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COPERNICUS SAR DATA SHOW SALMON OIL SLICK FROM COLLAPSED FARM IN PATAGONIA

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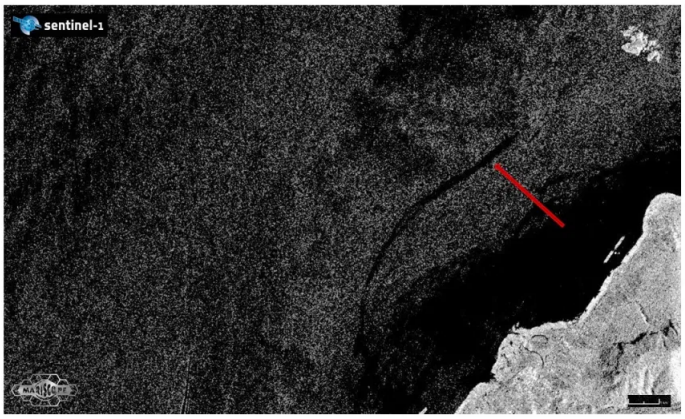

By Cristina Rodriguez • Christian Haag

In the south of Chile, several species of salmon fish are produced. The country is the second largest salmon producer in the world (around 953 tons produced in 2019). Authorities have increased environmental protection regulations since the start of aquaculture.

At the end of June this year, there was a complete collapse of a marine harvesting site that contained between 16 and 18 cages with more than 770,000 fish of an average of 3.8 kg each; a total biomass equivalent to 2,900 tons of fish. The site collapsed and sank on June 27 at a depth of 295 to 310 m in eastern Reloncaví Bay. The estimated value of the loss is $15 million.

Only six days after the event, Sentinel-1 satellites of the European Copernicus program revealed the first signs of fish oil on the sea

surface. Synthetic aperture radar (SAR) technology is an active observation system on board some satellites, able to detect variations in sea surface patterns, even under cloud cover. The aquaculture site has a very high annual rainfall average. Cloud coverage is between 30 and 70 percent, varying throughout the year. SAR is relevant for the study of physical aspects of regional oceanography, as well as for maritime and environmental surveillance studies. Radar measures changes in sea surface roughness originated by winds, waves, changes in density, etc.

The decomposition of almost 3,000 tons of salmon began to be detected seven days after the sinking, with a slick of 900 m in a southerly direction, at 740-m linear distance from the center of the sunken module. On July 5, the slick measured more than 7 km in a southwest direction.

The plume was still visible in August. The fish oil can be detected on the radar images because it produces a modification in the sea surface roughness. The surface pattern is influenced by the wind intensity, for which the detection changes depending on the local meteorological conditions of the date of acquisition. The presence of the fish oil on the surface is an indirect indicator of eutrophication in the area, due to the decomposition of the dead fishes. Monitoring the extent and permanence of fish oil with the radar data can support the post-accident environmental parameter sampling program.

Nowadays, one of the most used applications of satellite radar images is the detection and monitoring of oil spills from tankers and other accidents in the offshore industry. As demonstrated in Chile, this technology can be applied to marine harvesting sites or fish farming in lakes. Sentinel-1 satellites revisit the same point on the planet every five days, making it possible to quantify the evolution of many processes on the ocean surface to get environmental information, as well as to quantify the forces that influence these patterns, such as wind and the direction of ocean currents.

Copernicus data has incomparable value and great capabilities to exploit new and potential future studies of environmental patterns and operational applications. This high-quality data can inform public and private entities' decision making.

This first aquaculture accident investigation described here shows the potential that radar data have to monitor marine harvesting activities around the world, particularly in remote regions with extreme climates like Patagonia.

Cristina Rodriguez and Christian Haag are from Mariscope companies.

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