3rd PICES/ICES/IOC Symposium on "*Effects of Climate Change on the World's Oceans*"
Mar 23-27, 2015, Santos City, Brazil

Managing Pacific Tuna stocks under strong fishing pressure and Climate Change impact

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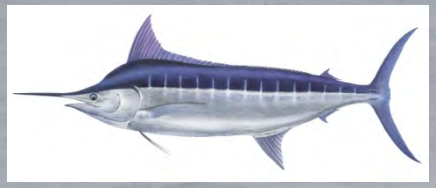
4 Key Species

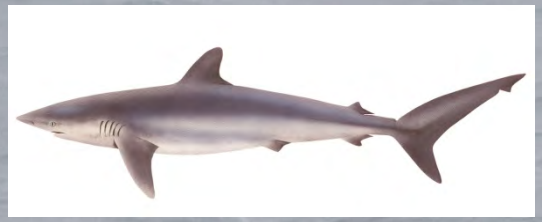
Skipjack – fast growing, short lived (~4 yr)

Yellowfin – fast growing, moderate longevity (~7 yr)

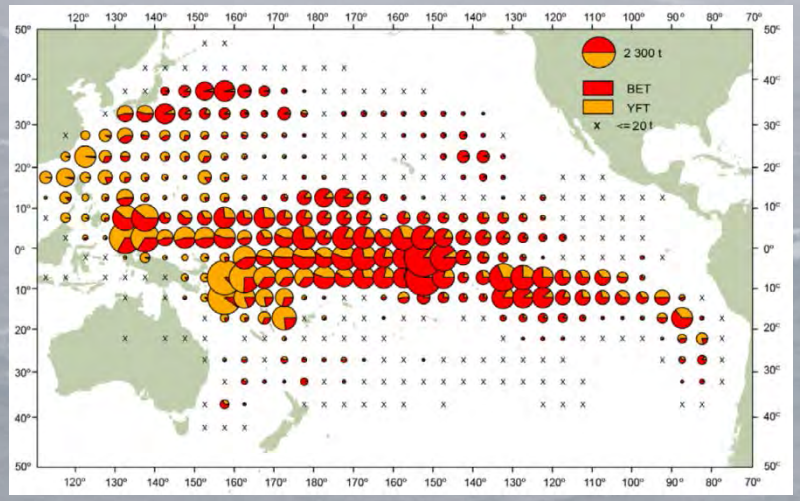
Albacore – slow growing, longer lived (10+ yr)

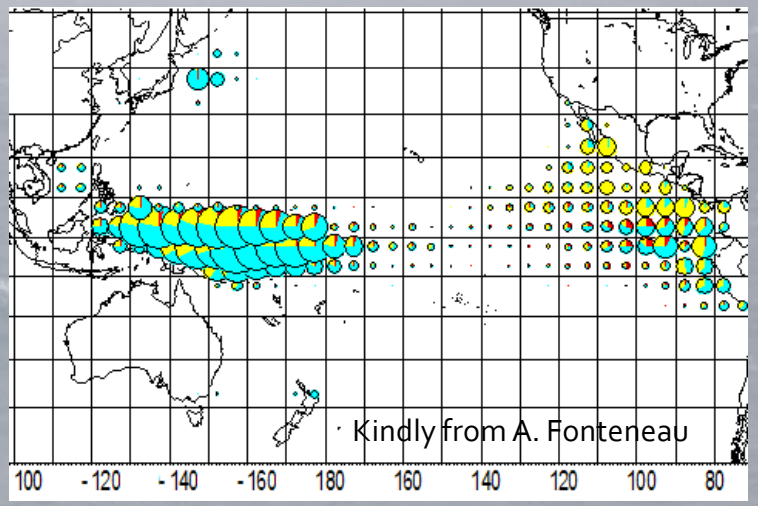
Bigeye – moderate growth, longer lived (10+ yr)



