# NEW ZEALAND OCEANS

Temperature

This map of the South Pacific ocean shows the average temperature of the ocean as coloured bands. Notice how NZ spans across three different colours, representing a range of over 6 ºC. Notice also how the cool water penetrates north along the west coast of South America, due to the coastal Peru or Humboldt Current running northward. It brings cool, plankton-rich waters all the way to the tropics where the Galapagos Islands are located. Conversely, on the western side of the Pacific, the warm water is brought down by a wide, slow moving current. It passes southward along Australia's east coast, bringing warm water to New Zealand. For this reason, the temperature of New Zealand is 2-3ºC warmer than it would have been without.
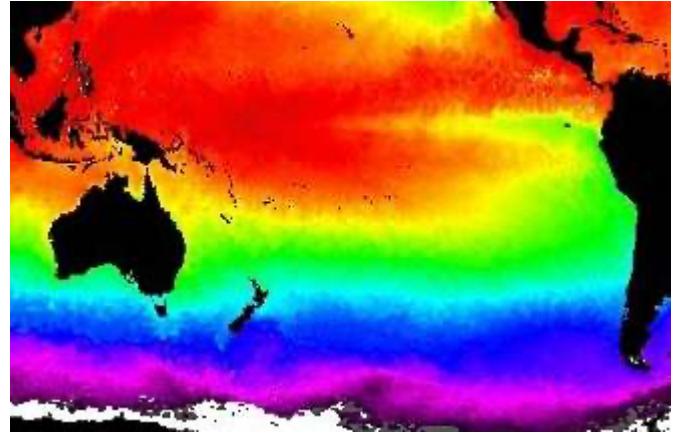
This part of the world map shows the most important currents affecting New zealand. In the south runs the circumpolar current of cold water. It is the only current running non-stop around the world, which allows it to achieve speed. Powered by the strongest winds of the world, this current moves fast. As it gets blocked by the spit of South America, it is deflected northward, bringing very cold water to its coast. Already rich in nutrients, this current spirals anti-clockwise along Chile's coast, bringing even more nutrients to the surface, reason why Chile's fishery is legendary in its yields. As it warms, this current brings a dry climate. The reverse is true when the East Australia current cools off over New Zealand, bringing a moist climate.
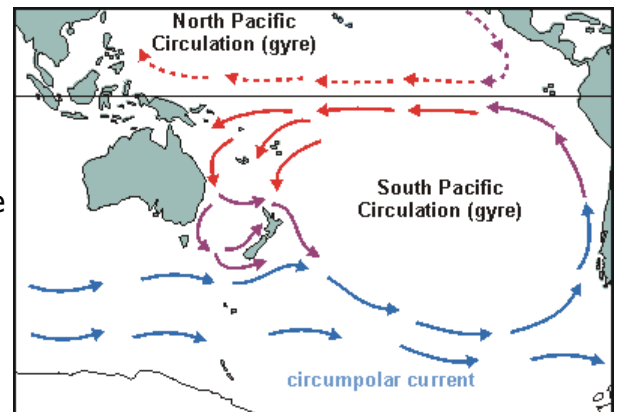
The South Pacific circulation is not constant, but is subjective to decadal oscillation (IPO= Inter-decadal Pacific Oscillation), resulting in El Niño/ La Niña periods. This phenomenon will be explained in detail in a later chapter, but it can be understood from the effect affecting its cause (like the tail wagging the dog). The dry climate over Chile causes a high pressure area, and conversely there is a low pressure area over the Coral Sea. The westward equatorial wind caused by this barometric pressure difference, drives one arm of the gyre, the South Equatorial Current. As the current increases, it creates weather patterns that increase its speed even further. Conversely, once it slows down, it weakens its driving force, slowing down further still. Eventually it comes to a periodic standstill. This is the El Niño phase, during which warm tropical water is not transported southward, amassing instead in the tropics, causing corals to bleach and the Chilean fishery to collapse. It also causes nuisance plankton blooms in New Zealand (1983-84, 1992-96, 2002-?).

