SUSTAINABILITY: Anchovy Fishery Threat to Patagonian Ecosystem

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SUSTAINABILITY

Anchovy Fishery Threat to Patagonian Ecosystem

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Unsustainable anchovy harvest could disrupt ecosystem function, other fisheries, and ecotourism revenues.

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The Patagonian coast is famous for its charismatic megafauna—Magellanic penguins, southern right whales, southern elephant seals, and southern sea lions—but the small, less charismatic southwest Atlantic anchovy is a key trophic link in the ecosystem (*1*). Overfishing anchovy could disrupt energy flows in the southwest Atlantic ecosystem, harm other fisheries and wildlife, and damage the valuable ecotourism sector.

In 2003, Argentina's Federal Fisheries Council (CFP) approved a plan by the Province of Chubut for an experimental program to develop a small-scale trawler fishery for the "under-exploited" anchovy in provincial waters south of 41°S, partially as an alternative to the overfished hake (*2*). The plan notes the proximity of the Peninsula Valdés (a World Heritage Site) and the world's largest continental Magellanic penguin colony at Punta Tombo, but has no specific mechanisms to quantify the fishery's effect on the fish and wildlife species that depend on anchovy. In both 2004 and 2005, Argentine catches exceeded 30,000 tons of anchovy for the first time in 30 years (*3*).

Rising global demand for fish meal could fuel unsustainable anchovy fishery expansion on the Patagonian coast. Global aquaculture, which uses feeds manufactured from fish meal, increased by 50% between 1998 and 2004, and will likely continue to grow (*4*). Uruguay recently approved a Chilean-financed factory to process 200,000 tons of anchovy into fish meal (*5*). An increasing human population will create even greater demand for protein and nutrients derived from harvest of forage fish like anchovy.

The southwest Atlantic anchovy (*Engraulis anchoita*) is a crucial intermediate step in the flow of energy through the food web, dominating the level between tiny plankton and much of the wildlife of the Patagonian shelf (*1*). Commercially important fish and cephalopods, penguins, cormorants, terns, sea lions, and dolphins prey on the anchovy (*6*). Anchovy compose more than half the Magellanic penguin diet in the province of Chubut (*7*). The penguins also eat Argentine hake (*Merluccius hubbsi*), one of the commercially important fish species that prey on anchovy (*8*). Anchovy populations are naturally quite variable, and longer-lived predators are able to cope with this variability—as long as good years follow bad ones.

Food web interactions and trade-offs among competing fisheries require a multispecies management approach (*9*) if Argentina hopes to recover its hake fishery and simultaneously expand an anchovy fishery. Changes in anchovy populations can alter the abundance of both their predators and their prey. The effect of a decrease in the anchovy population could spread through the food web, changing the flow of energy and abundance of species not directly linked to the anchovy. These food web interactions are not yet quantitatively understood.

The spectacular wildlife of the Patagonian coast supports a thriving ecotourism industry. The Province of Chubut reported U.S.$165 million of direct revenue and U.S.$300 million of indirect revenue from tourism in 2005 (*10*), over half of which is associated with the biodiversity of the coast. If anchovy fishing reduced seabird numbers, especially of penguins, this revenue would be jeopardized.

Once a fishery is established, social pressures make it politically difficult to reduce fishing effort. The Argentine government declared a state of emergency for hake in 1999, when the hake fleet capacity exceeded the legal Total Allowable Catch (TAC) by a factor of three (*11*). The government faced stiff opposition to emergency fleet-specific bans to prevent further overfishing (*8*). Biologically rational decisions may not be politically possible once investment has occurred.

Argentine officials seek to provide employment and to generate revenue from an anchovy fishery. But before any further expansion and investment takes place, the costs to other fisheries, risks to wildlife and ecotourism, and food web interactions need to be determined. Costs and risks can then be weighed against the anticipated benefits under various management options. A conservative (precautionary) TAC, leaving a safety margin for natural fluctuations and unanticipated food web interactions, is needed to prevent overfishing and overinvestment. For adaptive management, data on ecosystem status, indicator species' populations over time, and food web interactions are needed to build quantitative understanding and to inform future management decisions.

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