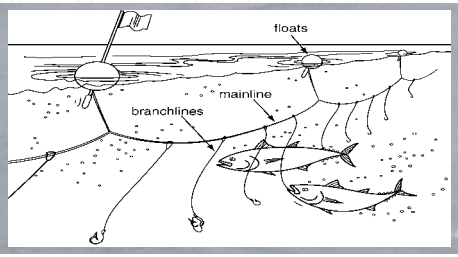


2 main fishing gears

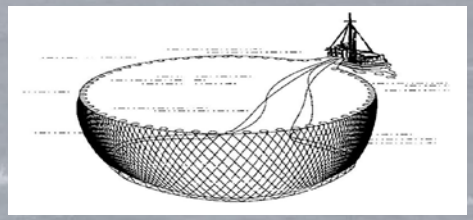


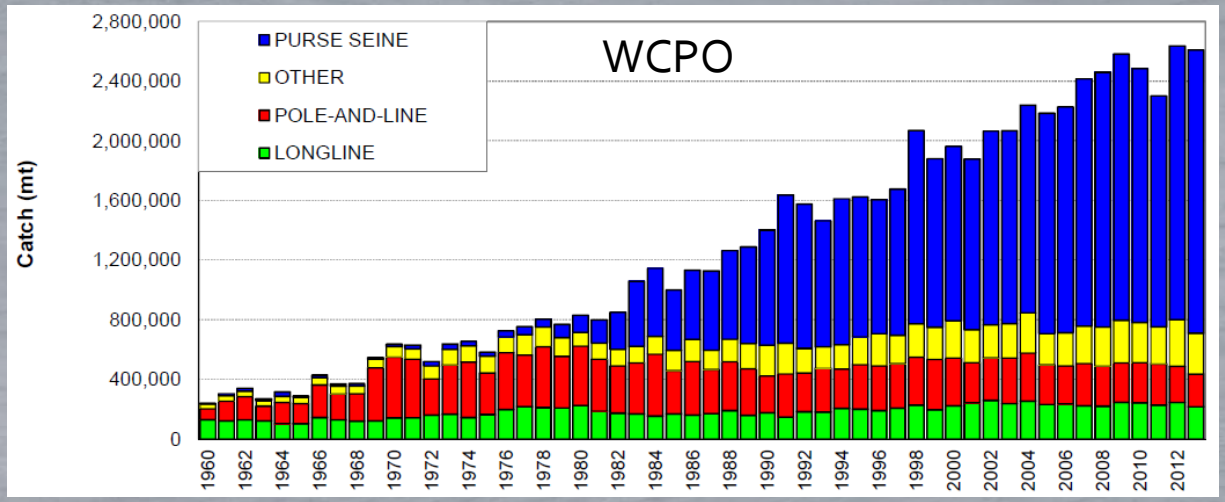


Longline

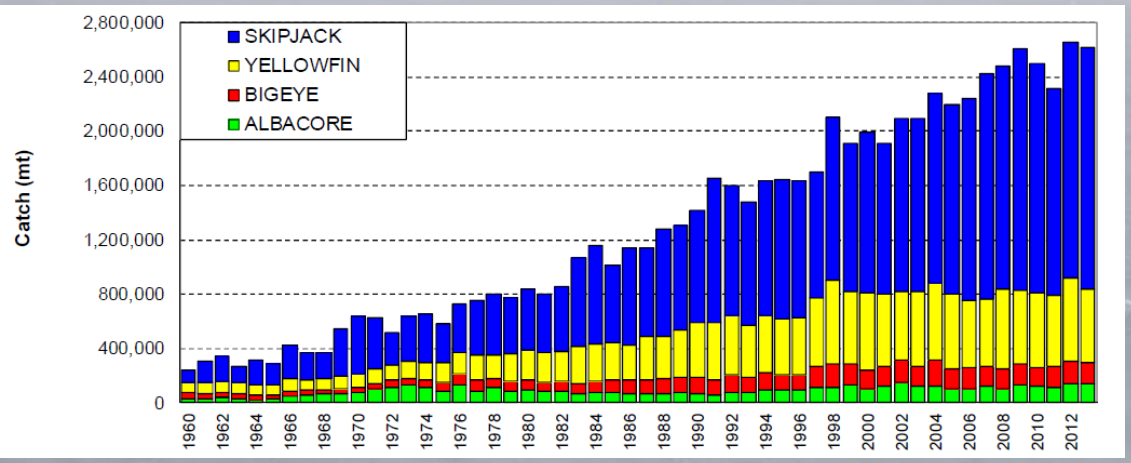


Purse seine

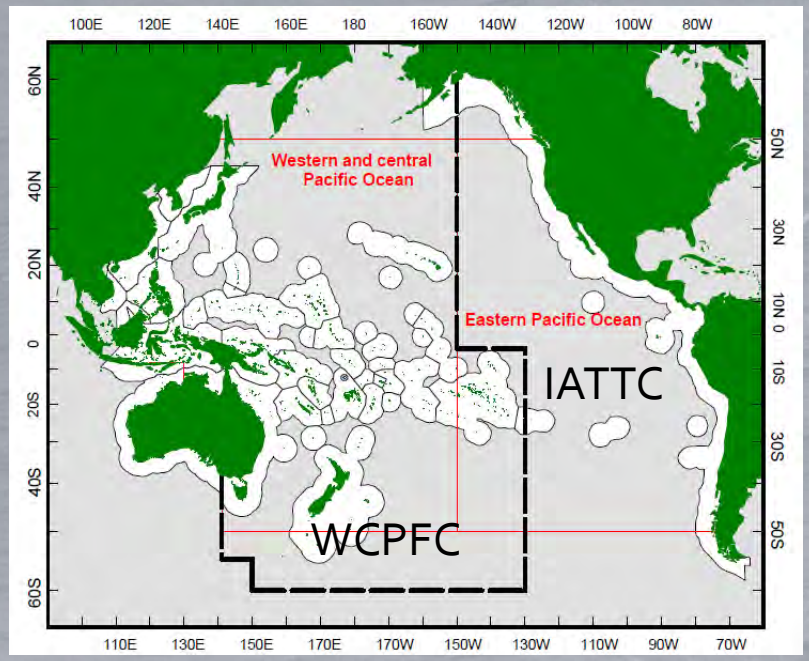




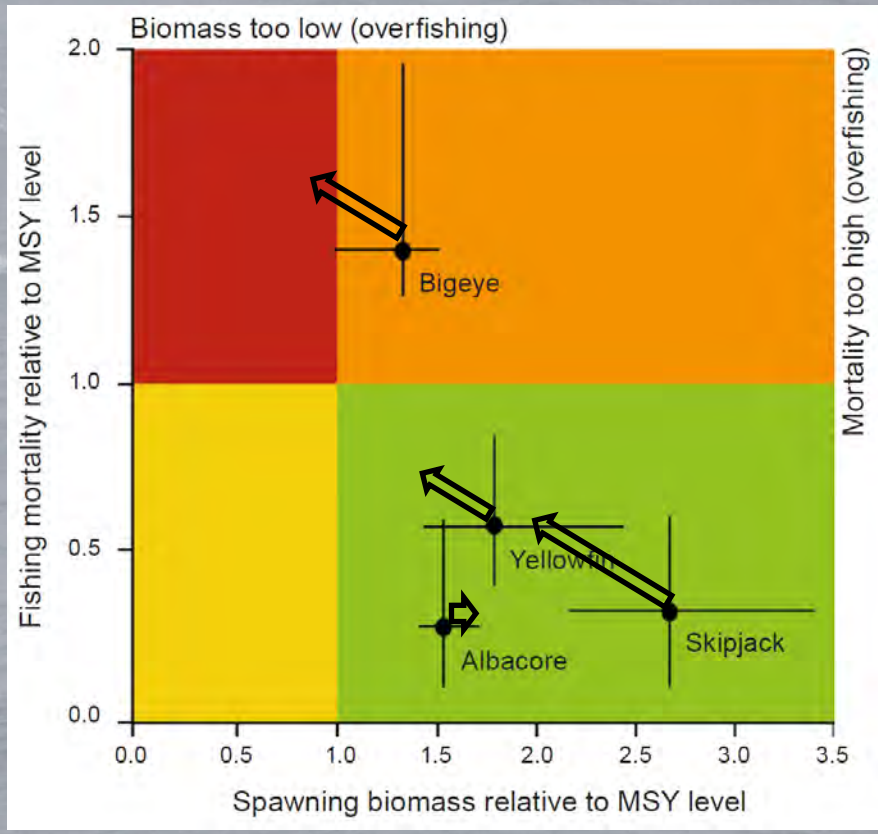
Near, fully exploited or overfished



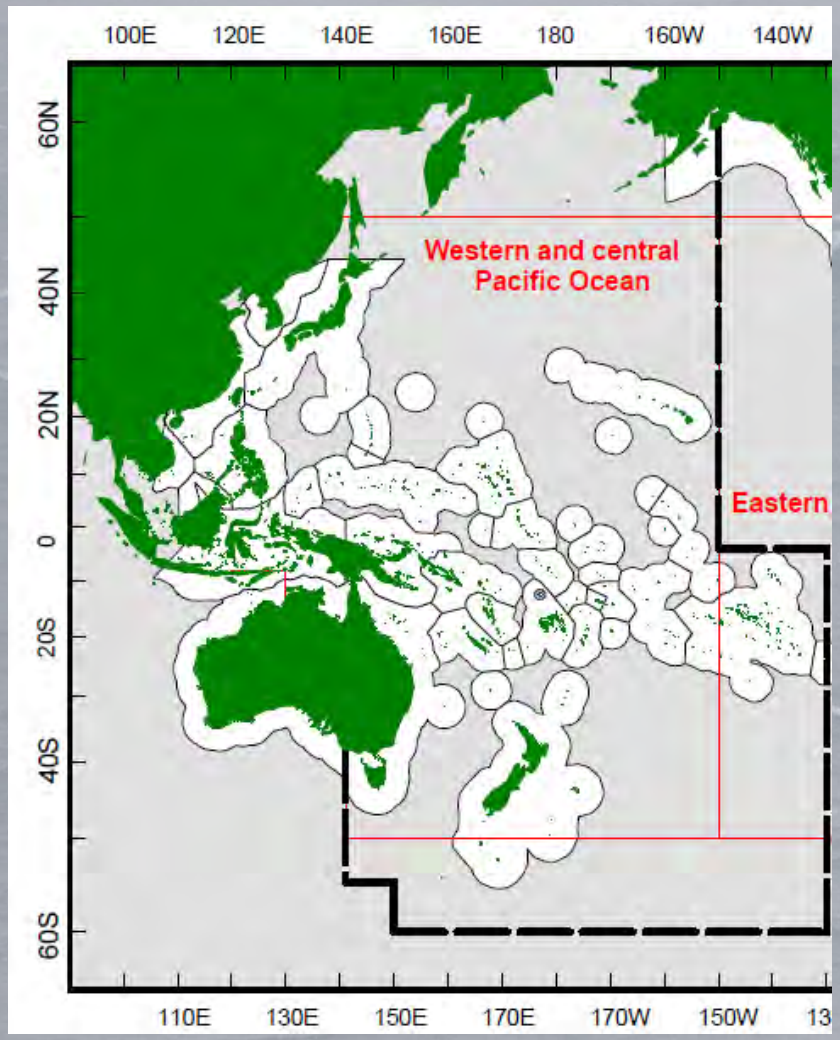
2009 ⇨ 2014



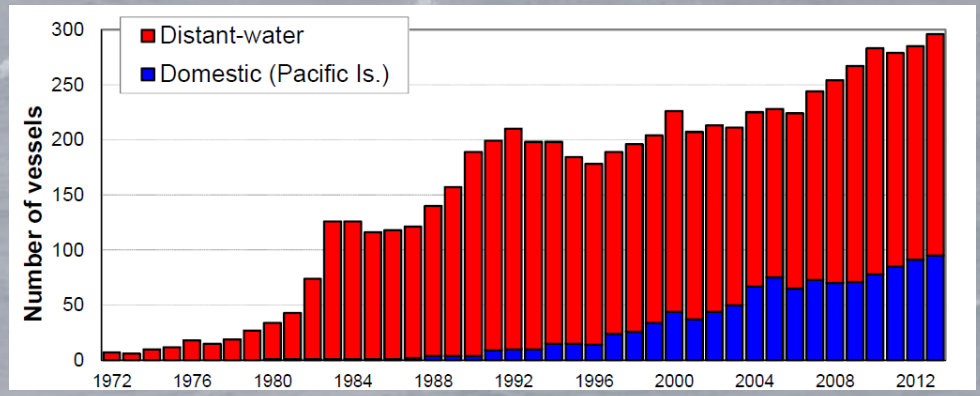
2 management organizations



