Hydropeaking extirpates river insects

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Hydropower produces 19% of the world's electricity—far more than all other renewable sources combined. In the face of mounting climate-change effects, the rush to this profuse energy source is expected to continue. However, hydroelectric dams can also produce a number of environmental consequences, many of which are unrecognized or understudied.

Writing in an article for *BioScience*, an interdisciplinary team led by Theodore A. Kennedy of the US Geological Survey identifies one such threat: these dams' ability to devastate aquatic insect populations and the food webs that those insects underpin. One of hydropower's benefits as an energy source is that water releases can be timed to match periods of peak electrical demand. However, say the authors, such releases create "an extensive intertidal zone along river shorelines that is absent from natural rivers and to which freshwater organisms are not adapted." The threat may be most dire for aquatic insects who lay their eggs nearshore, where they are damaged by varying water levels that expose them to air. In lab tests of mayfly and caddisfly egg viability, the authors found that even "brief desiccation markedly reduced egg viability."

Putting their laboratory results to a real-world test, the authors recruited a group of citizen scientist river rafters to collect thousands of insect samples in a Grand Canyon section of the Colorado River. Lower abundances of insects that lay their eggs nearshore were expected. The results were a striking confirmation: "Citizen science data indicate species with river-edge egg laying behaviors have been largely extirpated from Grand Canyon," say the authors. The results were bolstered by a

further analysis of 16 rivers, in which the authors found that "aquatic insect diversity was strongly and negatively related to the degree of hydropeaking." Decreased aquatic insect abundance and diversity may have major effects on food webs, predators, and human recreational activities, such as in the case of the valuable rainbow trout fishery downstream of the Glen Canyon Dam. To prevent such impacts, the authors suggest a number of methods for mitigating the environmental degradation inflicted by hydropeaking, including a reduced peak-flow schedule on weekends, when energy needs are typically lower. Through such measures, the authors suggest, highly altered rivers such as the Colorado can "continue meeting societal needs for renewable hydroelectricity while ensuring the sustainable provisioning of critical ecosystem services."

More information: bioscience.oxfordjournals.org/ … /04/30/biosci.biw059

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