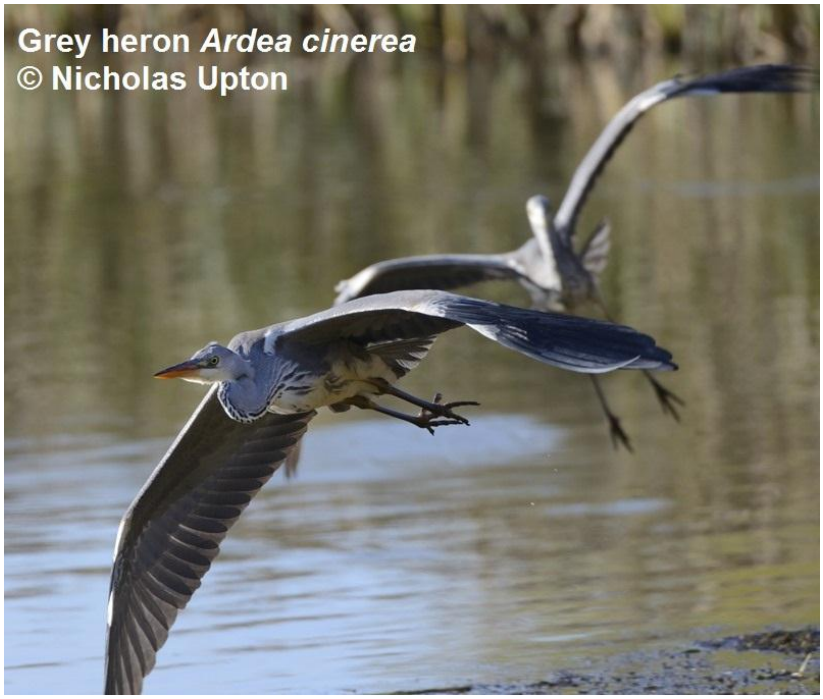
The Hidden World of Fish Parasites

Fish parasites are a natural component of our river ecosystems. Most river fish will carry fish parasites during their lives. Many of these parasites rely on a series of hosts to complete their lifecycles. Natural, well-managed rivers not only facilitate parasite movement, they also promote healthy fish populations with strong immune systems, which can cope with parasitic infections and build up natural resistance to the parasites. Native parasites do not usually cause significant problems unless the river ecosystem is faced with additional stresses such as pollution, over-engineering, lack of vegetation for fish refuge, and obstructions to fish passage.

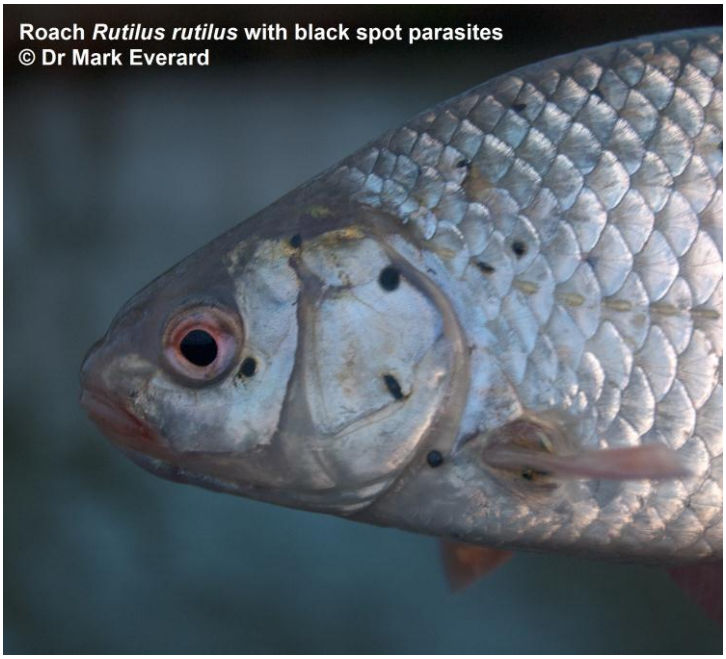
There are many different types of fish parasites, each with life-cycles which have evolved to exploit different hosts. The final host is generally warm-blooded, whilst intermediate hosts are usually cold-blooded. One such fish parasite is *Posthodiplostomum cuticola;* more commonly known as 'blackspot' (which is the larval form). If you are an angler, you may have noticed distinctive black spots on the fish you have caught. Peer a little closer, the culprit could be black spot!



P. cuticola is a flatworm belonging to the Family of parasitic worms known as 'Digeneans'. The adult lives in the intestine of a fish-eating bird such as a heron, cormorant, or kingfisher. The eggs are released into the water via the bird's faeces. Once in the water, the eggs hatch out into larvae called 'miracidia'. The miracidia larvae have hair-like structures called cilia, which help to propel them through the water.

The miracidia seek out an intermediate host, in this case freshwater snails. The larvae settle inside the snail and undergo metamorphosis into 'sporocysts'.

The sporocysts reproduce asexually to produce 'furcocercariae', which leave the snail and search for a secondary intermediate host; a fish.


Roach *Rutilus rutilus* with black spot parasites
© Dr Mark Everard

Once burrowed into the fish's skin, gills, or fins, the furcocercariae can multiply in the fish host. They then metamorphose into a final larval stage called 'metacercariae'. The larvae then need to undergo final metamorphosis to turn into adults, but for this they require a warm-blooded bird to act as the definitive host.
The burrowing of the metacercariae into the skin of the fish evokes a host response which causes the fish to produce melanin (a dark pigment) around the cyst. The black spots on the fish break down the fish's natural camouflage, making it more probable that a final host will find it and eat it. The fish is eaten by a bird, and the parasite larvae have the environmental conditions required to develop into adults.

There are many other examples of parasites which have evolved special ways to change the appearance, or behaviour of their hosts. Whilst black spot, in moderate numbers, are fairly benign to the fish, some metacercariae will incapacitate their hosts. For example, sticklebacks often end up blind with heavy parasitic loads. Another macabre example is the terrestrial parasite *Leucochloridium paradoxum* (also a parasitic flatworm). This parasite, found in the temperate forests of Northern Europe, invades the tentacles of its intermediate host (a land snail) and causes the tentacles to pulsate in a mesmerising, multi-coloured extravaganza which attracts a predatory bird. Look it up on YouTube and prepare to be amazed…

So the next time you're out fishing, and catch a fish with black spots, take a moment to think about what it might be, and how it came to be there!

Daniel Wood, BART volunteer