And many Countries…

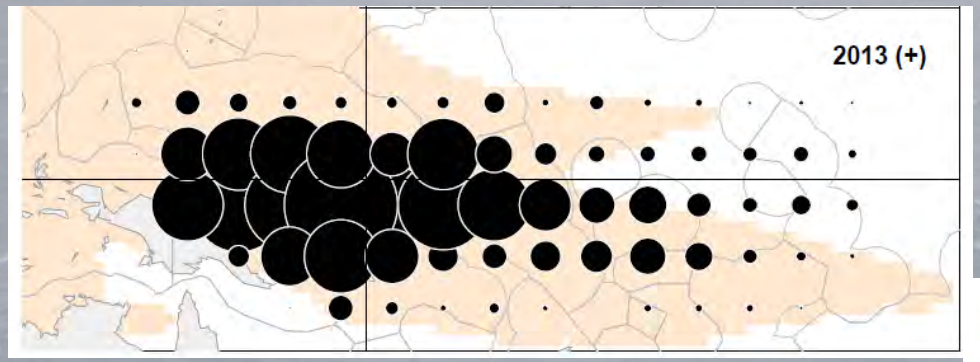


- 7 of the 22 Pacific Island countries and Territories receive up to 40% of their taxes from tuna fishing licences sold to distant water fishing nations (US, Japan, China, Korea, Philippines, EU).
- Another 5 countries and territories derive up to 25% of their gross domestic product (GDP) from industrial fisheries and fish processing (Gillett 2009).



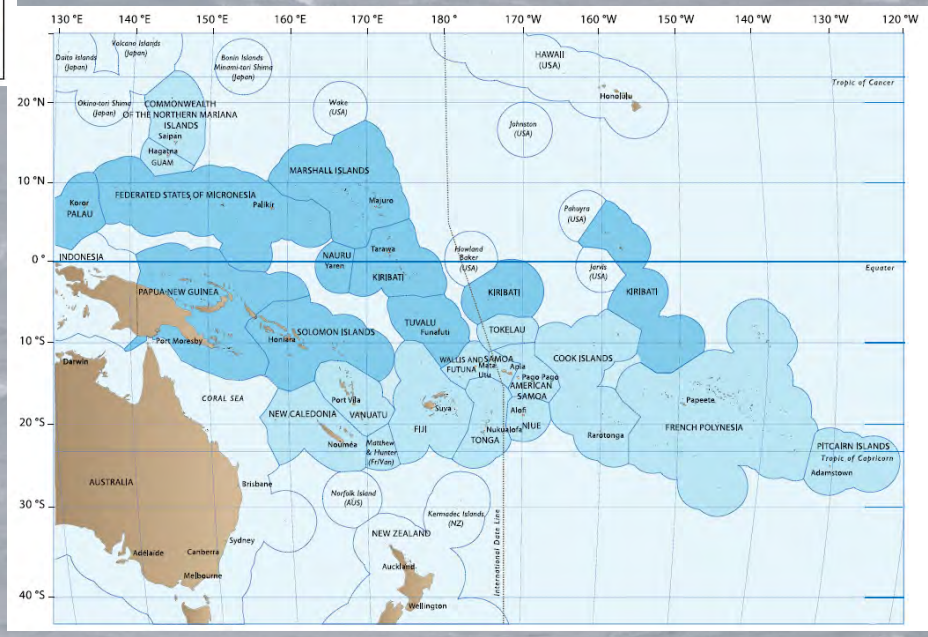
Number of purse seine vessels operating in the WCP–CA

Management: PNA



Distribution of purse seiners fishing effort (pink shading shows average sea surface temperature > 28.5°C)

Half of world tuna production is from skipjack (~2/3 in WCPO)



The PNA (Parties to the Nauru Agreement) Countries* control the main fishing grounds, with the objective to maximize the benefits from the tuna in their waters and ensure fishing controls and resource sustainability.

