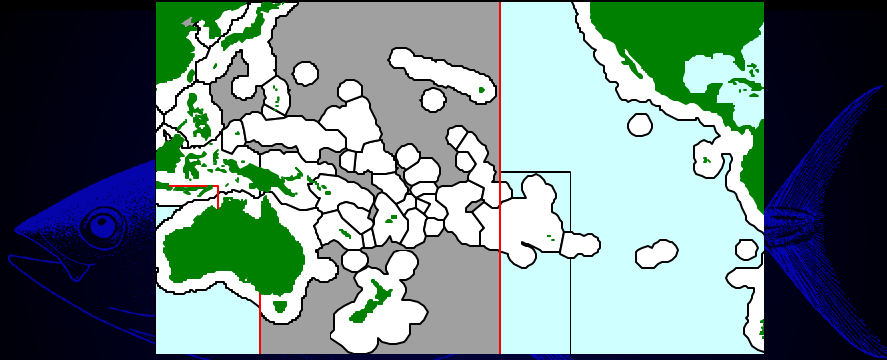


WCPO Tuna Fisheries and Climate

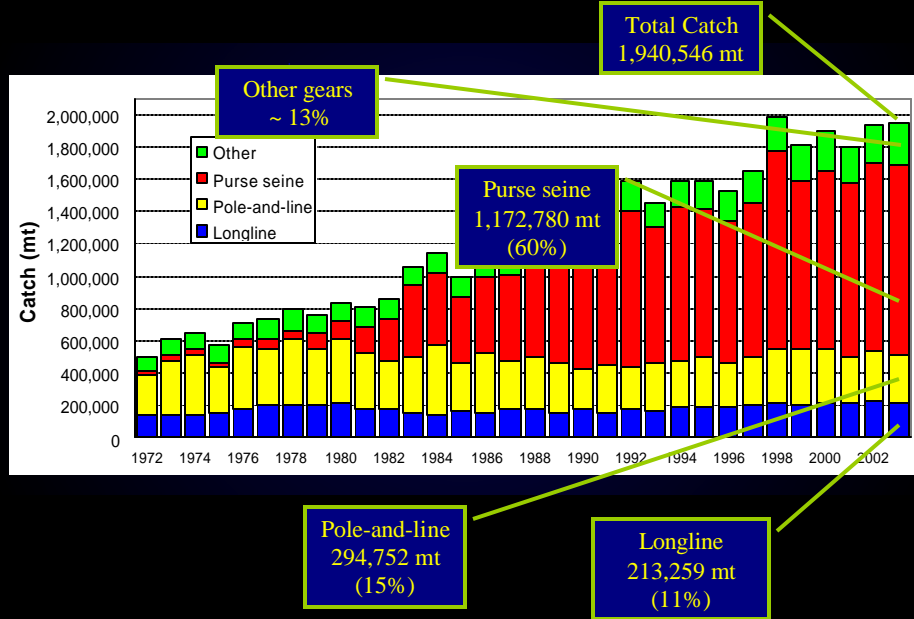


Oceanic Fisheries Programme
(Secretariat of the Pacific Community)
Presented by
Secretariat of the Pacific Regional Environment Programme
(International Waters Project)

