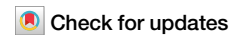


<https://doi.org/10.1038/s43247-025-02229-w>

Mangroves support an estimated annual abundance of over 700 billion juvenile fish and invertebrates



Philine S. E. zu Ermgassen^{1,61}✉, Thomas A. Worthington^{2,61}✉, Jonathan R. Gair³, Emma E. Garnett⁴, Nibedita Mukherjee⁵, Kate Longley-Wood⁶, Ivan Nagelkerken⁷, Kátya Abrantes^{8,9}, Octavio Aburto-Oropeza¹⁰, Alejandro Acosta¹¹, Ana Rosa da Rocha Araujo¹², Ronald Baker^{13,14}, Adam Barnett^{8,9}, Christine M. Beitz¹⁵, Rayna Benzeev¹⁶, Justin Brookes¹⁷, Gustavo A. Castellanos-Galindo^{18,19,20}, Ving Ching Chong^{21,22}, Rod M. Connolly²³, Marília Cunha-Lignon^{24,25}, Farid Dahdouh-Guebas^{25,26,27,28}, Karen Diele²⁹, Patrick G. Dwyer³⁰, Daniel A. Friess³¹, Thomas Grove³², M. Enamul Hoq³³, Chantal Huijbers³⁴, Neil Hutchinson^{35,36,37,38}, Andrew F. Johnson^{39,40}, Ross Johnson⁴¹, Jon Knight⁴², Uwe Krumme⁴³, Baraka Kuguru⁴⁴, Shing Yip Lee⁴⁵, Aaron Savio Lobo⁴⁶, Blandina R. Lugendo⁴⁷, Jan-Olaf Meynecke⁴⁸, Cosmas Nzaka Munga^{49,50}, Andrew D. Olds⁵¹, Cara L. Parrett⁵², Borja G. Reguero⁵³, Patrik Rönnbäck⁵⁴, Anna Safryghin⁵⁵, Marcus Sheaves^{9,56}, Matthew D. Taylor⁵⁷, Jocemar Tomasino Mendonça⁵⁸, Nathan J. Waltham^{9,35}, Matthias Wolff⁵⁹ & Mark D. Spalding^{2,60}

Mangroves are a critical habitat that provide a suite of ecosystem services and support livelihoods. Here we undertook a global analysis to model the density and abundance of 37 commercially important juvenile fish and juvenile and resident invertebrates that are known to extensively use mangroves, by fitting expert-identified drivers of density to fish and invertebrate density data from published field studies. The numerical model predicted high densities throughout parts of Southeast and South Asia, the northern coast of South America, the Red Sea, and the Caribbean and Central America. Application of our model globally estimates that mangroves support an annual abundance of over 700 billion juvenile fish and invertebrates. While abundance at the early life-history stage does not directly equate to potential economic or biomass gains, this estimate indicates the critical role of mangroves globally in supporting fish and fisheries, and further builds the case for their conservation and restoration.

Food from the marine and coastal environment is a crucial source of protein and micronutrients for billions of people^{1,2}. As the global human population and its requirement for food continues to increase, pressure for the marine and coastal environment to supply greater amounts of seafood will also increase^{3,4}. In addition, marine fisheries support livelihoods for an estimated 260 million people, particularly in the Global South^{5,6}. The production of marine and coastal food as well as the livelihoods supported are intrinsically linked to the condition of the environment, with healthy fish stocks dependent on the effective ecological functioning of freshwater, coastal and marine ecosystems⁷. Marine and coastal food production is therefore highly vulnerable to human driven environmental disturbance⁷, including over-harvesting, which has already driven losses in productivity and the collapse

of some fisheries^{8,9}. Coastal ecosystems have been highlighted as a critical driver of marine fisheries productivity¹⁰. In the face of widespread loss and degradation of these ecosystems, quantifying their role in marine fish and invertebrate production is key to help inform and support actions to sustainably manage these resources¹¹.

Mangrove forests are complex and highly productive ecosystems, thriving in sheltered intertidal areas of tropical, subtropical, and warm temperate coasts worldwide¹². Their location, productivity, and structure provide critical habitat for several finfish and shellfish species, giving shelter, food, solid structure for settlement, and critical nursery grounds^{13,14}. For millennia they have supported human communities who fished and foraged in their waters, and today there are an estimated 4.1 million mangrove-

A full list of affiliations appears at the end of the paper. ✉e-mail: Philine.Zu.Ermgassen@ed.ac.uk; taw52@cam.ac.uk