

## Crab Burrows Driving Groundwater-Surface Water Exchange in Bangladesh

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To investigate surface water-groundwater interaction in Bangladesh we constructed an experimental pond. Man-made ponds are widespread throughout Bangladesh and recent research has linked recharge from these ponds to high levels of groundwater arsenic [1]. We have developed a novel method that couples stable isotope and water balances to estimate time-series data for fluxes into and out of the pond and to estimate hydraulic parameters of the underlying aquifer.

Our results show that nearly all of the aquifer recharge from ponds is flowing through crab burrows that short-circuit the low permeability surficial sediments. To maintain wetted gills required for breathing, terrestrial crabs excavate burrows that reach the deepest extent of the watertable in the dry season [2]. With surface clays covering the majority of the land area and the wide distribution of terrestrial crabs in Bangladesh, it is likely that enhanced recharge due to crab burrows is a common phenomenon.

We calculate that the annual minimum watertable falls below the surficial clay in 13% of the land area, a feature that would require crabs to burrow completely through the clay. We suggest that the lowering of the watertable throughout much of Bangladesh, due to increased groundwater usage over the past several decades, may have broadly increased surface permeability as crabs have burrowed deeper to reach the watertable.

We also use our findings to retrospectively explain previous research that found the existence of *E. coli* contamination in shallow aquifers, anomalously high rates of recharge in rice fields, and variability in recharge rates from different ponds

[1] Neumann *et al* (2009) *Nat. Geosci.* **3**, 46-52. [2] Rahman *et al* (2008) *Int. J. Sustain. Crop Prod.* **3**, 10-17