Parasites from Threespine Sticklebacks in Oregon

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by

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While performing a fish survey in a reservoir on the Basket Slough National Wildlife Refuge in Polk County, Oregon, we noticed two interesting things. First, we collected only native threespine stickleback, *Gasterosteus aculeatus*, and no other fish species. Finding only native fish was surprising because this reservoir was on a historic farm, and farm ponds are generally stocked with some type of warmwater fish, such as sunfish and/or catfish. Bodies of waters containing only native fish species in this region of Oregon are rare.

Second, we noticed that most of the stickleback had greatly distended abdomens. Our collections were in June and so, initially, we assumed that we had collected many gravid females. We couldn't extrude any ova, though, so we then had to look for an alternative explanation for the distended abdomens. The next obvious explanation was parasitism. We dissected a few specimens and found them loaded with parasites. We gave specimens of the sticklebacks to a pathologist with the Oregon Department of Fish and Wildlife. The pathologist isolated several parasites from the fish: cestode (tapeworm), *Schistocephalus solidus*; protozoans (*Glugea* spp., *Loma* spp., *Tricodinella*, and encysted *Trichodina*); and a few unidentified trematodes. For the remainder of this article, I will focus on *S. solidus*.

The most obvious parasite was the tapeworm, *Schistocephalus solidus*, the cause of the distended abdomens (Figs. 1 and 2). In some specimens, the tapeworm actually weighed more than the host fish, and frequently took up so much more space that the fish's organs were displaced. Not only was *S. solidus* the largest parasite recovered from the fish, it has a fascinating life history as well.

The eggs of *S. solidus*, when dropped in water, hatch into free-swimming larvae. The larvae are then eaten by copepod crustaceans. The tapeworm develops into additional larval stages as the copepods become the first intermediate host of the tapeworms. The infected copepod is eaten by a fish—a second intermediate host of the tapeworm. As the infected second copepod is in the gut of the fish, the larval tapeworm burrows out of the gut of the fish and takes up residence within the fish's gut cavity. The tapeworm demands high oxygen and respires through its integument, getting its oxygen from the fish's highly vascularized gut lining. In response to its oxygen-robbing host, the fish rises to the water's surface to gulp atmospheric air. While gulping air at the surface, the fish becomes more susceptible to predation by fish-eating birds, the ultimate host of *S. solidus*. The tapeworm attaches to the lower gut of the bird and spends its entire life there. The tapeworm extrudes eggs in the feces of the bird and the cycle starts all over again.

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Fig. 1. Left lateral view of threespine stickleback, *Gasterosteus aculeatus*, with a distended abdomen. Photograph by Aaron Drew.

Fig. 2. Left lateral view of a dissected threespine stickleback, *Gasterosteus aculeatus*, with specimens of the tapeworm *Schistocephalus solidus* removed from the fish. Photograph by Aaron Drew.