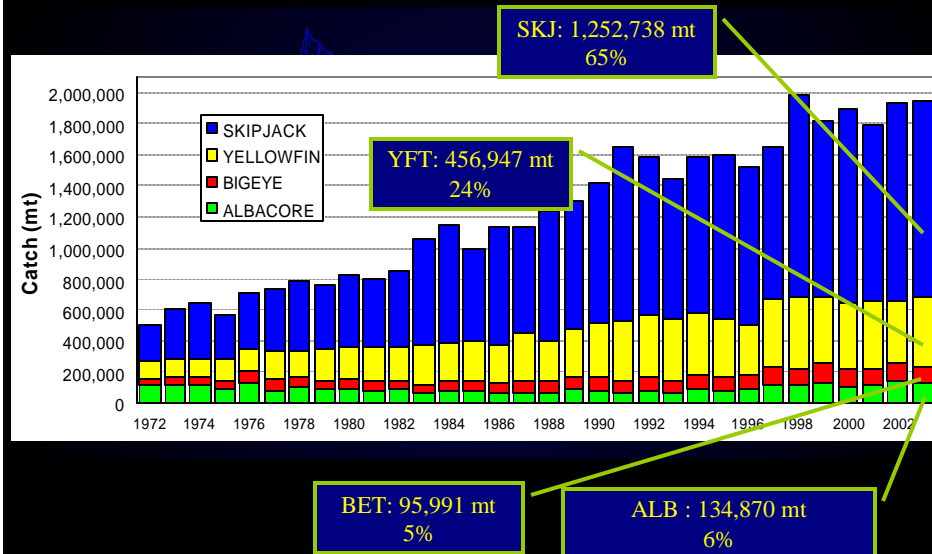
Presentation:

- Background on WCPO tuna fisheries
- Climate affects

WCPO Tuna Catch by gear



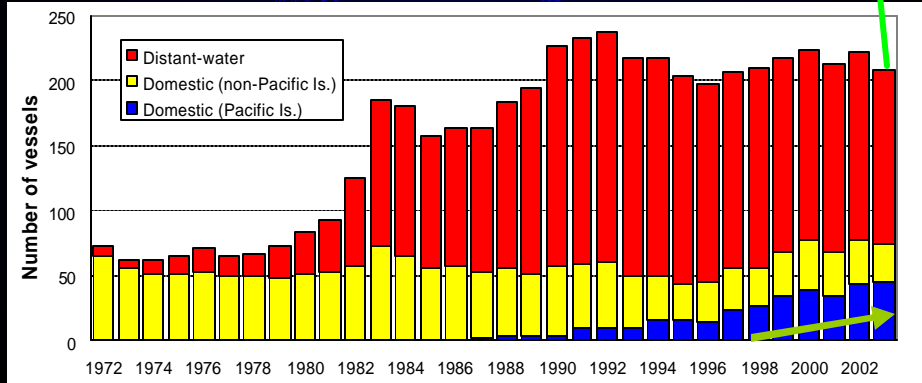
WCPO Tuna Catch by species



WCPO Purse seine fishery

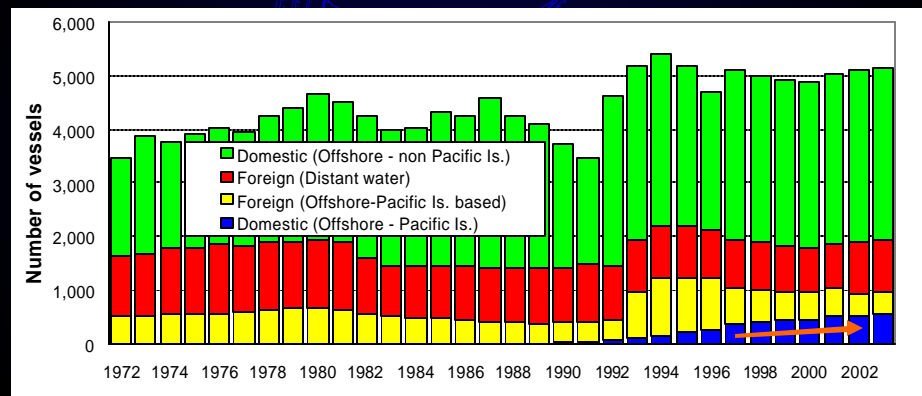
Number of vessels

2003 : Provisional



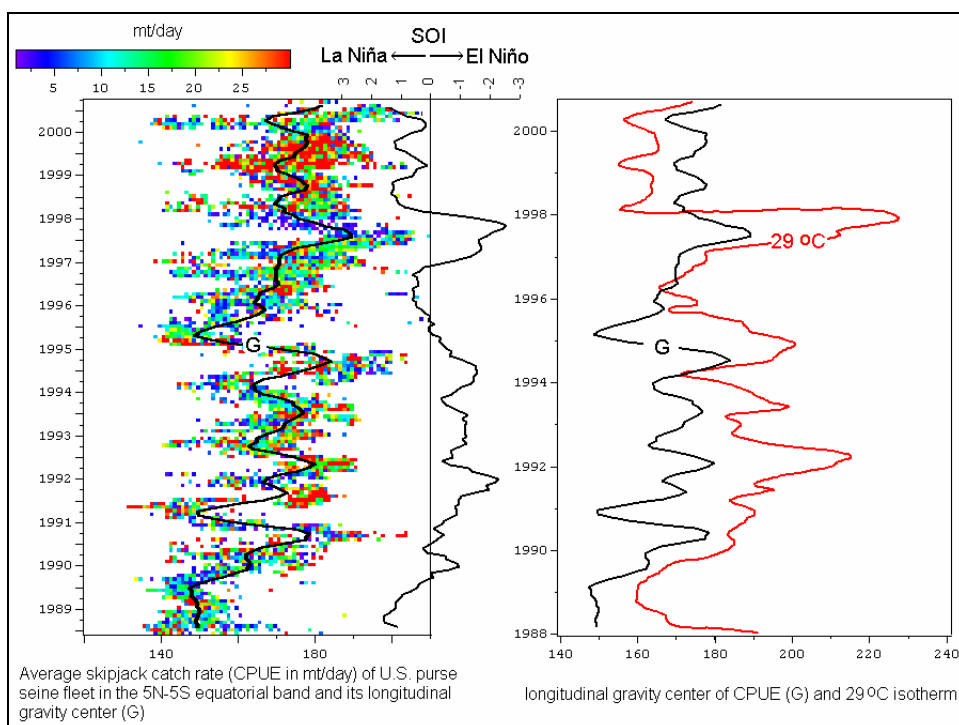
WCPO Longline fishery

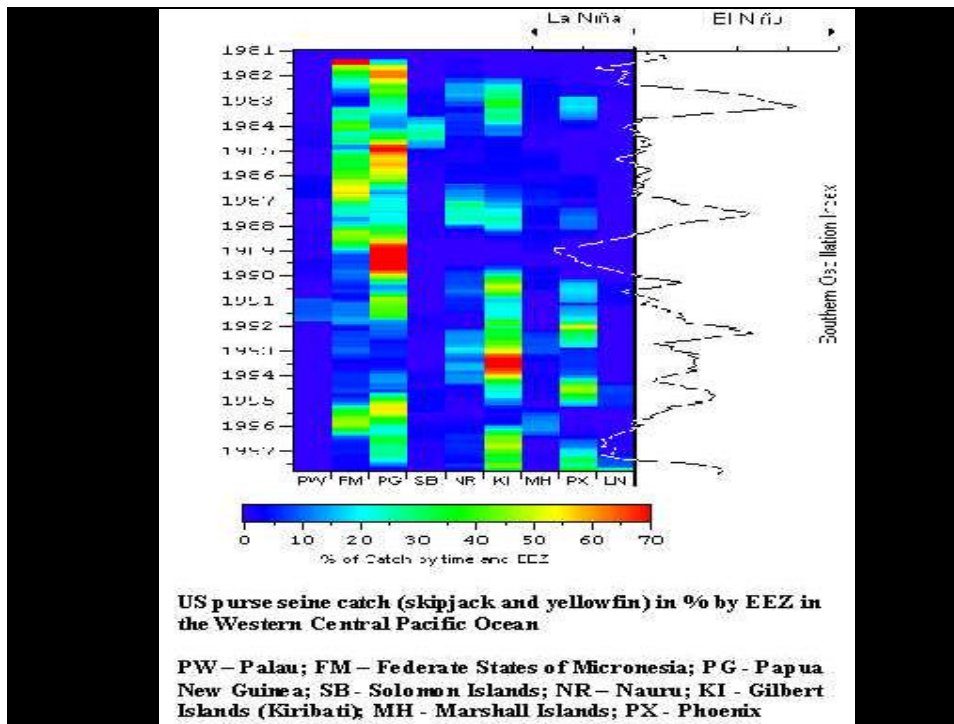
Number of vessels



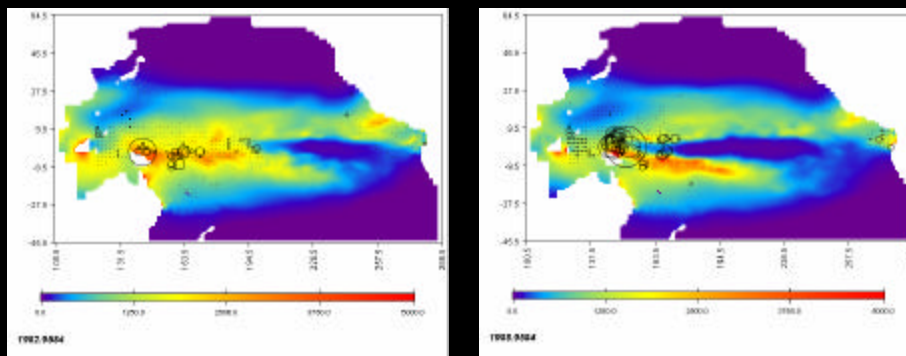
Environment relationships:

- Fishing operations – catchability
- Stock distribution – horizontal/vertical
- Recruitment - abundance





Development of the spatial ecosystem and population dynamics model (SEAPODYM)

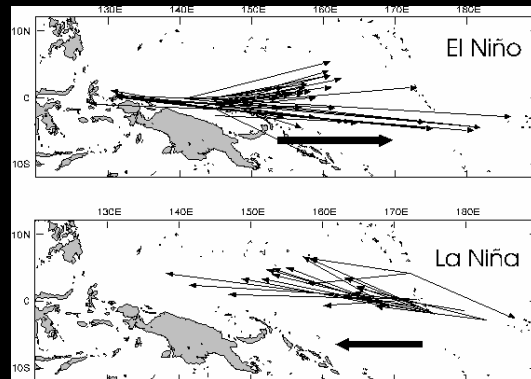