Since 2010 PNA arrangements have resulted in quadrupling of revenue to the eight member nations. The main tool for that is the Vessel Day Scheme (VDS)

* Federated States of Micronesia, Nauru, Kiribati, Republic of the Marshall Islands, Palau, Papua New Guinea, Solomon Islands, and Tuvalu

Management: PNA

VDS

The PNA's Vessel Day Scheme (VDS) is a scheme where vessel owners can purchase and trade days fishing at sea in places subject to the PNA.

The VDS sets overall limits on the number of days purse seine fishing vessels can be licenced to fish in PNA waters (based on WCPFC recommendation for stock status and overall fishing effort limit). Fishing days are then allocated by Country and sold to the highest bidder. The total allocation of fishing days is set and apportioned between Pacific Island members for one-year periods up to three years in advance.

FAD

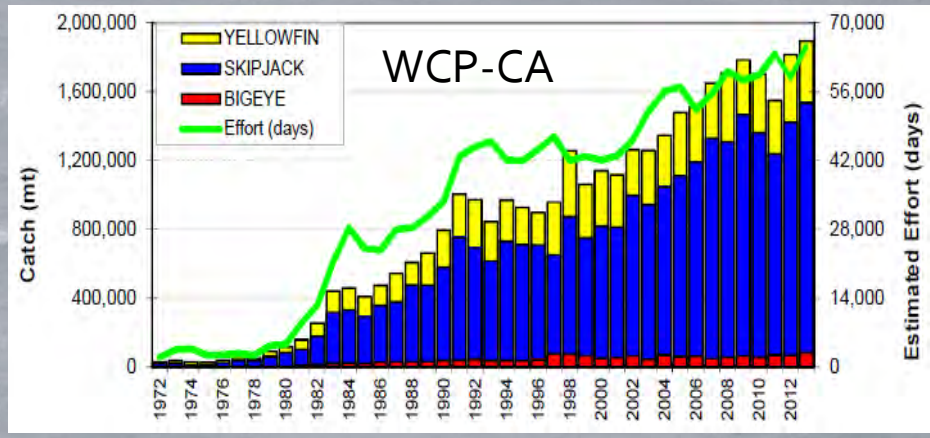
Fishing Aggregating Devices (artificial logs) are used by purse seiners to increase catch rates of surface tuna schools (skipjack & yellowfin). But they also increase catch of juvenile bigeye tuna that is target species of longline fishery and severely overfished.

PNA will launch registration and monitoring of the use of fish aggregating devices (FADs) in 2016

Dagorn et al (2012)

Summary on current situation:

- 2 international management organisations (WCPFC & IATTC) + one regional organisation (PNA - FFA)
- One stock (bigeye) reaching critical status (16 % of unfished spawning biomass)
- Longline and purse seine fisheries with antagonistic interests (FAD for PS; NO FAD for LL)
- Lack of success by the WCPFC to limit the fishing effort despite continuous recommendation since many years.



- PNA can impose some rules to control fishing effort and fishing practices in its area (eco label)

How could Climate Change impact this complex landscape?

