

Science for Environment Policy

What is the medical value of marine biodiversity?

Undiscovered cancer treatments from marine organisms could be worth between US\$563 billion (€428.5 billion) and US \$5.69 trillion (€4.33 trillion), according to a recent study. The researchers estimate that there may be as many as 594,232 novel compounds waiting to be discovered in unstudied marine species, and that these could lead to between 55 and 214 new anti-cancer drugs. The study only accounted for anti-cancer drug revenues. In reality, these chemicals from the sea can have numerous other biomedical applications including antibacterial, antifungal, antiviral and anti-inflammatory uses.

Marine ecosystems are under pressure from human activities, such as fishing, and coastal and offshore development. Legislation, such as the EU Marine Strategy Framework Directive¹, aims to protect the marine environment, but monitoring and conservation often comes with a substantial cost. Demonstrating the economic and social value of marine ecosystem services could help with raising awareness and informing management and policy decisions.

The results of this study provide a global estimate of the market value of one of the most important ecosystem services the oceans provide, and emphasise the need to protect our seas if we are to reap the health and economic benefits they could supply.

The researchers used a mathematical model to predict the value of undiscovered anti-cancer drugs from marine sources. They began by looking at how many novel marine products have already been identified, and how many marine species have been investigated. From there, the researchers used marine biodiversity estimates from international databases to calculate the proportion of species that had not yet been studied. This allowed them to estimate how many novel compounds awaited discovery.

They found that 18,552 marine products had already been discovered, at a rate of 2.12 new products per species studied. This figure, together with estimates of marine biodiversity, suggested that between 253,120 and 594,232 novel marine products could still be found. The animal kingdom and bacteria were the major sources, providing more products than other groups, such as plants and fungi.

The researchers conducted an overview of previous research to reveal how many existing anti-cancer drugs from marine species had made it to market. From this, they estimated that only around 1.18% of the novel compounds would make it to pre-clinical trials, 0.36% would reach clinical trials, and just 0.02% would make it to market. The researchers caution that the figures were likely to be conservative estimates as they were based on underestimates of biodiversity; of how many marine products could have anti-cancer properties; and of revenues from generic, not just patented, products.

Estimates based on economic data for existing anti-cancer drugs suggested that these novel compounds could be worth between US\$563 billion and US\$5.69 trillion, depending on estimates of total biodiversity and on the discount rates applied to calculate net present values. This economic assessment only included direct market values - in reality, improved cancer treatment is likely to lead to numerous indirect economic and social benefits that are only partially reflected in their market value.

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1. See: http://ec.europa.eu/environment/water/marine/directive_en.htm