Predicted distribution of skipjack tuna biomass (background color) during El Niño and La Niña phases in the Pacific Ocean and observed total catch (circles)

Redrawn from:

Lehodey P. et al., (submitted). Climate variability, fish and fisheries. *Journal of Climate*, special issue of the 1st CLIVAR conference, Baltimore USA, June 2004.

Change in spatial (horizontal) distribution

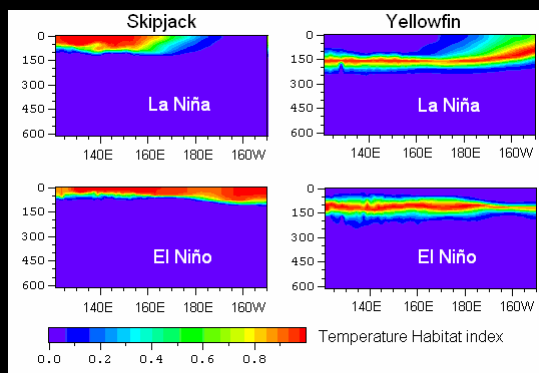


Displacement of tagged skipjack tuna. Tagging data were compiled from records of a large-scale tagging programme carried out by the Secretariat of the Pacific Community

Redrawn from:

Lehodey P., Bertignac M., Hampton J., Lewis T., Picaut J., 1997. El Niño Southern Oscillation and Tuna in the western Pacific. *Nature*, 389: 715-718