Projecting tuna stocks with IPCC forcings

"Classical" Stock Assessments

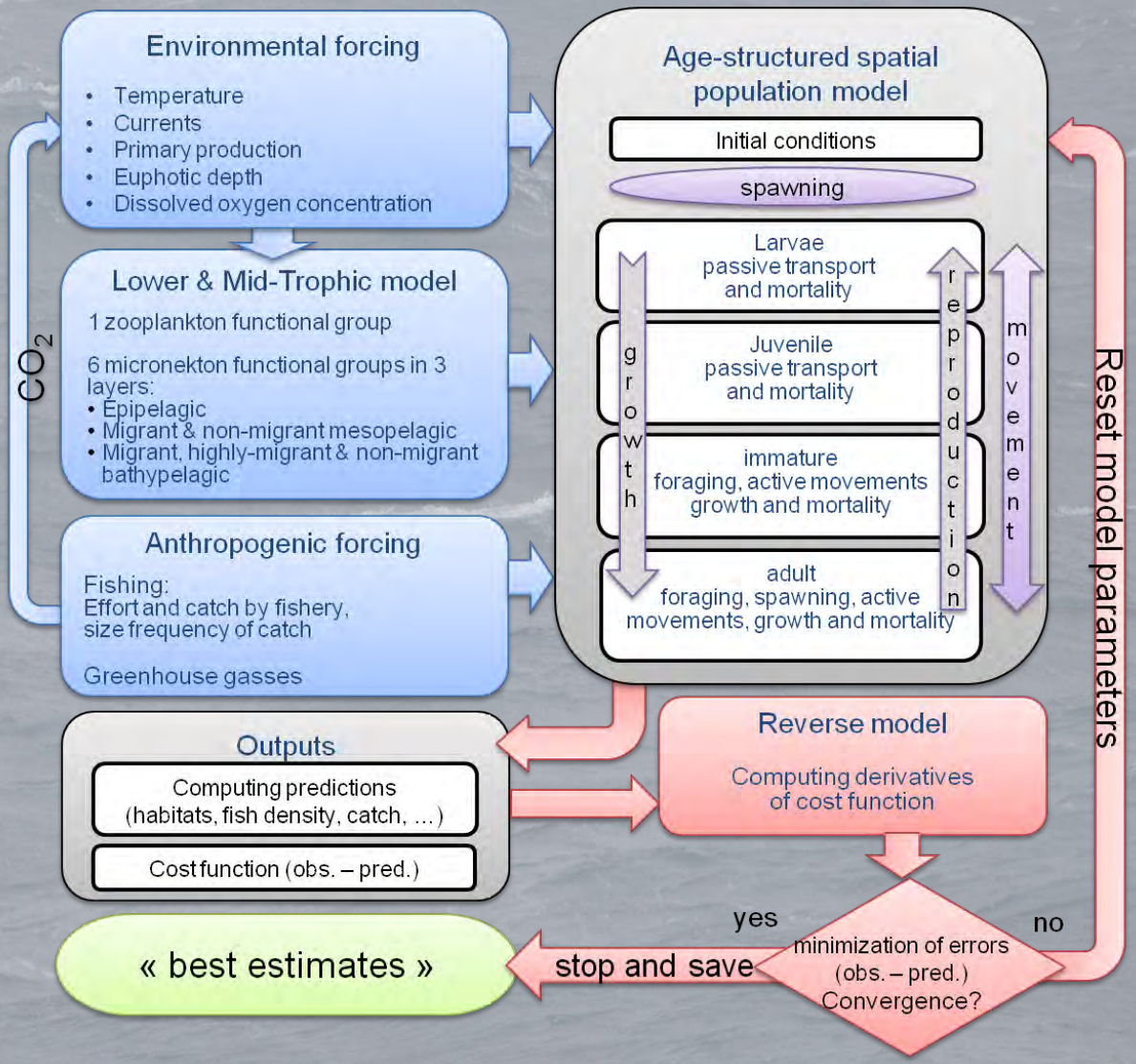
- Designed to provide mostly stock-wide indicators useful for fishery management
- Account for environmental change (historical) through process error terms in recruitment and catchability
- Do not model specific environmental variability or high spatial resolution effects

Projecting tuna stocks with IPCC forcings

Hybrid models : population dynamics
+
ecological mechanisms
+
robust statistical estimate of population parameters

SEAPODYM

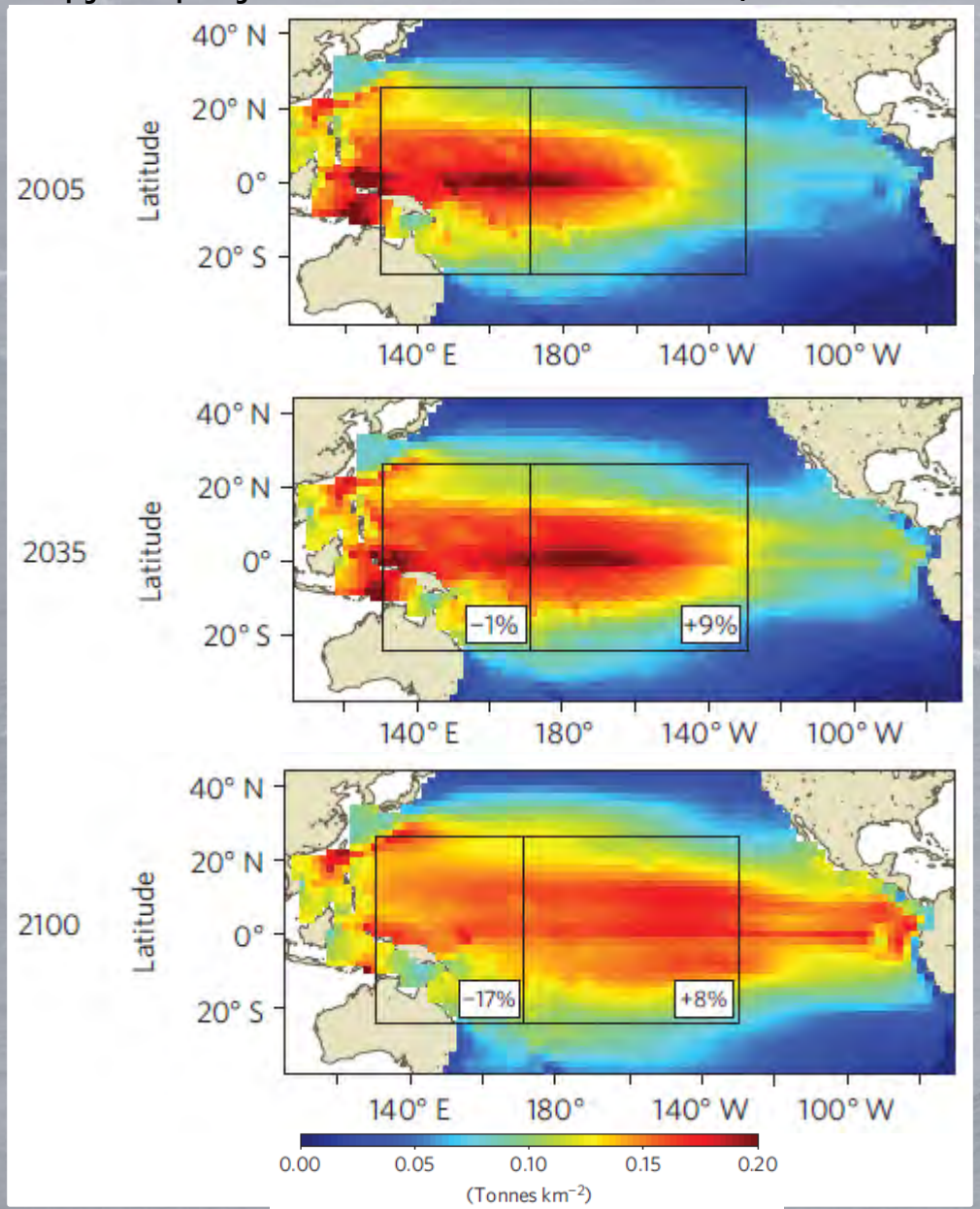
(Lehodey et al 2003, 2008, 2010; 2013; Senina et al 2008; Sibert et al 2013)

