Tuna migration in the South and Tropical Atlantic Ocean

Tuna roam the big ocean, responding to currents and temperature changes in the water.

To reproduce, adults migrate to a western zone of the Tropical Atlantic. They spawn from October to Febuary and then return to higher latitudes. Juveniles remain in subtropical and temperate zones on both sides of the ocean.

The migration of tuna is influenced by small variations in the ocean. A warming sea may change the abundance and distribution of these species.

Small changes in the environment may affect the catch of tuna.

Several species of tuna embark on extensive migrations to seek out favorable habitats for feeding and reproduction, all the while being subject to the prevailing patterns of ecosystem variability. Studies performed through the EU Horizon project TRIATLAS demonstrate that fluctuations in temperature, salinity and nutrients affect the distribution and abundance of tuna across the Atlantic Ocean.

Sea temperature influences fisheries

Large pelagic fish like tuna are influenced by variations in the ecosystem. Variations in the abundance and distribution of these species underscore the complex interplay between migration, ecosystem dynamics and fisheries. Understanding these relationships is essential for effective management and conservation.

Temperatures at depth matter

During the day bigeye tuna (*Thunnus obesus*) primarily forage in the colder layers below the surface, in water with temperatures ranging from 10 to 15 °C. This means that temperatures not only at the surface, but at 100 and 250 meters' depth, play a critical role in determining where tuna are found.

A study of the western Tropical Atlantic Ocean indicates that rising temperatures can affect catches of albacore tuna (*Thunnus alalonga*).

In 1970–2020, the catch per unit effort of the China Taipei longline fleet was lower in fishing seasons with high sea surface temperatures at 10–20°S, 20–40°W. This is a reproduction area for this species.

Migration patterns vary with age

Annual migration patterns of albacore tuna (*Thunnus alalonga*) were studied with data from the China Taipei longline fleet between 1997 and 2020.

During its annual migration in the South Atlantic, more albacore juveniles are distributed in southern areas (30–40°S). In tropical areas (10–20°S) adults predominate, indicating that the migration pattern changes during the life cycle of the fish.

In a model, both sea surface temperatures and chlorophyll were found to affect catches related to the seasonal migration of adults.

Warmer water in the fishing season

In the ocean off the Brazilian coast (10–20°S, 20–40°W) catches were highest between October and February, matching the albacore's reproductive period.

In February adults begin their return migration to cooler waters around 40°S, where they remain from March to July. From August, they start moving toward tropical waters, again concentrating in the region off Brazil from October to February.

By 2040, the Intergovernmental Panel on Climate Change (IPCC) projects 0.5 °C higher sea surface temperatures than in 1995–2014 in the fishing season, October–February. By 2060, the projected increase is 0.7–1.1 °C. Such an increase could negatively impact the survival of fish larvae, and in turn the fisheries.

Monitoring reproductive migrations to identify changes in stock abundance or spawning area, could provide early warning signals of any adverse effects of climate change on the species.

Catch of tuna follows variations in the subpolar gyre

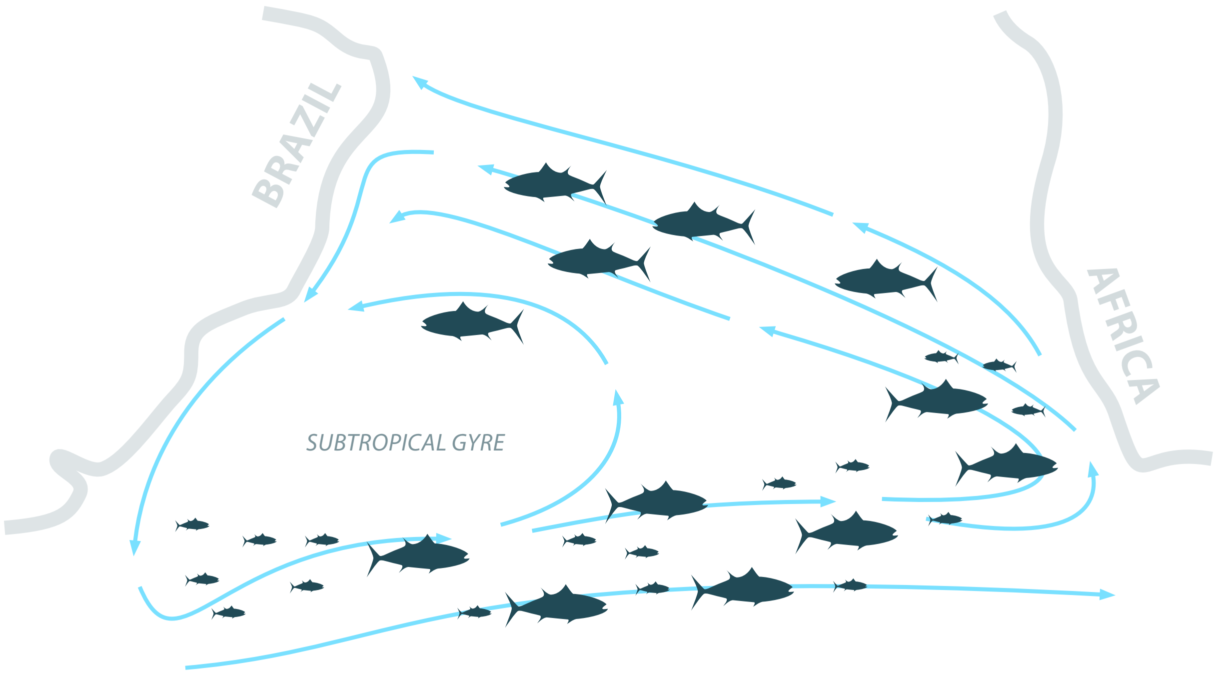
Natural variations in the large-scale circulation in the ocean influence the tuna fisheries in the South Atlantic, from interannual to decadal timescales.

Over a thirty-year period, a study found that long-term changes and meridional shifts in albacore and bigeye tuna populations in the South Atlantic were associated with temperature changes driven by changes in the dynamical structures of the subtropical gyre.

The study also revealed that the South Atlantic subtropical gyre and tuna catch show concurrent inter-annual variations. These are strongly linked to variations in the winds.

In 2010 and 2011, changes in the trade wind and westerlies reduced gyre transport and shifted the gyre core southward.

The weakening of the gyre led to an uplift of cold and nutrient-rich water from the depths. Abundant nutrients caused high primary production in the surface waters, providing more food also at higher levels of the food chain. This led to a doubling of the catch of albacore and bigeye tuna in 2011 and 2012.



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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 817578.