

important role in feeding the world (1–6). As this industry grows, we must ensure that it is ecologically and socially sustainable. However, the current production process for the food given to farmed fish still threatens coastal ecosystems and the livelihoods of local fishers, especially in the Global South (2–7). Before aquaculture is scaled up further, its global environmental and socioeconomic footprint should be carefully reimagined.

Because small fishes are at the bottom of the trophic pyramid, overharvesting can lead to the collapse of local ecosystems (8, 9). In many places, these small fish also serve as vital, local food sources. Small fish caught in the Global South are increasingly used for fish meal production for livestock and aquaculture rather than for direct human consumption. These practices have disrupted food security in places such as Bangladesh, Gambia, and Ghana (7, 10), as affordable protein has shifted from poorer coastal communities to richer markets. Widespread illegal, unreported, and unregulated fisheries support unsustainable, large-scale fish meal production for regional use or for growing global markets.

To achieve the goals of the United Nations Decade of Ocean Science for Sustainable Development, we must develop strategies to make aquaculture truly sustainable in the Global South and beyond. This will require concerted support for technological advances such as new water recirculation and offshore innovations to efficiently rear species ranging from algae to large predator fish. To meet UN goals within a decade, we also need faster development of environmentally and socially responsible ingredients for fish feed (2–6) and effective policies to support sustainable development production schemes and human nutrition initiatives in affected coastal communities. Fisheries and aquaculture policies should include environmental governance strategies focused on seawater quality and biodiversity protection (such as farm level sustainability certification), comprehensive sustainability assessments, socioeconomic dimensions, capture fisheries, and improved feed ingredient production (1–6, 11, 12).

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Weather radars' role in biodiversity monitoring

Biodiversity is changing at an unprecedented rate, and long-term monitoring is key to quantifying these changes and identifying their drivers (1, 2). Weather radars are an essential tool for meeting these goals. However, recent policy changes make vital data unavailable. Data policy should be adjusted to take into account the broad role that weather radars play beyond meteorology.

In addition to providing essential meteorological data for weather forecasts, flood risk planning, storm warnings, and atmospheric and climatological research (3, 4), weather radars detect trillions of insects, bats, and birds in the air (5, 6). By collecting such data, they could provide an unrecognized service to society: long-term standardized monitoring of aerial biomass flows (7). In the United States, weather radar data have already been used at a continental scale for these purposes (6, 8). However, similar efforts in Europe (9, 10) are now fundamentally threatened.

The Operational Programme for the Exchange of Weather Radar Information (OPERA) coordinates the exchange of radar data among European national meteorological services (11). It serves as a central hub for accessing weather radar data in Europe, allowing those in search of data to make one request instead of contacting each meteorological service separately. However, because of budget cuts and resulting prioritization of meteorological products, OPERA now requests that national meteorological services submit cleaned rather than uncleaned

polar volume radar data (12). Uncleaned radar data include both meteorological and biological signals, whereas cleaned data exclude biological signals.

OPERA is currently establishing new centers for European weather radar data that could serve as ideal access points for diverse users and stakeholders. Access to uncleaned polar volume data at these data centers would boost their utility for aerial biodiversity monitoring and other multidisciplinary applications. To make this possible, OPERA should revise its data exchange policy to require that all countries submit uncleaned radar data, and Europe must build adequate data infrastructure to transfer and store the full data. National and international funding schemes and policy-makers such as the EU Commission should recognize and stimulate diverse applications of weather radar data, and OPERA should establish an open access data archive, which would facilitate long-term multidisciplinary research and biodiversity monitoring. If all regional associations of the World Meteorological Organization adopted similar policies, weather radars could be used for aerial biodiversity monitoring worldwide.

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