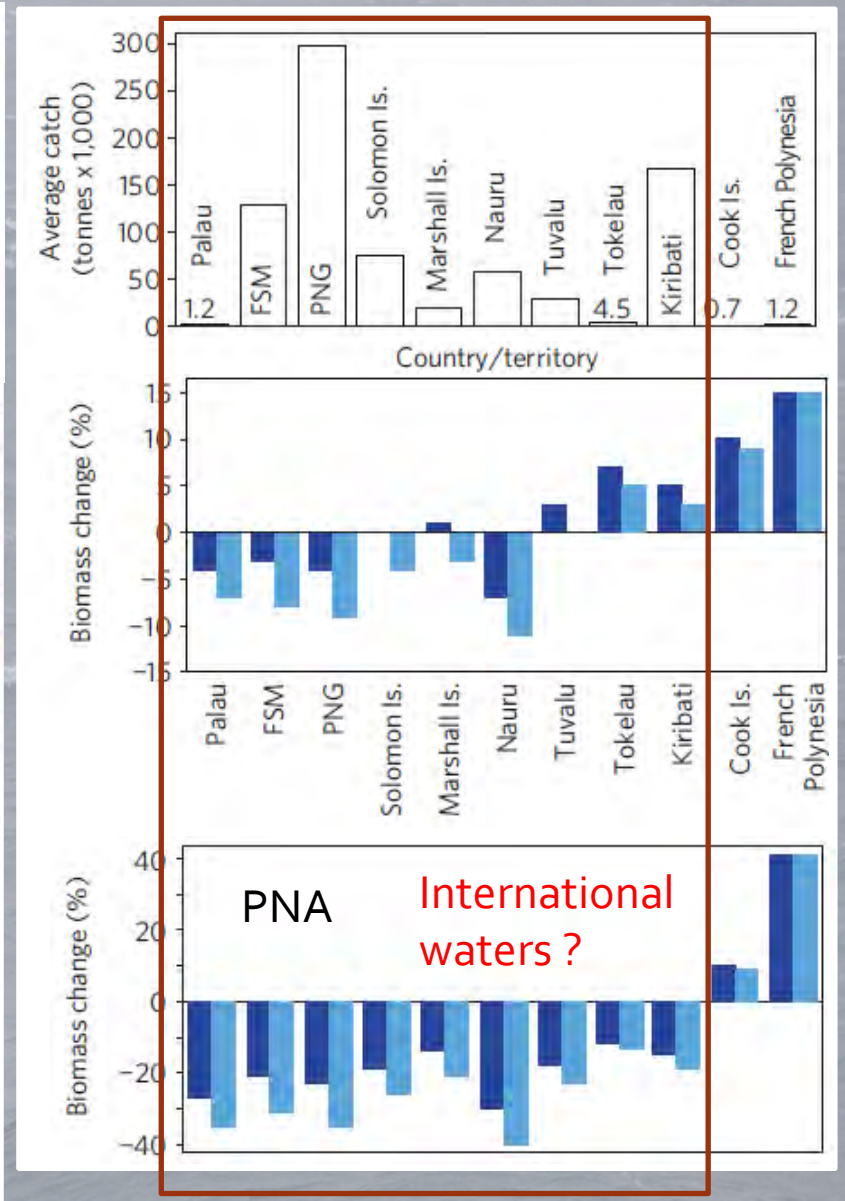


Projecting tuna stocks with IPCC forcings

Skipjack projection (total biomass CM4-A2 scenario)

