WATER AVAILABILITY

Humans trump climate

Environ. Res. Lett. **15**, 014007 (2020)

Credit: Westend61/ Getty

The altered precipitation and temperature patterns that come with climate change are expected to affect water availability across the globe. In addition to this, human systems have an impact on water resources, for example through increasing water demand by growing populations or investment in technologies that limit water use. The impact of climate and human systems is simultaneous; however, their relative roles in determining water availability, as well as how this may change in the future, are unclear.

To address this question, Neal Graham from the Joint Global Change Research Institute and colleagues quantify the contribution of both systems as drivers of future water availability under the Shared Socioeconomic Pathways–Representative Concentration Pathways framework. They find that humans drive water availability under all scenarios, but whether its scarcity increases or decreases depends on the socioeconomic pathway, as well as geographical area. In some cases, humans could reduce water scarcity in nearly half of the world by 2100. The results show the importance of technological development in managing water resources under climate change. *AF*

https://doi.org/10.1038/s41558-020-0700-9

OCEAN ACIDIFICATION

Fish behaviour unchanged

Nature **577**, 370–375 (2020)

Increasing CO_2 levels in the ocean will lower the pH, creating a more acidic environment. Research has shown that fish sensory systems and behaviour are affected under these conditions, with reef fish particularly sensitive to pH decreases. However, differences between studies and species responses require further investigation to draw conclusive predictions of impacts.

Timothy Clark of Deakin University, Geelong, Australia and co-authors conducted three years of experiments to replicate previous studies and advance the field of fish behavioural response to ocean acidification. The study used over 900 individual coral reef fish from six species across different life stages and looked at avoidance of predator chemical cues, fish activity levels and preference of turning direction. Experiments were carefully documented to ensure transparency.

The authors found no consistent change in the studied behaviours under predicted end-of-century ocean acidification. They suggest that this difference could be a result of small sample sizes and methodological or analytical weaknesses in previous studies, and warn against results showing small within-group variance. *BW*

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SALINIZATION AVOIDANCE

Freshwater fauna flee

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Credit: Colin Milkins / Photodisc / Getty

Climate change scenarios predict increased seawater intrusion resulting in salinization of low-lying coastal freshwater ecosystems. Largely, ecological risk assessment of this intrusion has used standard organism toxicity tests, in which lethal or sublethal effects are assessed following forced stress exposure. For mobile organisms, however, stress avoidance is common, suggesting that emigration may result in local population losses at much lower saline concentrations.

Cátia Venâncio from the University of Coimbra, Portugal, and co-authors used a lab-based avoidance system to observe the emigration of four diverse aquatic species in response to a saline gradient. Planktonic crustacean (*Daphnia magna*), epibenthic ostracod (*Heterocypris incongruens*), frog (*Xenopus laevis*) and zebrafish (*Danio rerio*) exposed to species-specific salt concentrations associated with 50% population lethality (LC_{50}) all showed avoidance of well above that 50%. Including avoidance, LC_{50} concentrations resulted in 85–97% decrease in local population.

To assess the full risk of local losses due to salinization, avoidance emigration must be considered. *TAM*

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ATMOSPHERIC CONVECTION

Trouble rising

J. Clim. https://doi.org/10.1175/JCLI-D-19-0461.1 (2019)

The strength and likelihood of atmospheric convection is often distilled into two quantities. Convective available potential energy (CAPE) estimates the energy that air can access if lifted to a height where it is buoyant; more CAPE suggests a less stable atmosphere and stronger convection. Convective inhibition (CIN) is the energy that air must overcome to access its CAPE; higher CIN implies that air is more stable and less buoyant. Both CAPE and CIN are expected to increase over land under climate warming. Understanding why informs future storm behaviour.

Jiao Chen of Nanjing University, China, and co-authors use climate models to analyse these warming-induced increases. Over most land, higher CAPE is attributed to more moisture in the near-surface atmosphere, which releases extra latent energy as air rises and water condenses. CIN increases are due to lower near-surface relative humidity, which makes it more difficult for rising air to condense water and release latent heat. These changes lead to a recipe for more extreme weather: while higher CIN suppresses storms and increases dry-spell and drought likelihood, higher CAPE permits more vigorous convection and heavy precipitation. *BL*

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