

Press release

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HKU Ecologists Lead Global Study Revealing Dam Construction's Harmful Impact on Migratory River Species



The gold neon dwarf goby (*Stiphodon percnopterygionus*) is one of many diadromous species affected by dam-induced habitat fragmentation. Image credit: Jeffery C.F. Chan

A global review of research on the impacts of dams has revealed that they are significantly harmful to diadromous species – fish, crustaceans and snails that migrate between fresh water and the sea, relying on intact, connected rivers to complete their life cycles.

The study, led by PhD student Jeffery CHAN and supervised by Emeritus Professor David DUDGEON of the School of Biological Sciences, The University of Hong Kong (HKU), in collaboration with researchers including Billy LAM from Max Planck Institute for Neurobiology of Behaviour-Caesar and Dr Jia Huan LIEW from the University of Tasmania, found that dams cause widespread disruptions to migratory species, reducing their abundance, species diversity, and genetic diversity.

Published in *Biological Reviews*, the study is the first comprehensive global synthesis of the impacts of dam-induced fragmentation on diadromous species. Drawing on over 100 research outcomes, it finds that while dams pose a major threat to freshwater biodiversity, the full extent of the impacts is underestimated on a global scale due to knowledge gaps and research shortfalls that urgently need to be addressed.

The findings show that dams obstruct breeding migratory routes and feeding grounds between coastal waters and rivers. While fish passes – also known as fish ladders – are structures commonly employed to facilitate fish

movement around dams and enable free passage between habitats, their effectiveness has consistently proven to be inadequate.

‘We found consistent negative effects across most ecological indicators, especially for species that can’t survive in landlocked environments,’ said Chan. ‘Fish that lack strong climbing or jumping abilities are particularly affected, but even better climbers like eels or species capable of adapting to a landlocked life cycle like salmon are not spared.’

‘Despite their widespread use, fish passes often underperform, particularly when designed without understanding the specific behaviours and traits of local species,’ added Dr Liew.

Dam removal, while sometimes costly and limited by societal needs, was identified as the most consistently effective strategy for restoring connectivity and migration routes in fragmented rivers.

This study offers crucial insights for managing freshwater biodiversity amid accelerating dam construction for hydropower generation and climate-driven ecological change. However, the researchers emphasise that significant knowledge gaps remain — particularly in regions where biodiversity is highest, and dam development is most rapid. Dudgeon points out that ‘China is a world leader in the construction of large dams, and rivers such as the Yangtze and Pearl have been fragmented by multiple dams in ways that are most likely to be irreversible; the effects have not been confined to diadromous species, with virtually all river fishes experiencing population declines leading — in some cases — to extinction’.

Most studies on the effects of dams have focused on temperate species such as salmon, leaving tropical systems and non-fish diadromous animals — such as migratory shrimps and snails — largely understudied. This imbalance limits the understanding of the full global impact of river fragmentation.

The authors stress the need for improved ecological assessments during the early stages of dam planning and development to minimise long-term harm.

‘There are many ways to assess and reduce the impacts of dams before they’re built,’ Chan added. ‘With more rigorous planning, standardised guidelines, and context-specific solutions, we can better safeguard the biodiversity of our rivers.’

Read the full journal article here: <https://doi.org/10.1111/brv.70032>



Dams disrupt river connectivity, posing significant threats to migratory aquatic species and freshwater biodiversity. Image credit: Jeffery C.F. Chan



The migratory giant mottled eel (*Anguilla marmorata*) relies on connected rivers to complete its life cycle, making it vulnerable to dam-induced fragmentation. Image credit: Jeffery C.F. Chan



The Tahitian prawn (*Macrobrachium lar*), a migratory crustacean, faces challenges in rivers fragmented by dam construction." Image credit: Jeffery C.F. Chan

For media enquiries, please contact HKU Faculty of Science (tel: 852-3917 4948/ 3917 5286; email: caseyto@hku.hk / cindycst@hku.hk).

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