventer*, is a large, fast moving spider that may enter homes and show aggressiveness towards humans.

Chapter 8, Social Spiders, is short but describes some social species of spiders. Chapter 9, Spiders and Humans, begins with the fairly common arachnophobia in humans, and Hillyard concludes that the best way to combat it is to learn about spiders, which is likely to show that most fears are caused by misconceptions about spiders. This chapter includes a short section on biotechnology in which spider genes that produce silk have been inserted into the genome of certain goats, so that the females produce the silk proteins in their milk. The proteins can be purified and spun into silk. The chapter concludes with several pages on the importance of spider conservation. As is typical in loss of biodiversity in general, loss or disturbance of habitat is the principal enemy of spider conservation. A recent publication by James Carrel (2008) showed that density of female orb weavers was not significantly changed by winter burning of habitat at Archbold Station in south-central Florida, but summer burns nearly wiped out local spider populations. One can only be dismayed at what is happening to wildlife in general, and spiders in particular, as the hundreds of wildfires burn in California as this is being written.

I recommend this beautiful book to all naturalists, amateur as well as professional. It will inform and entertain, and if you are an arachnophobe, this book might alleviate most of your fears.

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