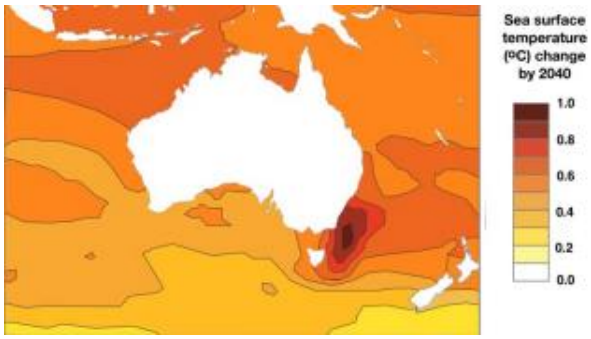
Climate impacts on Australia's tuna fisheries

Climate change is expected to impact Australia's tuna fisheries in coming decades. Australia's oceans are experiencing warmer temperatures, rising sea levels, and more acidic waters. Levels of dissolved oxygen are decreasing, major ocean currents are changing, and extreme weather events are becoming more severe.

Ocean warming

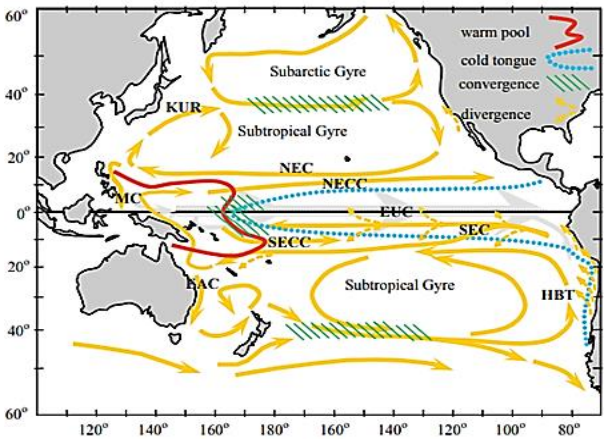
By 2040, Australia's oceans are expected to increase in temperature by 0.3 to 1.5°C. Marine heatwaves are becoming more frequent and intense, with heatwave conditions predicted to occur for more than 200 days a year by 2040 across Eastern and Southern Australian waters.



Water temperature changes 2015-2040. Source: NOAA

Changing currents

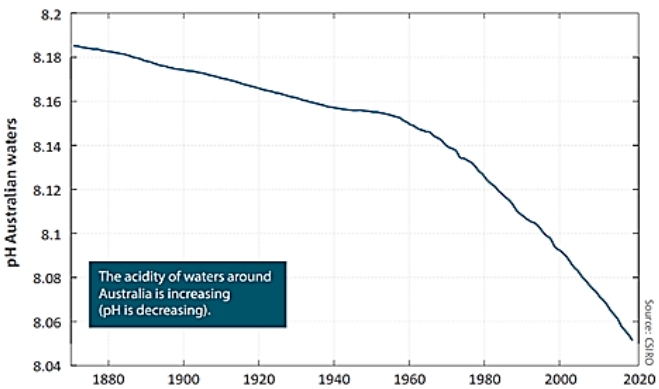
More frequent and severe ENSO events are leading to intensification of the East Australian current, as well as its extension further south. Changes in ocean currents strongly affect the productivity of tuna species as it alters the timing, location, and extent of larvae retention. Abundance of zooplankton and nutrients, upon which tuna stocks depend, are projected to decrease in southern regions of the Pacific ocean from circulation changes.



Direction of major currents in the Pacific Ocean. Source: The Pacific Community (SPC)

Changing ocean chemistry

Ocean acidification has already increased by 30% since 1960, however by 2040 this is expected to increase by a further 20-50%. The impacts of increased ocean acidification varies by species, however for tuna it can include larval mortality and altered behavioural responses, leading to reduced fitness and increased mortality rates. Therefore, further increases are expected to have a negative impact on adult tuna populations.



Average pH of surface waters around Australia is decreasing. Source: FRDC

Australian Government
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Impacts of climate change on tuna

The changes occurring in Australian waters are affecting the abundance, distribution, seasonality (phenology), and condition of marine species. Research is being undertaken by a number of agencies, including the Commonwealth Scientific and Industrial Reseach Organisation (CSIRO) and the Pacific Community (SPC), to assess the sensitivity of tuna stocks to climate change impacts and estimate stock responses over coming decades. Results from these assessments and projections are summarised below.

Predicted climate impacts for tuna and billfish species

Albacore Tuna

Possible impacts include southerly movement of the tuna, an increase in density in the eastern Pacific, and decreased density in the western and central Pacific.

Southern bluefin tuna

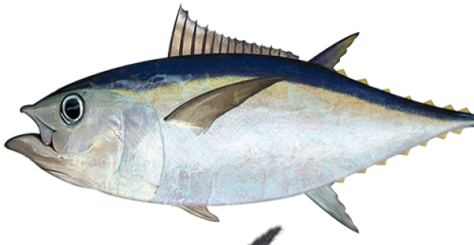
Depending on changes in primary productivity, upwelling and spawning thermal tolerances, SBT might experience southerly shift, increases in abundance of juveniles and change in the catchability and location of tuna and sardines. Increased temperatures and marine heatwaves may also impact sea ranching operations.

Yellowfin tuna

Possible impacts include movement of tuna stock eastwards and changes in catchability , with possible declines in abundance after 2050.

Bigeye Tuna

Considered to have a low sensitivity to climate change. Distributional shifts are not predicted, however abundance may start to decline from 2050.



Broadbill Swordfish

Highly sensitive to climate change. Abundance projected to decline by 5-60 per cent by 2040, with strongest declines at the northern extent.

Striped Marlin

Moderately sensitive to climate change. Abundance projected to decline by 20-25 per cent by 2040.

Further information can be found in the CSIRO reports 'Decadal scale projection of changes in Australian