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Sea otters: how welcome should a recovering top predator be?

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The recovery of sea otters in Pacific Canada is broadly seen as a rewilding success story because they contribute to a more productive and biodiverse ecosystem. However, they also displace local fisheries by eating commercially valuable shellfish. Our study examined some of the costs and benefits from the recovery of this endearing, endangered animal.

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Sea otters are a marine mammal with a long history of interactions with humans. Beyond their cute appearance, they were once hunted to near extinction for their lush pelts. To help recover this endangered species, sea otters were re-introduced to the northwest coast of Vancouver Island in British Columbia, Canada, by federal agencies from a small Alaskan population in the late 1960s and early 1970s. The 77 animals that survived the voyages did well in their former habitat, and 30 years later they had fully re-occupied a large stretch of this remote, exposed coastline.

While this is widely seen as a success story in species recovery, sea otters are prodigious consumers of shellfish, using tools and adaptive hunting strategies to catch prey such as sea urchins, crabs, and clams. After sea otters arrive in an area, commercial fishers and coastal communities dependent on wild food harvest can face a transformed coastal landscape, with shellfish populations decimated by sea otter foraging. This puts sea otters in direct competition with people who make a living from these shellfish.

Despite this impact on human harvesters, sea otters often positively transform coastal ecosystems by eating the sea urchins that became abundant in their absence. Fewer urchins reduces grazing on kelp and allows the kelp forests — one of the most productive ecosystems on the planet — to recover. These towering plants reach the surface from depths of up to 30 m, and can grow as much as a metre a day during peak growing seasons. They create expansive marine forests that provide important habitat for fish and other marine species, increasing productivity and biodiversity. Kelp forests also

provide a range of services for people, including increased fishing, recreation, and harvest opportunities.

We considered these benefits and losses, and asked in what ways can the sea otter recovery indeed be 'valuable'? For our answer we looked at how the sea otter recovery might affect the dollar value of four coastal resources off Vancouver Island: shellfish fisheries, sea otter-directed tourism, ocean storage of carbon dioxide, and the nutrition provided by the kelp forests to the coastal ecosystem (measured as an increase in commercial finfish).

We first collected field data in two distinct coastal areas of Vancouver Island: Kyuquot Sound, -occupied by sea otters after their re-introduction, and Barkley Sound, where sea otters are still absent leaving an ecosystem that continues to be dominated by urchins and support coastal shellfish fisheries. We estimated the amount of kelp and other species in the two areas, and compared the values with and without sea otters using an ecosystem model to predict the changes triggered by the sea otter recovery. Our model showed the expected loss of commercial shellfish, but also predicted 37% more total biomass in the sea otter-present system. While comprised largely of an increase in kelp, this also included a doubling of rockfish, and significant increases in the biomass of smaller animals at the bottom of the food web.

We combined our predicted changes in biomass with fisheries prices to estimate a loss to commercial fisheries of about 7.3 million CAD a year. In contrast, the estimated gains in tourism (47 million CAD), the value of increased finfish production (9.4 million CAD), and ocean storage of carbon dioxide (at least 2.2 million CAD) significantly offset the commercial fishery losses. Our analysis broadens the discussion beyond fisheries vs. conservation and shows how a more complete assessment can expose meaningful trade-offs between ecosystems.

Rewilding of keystone predators – like sea otters in coastal systems or wolves in forest landscapes – inevitably leads to conflict with human resource users such as fishers and ranchers who have benefited from the species' absence. Our study illustrates that the costs and benefits of re-wilding are more complex, and have broader implications than just the recovery of one species versus the economic losses for a small group of humans. The transformative ecosystem changes caused by such species can have substantial, indirect economic benefits and impose unintended social costs on diverse groups of people. Some of these costs and benefits are difficult to monetize, emphasizing the importance of looking beyond dollar value to include issues of justice and equity in resource management.