Sea surface temperatures
at Leigh during 1992
Red line: averages 1967-91
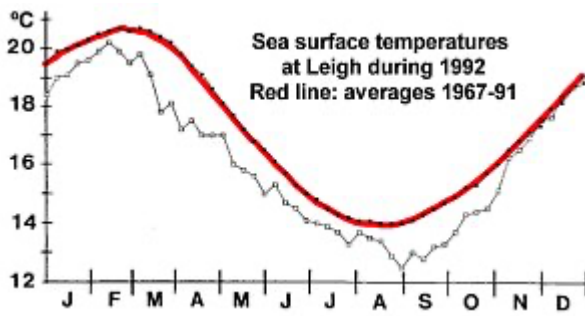
This map of seawater surface temperatures, taken in mid-summer of 1955, shows the typical range from 21ºC in the north to 14ºC in the very south of New Zealand. The seasonal variation from summer to winter is presented in the temperature graph for Leigh, north of Auckland. In this year, the water was very much colder than normal, associated with a strong El Niño event for that year and the two years following. It led to massive plankton blooms, resulting in kelpbed death, huge fish mortality and poisoned shellfish.
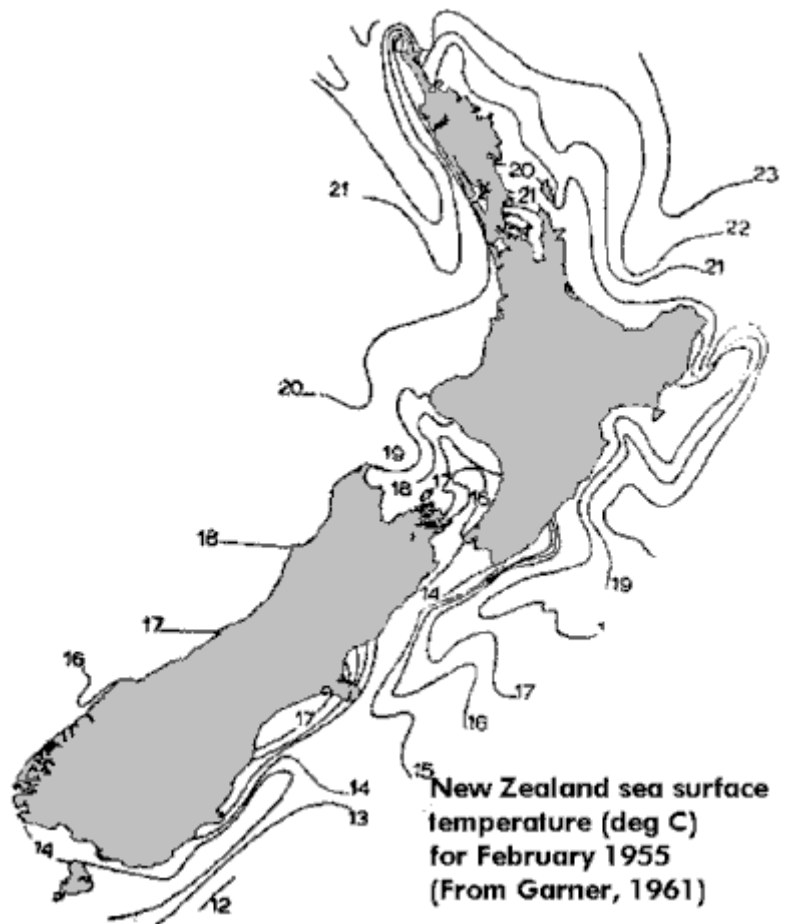
Why this happens, is not clearly understood, but it may be explained from the stagnating Pacific currents. Seawater

New Zealand sea surface temperature (deg C) for February 1955 (From Garner, 1961)

temperatures drop because much less warm water flows southward from the tropics. Furthermore, the cleansing influence of the currents, which normally transport nutrients away from NZ, has lessened, allowing nutrients to increase their concentrations. The combination of unusual temperatures and high nutrient concentrations then favours unusual planktonic organisms to bloom. Many of these, particularly the ancient dinoflagellates, are poisonous. Higher concentrations of carbondioxide in the atmosphere, could be of influence too. It seems as if the sea conditions of many million years ago recur, favouring the ancient planktonic organisms of that era, organisms which under normal circumstances are not capable of competing with the more recent and more efficient diatoms.