Drugs in the water make fish shoal different

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In our rivers and lakes there is a broad variety of chemical pollutants that can affect in some way the existing wildlife. One of these types are the so-called “endocrine disruptors”, which are substances able to interfere with the hormonal system of an exposed individual. Hormones are the chemical messengers of the body and are involved in multiple processes such as regulation of mood, growth, development or sexual function. So interfering with the hormonal system can have very serious consequences!

So far, scientists have studied one by one the effects of the endocrine disruptors on different species. But few researchers have paid attention to what happens when these substances are mixed – as they are actually found in nature! Are the effects bigger compared to when the pollutants are present individually, or maybe do the substances neutralize each other?

Furthermore, almost none have looked at what happens to the behavior. Changes in behavior can have consequences not only for the individual exposed to the pollutant, but for the whole system. For example if a fish becomes bolder after the exposition to a pollutant, it may increase the amount of prey it eats, or be more easily hunted by a predator – therefore producing changes in the food web. In addition, the behavior of a fish is related to the morphology, which means body shape. For example fish from the same species but with different shape may hunt differently. Behavior and morphology can also relate to growth rate, for example if the fish is more aggresive it will get more preys. So my aim with this project was to test the effects that a “cocktail” of two naturally-ocurring endocrine disruptors could have on fish behavior and morphology. The two substances I used are called bisphenol A and ethinylestradiol, both contained in products largely used in our society, that enter into rivers and lakes mainly through the waste water treatment plants.

During 8 weeks, bleak (*Alburnus alburnus)* were living in aquaria with water containing these pollutants separated or mixed. During and after this time I measured their locomotor activity (how much the fish moved), the social behavior (if they tended to be near or far from each other), their morphology and their growth. There were some effects on this measured parameters, attribuable not to the “cocktail” but only to one of its ingredients. It turned out that the ethinylestradiol not only slows down the growth rate, but is able to change the behavior of the fish, making them to keep thighter shoals. This can have serious ecological consequences. In other studies, the decrease on growth rate of fish resulted in smaller fish. This had an impact on the zooplankton community, which serve as the fish food. Therefore the zooplankton community increased in size. The change on shoaling behavior can also have consequences. Shoaling has some benefits for the individual fish, as it is more protected against predators, but also some costs as more competition for the food occurs. Therefore a tighter shoal may alter this trade-off, although accurate consequences are difficult to predict. Threre is a lot left for future research!

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