Change in spatial (vertical) distribution

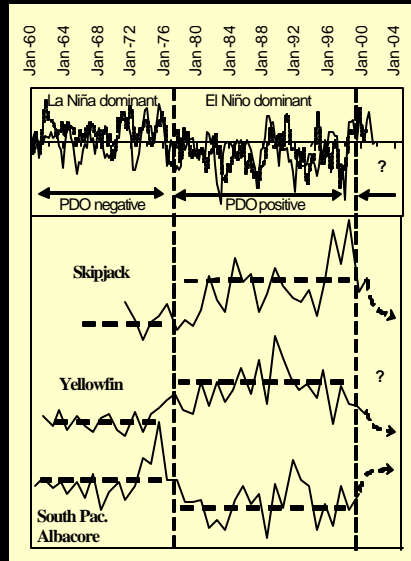


Longitudinal vertical section along the equator showing changes in temperature habitat of skipjack and yellowfin in December during El Niño and La Niña phase. The vertical thermal structure arises during El Niño in the western Pacific, increasing catchability of adult yellowfin by the surface purse seine gear.

Redrawn from:

Lehodey, P. (2000). Impacts of the El Niño Southern Oscillation on tuna populations and fisheries in the tropical Pacific Ocean. 13th Standing Committee on Tuna and Billfish, Noumea, 5-12 July 2000, Secretariat of the Pacific Community, Noumea, *Working Paper RG-1*: 32 pp.

Change in population abundance



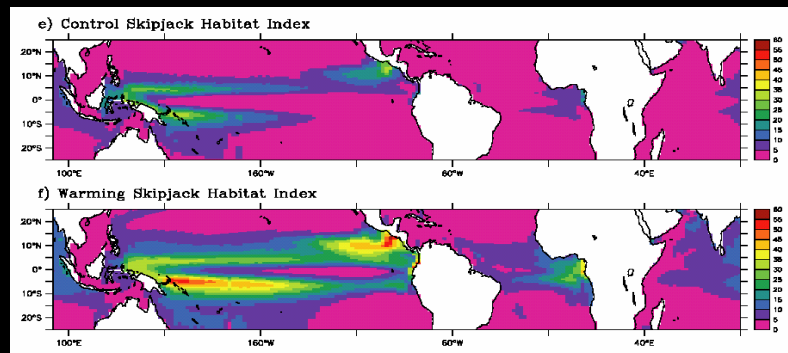
El Niño events have positive effects on skipjack and yellowfin recruitment, but negative on albacore

In addition, there are apparent decadal regimes with more frequent El Niño or La Niña creating long time trends in the populations

Redrawn from:

Lehodey P., Chai F., Hampton J., 2003. Modelling climate-related variability of tuna populations from a coupled ocean-biogeochemical populations dynamics model. *Fisheries Oceanography*, 12(4)

Simulations based on global warming scenarios (1900-2100)



Preliminary simulation of change in skipjack habitat.
e) control (present CO₂ level); f) 2x CO₂ warming scenario

Redrawn from:

Loukos H., Monfray P., Bopp L., Lehodey P., (2003) Potential changes in skipjack tuna habitat from a global warming scenario: modelling approach and preliminary results. *Fisheries Oceanography*, 12(4)

Conclusion

Rough trends can be suggested for a global warming scenario:

- Spatial extension of present fisheries to higher latitude,
- Increasing variability in some regions, decreasing in some others,
- Change in catchability of the different tuna species.

Uncertainty remains with several factors, e.G.:

- The change in the productivity of the western equatorial pacific.
- The impact on recruitment and spawning migrations.
- The connection with the extra-tropical areas.

GLOBEC:

Global ocean ecosystems: oceanic fisheries and climate change project

International Geosphere-biosphere Programme

[Co-sponsored by the scientific committee on oceanic research (SCOR)/intergovernmental oceanographic commission.]

www.spc.int/OceanFish/html/SCTB/sctb17/index.htm