

## “The effects of climate change on oceans”

As with all RFMOs, the North Pacific Anadromous Salmon Fisheries (NPAFC) is a complex system with many interactions between climate change and oceans. Pacific salmon fisheries are of primary importance to about 2 million jobs in fishing and related industries.

Annual production of Asian and North American salmon fisheries has undergone significant variability linked to climate change. Effective management needs improved fishery forecasts and understanding of climate variables and salmon stock conditions.

The 2011–2015 NPAFC Science Plan was adopted to address annual variations in Pacific salmon production. An overarching research theme “*Forecast of Pacific Salmon Production under Changing Climate*” at an international symposium was held in 2012.

As revealed from NPAFC-related studies, climate change is affecting the North Pacific in different ways. Change in extent and duration of ice cover plays a key role in structuring ecosystems that alters geographic distribution of salmon.

Researchers observe northward shifts in fish distribution. There is a high abundance of juvenile pink and chum salmon in the Arctic. Continued warming may enable new salmon populations to expand into the Arctic. At the same time, loss of cool water zones may reduce the southern end of their present range.

The warming ocean can adversely affect Pacific salmon production by decreasing availability of lipid-rich zooplankton and reducing

Change in the dominant species composition and distribution could affect location and timing of salmon fisheries. With variable environments, modifications to the timing and the size of juvenile fish at release will likely be required to optimize hatchery production. Models incorporating fish mortality and various environmental factors should improve the ability to forecast returns of salmon stocks. New scientific information will also contribute to effective protection of Pacific salmon by NPAFC member nations from illegal, unreported, and unregulated (IUU) fishing.