

River regulation influences land-living animals

February 28 2013, by Ingrid Söderbergh

Forest-living insects and spiders become less abundant and birds are adversely affected along regulated rivers. Three different studies by ecologists at Umeå University show that river regulation has a negative effect also on land-living animals.

It is already well known that river regulation influences salmon migration, [aquatic insects](#) and streamside vegetation, but effects on land-living animals have been poorly studied.

When free-[flowing rivers](#) become regulated, there is a reduction in the number of aquatic insects that, during spring and summer, emerge and fly onto land where they become food for land-living animals.

"Our studies show that the number of flying insects is lower along regulated rivers than along free-flowing rivers. This results in fewer forest-living insects and spiders along regulated rivers, as the resource they feed upon - emergent aquatic insects - is reduced," says [ecologist](#) Micael Jonsson, the lead author on two of the articles.

Together with a group of researchers, he has compared the abundance of insect-feeding animals along similar river stretches at four regulated and four free-flowing large rivers in northern Sweden and the Finnish Kemi River. Along these rivers, flying and ground-dwelling insects were caught. The [flying insects](#) were caught with a net mounted on the top of a moving car, and the ground-dwelling insects and spiders were caught in pitfall traps.

The research team also shows that birds are adversely affected by river regulation. Besides a standardised bird survey, nest boxes were used to investigate breeding success of insectivorous birds. The study species, the Pied Flycatcher, is a relatively common species and prefers to use nest boxes.

The results show that adult Pied Flycatchers breeding along regulated rivers lost more weight after their eggs were hatched and fewer of the chicks survived, because their food resource - the insects - was less abundant. Along one of the regulated rivers, the survival of the chicks was even lower than what is required for the species to persist.

There were also signs of whole bird communities being impacted by river regulation. Aquatic insect emerge and fly onto land before terrestrial insects peak in numbers. The aquatic insects are therefore an important food resource for birds early in the season, while, normally, birds are seen foraging away from aquatic systems later in the season.

"We could see that such seasonal movements of whole bird communities differed between regulated and free-flowing rivers," says Micael Jonsson.

That the effects are still visible half a century after regulation of these rivers was initiated clearly indicates that the changes are permanent. The studies also highlight the fact that different types of ecosystems influence each other via resource flows, and that changes in one ecosystem therefore affect plant and animals in nearby ecosystems.

"Therefore, there are even stronger reasons to question the use of biological insecticides to reduce the numbers of mosquitoes along rivers in central Sweden and elsewhere in the world, because it most likely results in poorer living conditions for a range of land-living animals."

The studies are published in the international journals *River Research and Applications*, *Ibis*, and *Ecological Research*.

More information: Jonsson, M, Delea, P. and Malmqvist, B. 2013. Persisting effects of river regulation on emergent aquatic insects and terrestrial invertebrates in upland forests. *River Research and Applications* ([doi:10.1002/rra.2559](https://doi.org/10.1002/rra.2559)).

Strasevicius, D. et al. 2013. Reduced breeding success of Pied Flycatchers *Ficedula hypoleuca* along regulated rivers. *Ibis* ([doi:10.1111/ibi.12024](https://doi.org/10.1111/ibi.12024)).

Jonsson, M., Strasevicius, D. and Malmqvist, B. 2012. Influences of river regulation and environmental variables on upland bird assemblages in northern Sweden. *Ecological Research* 27: 945-954.

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