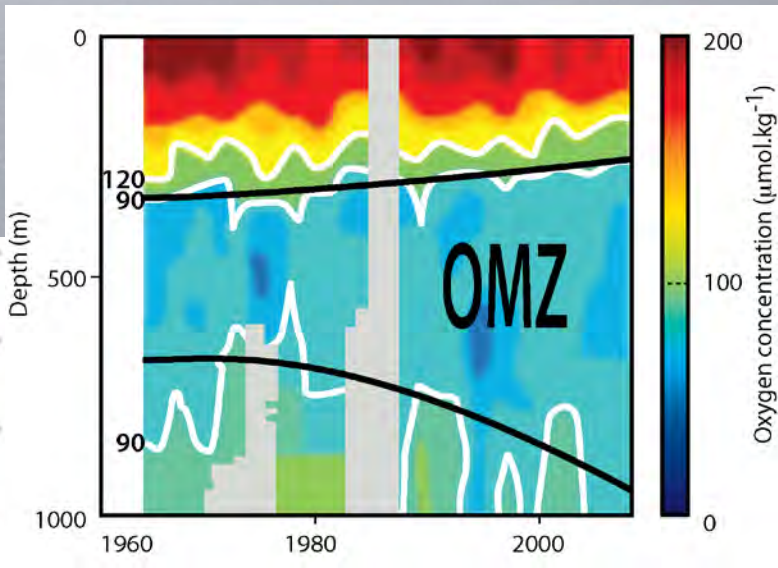
Lehodey et a.2013; Bell et al 2013

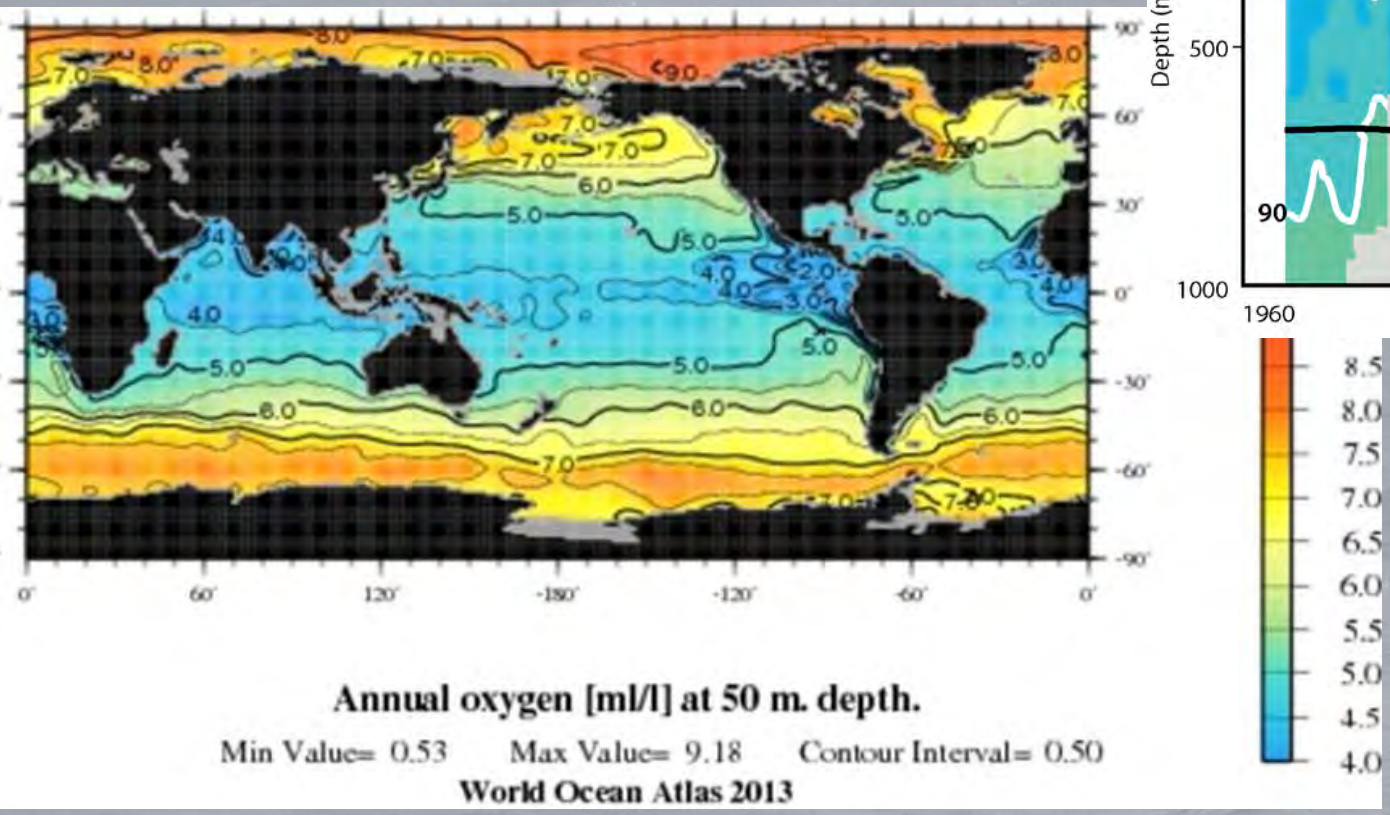




Projecting tuna stocks with IPCC forcings

Time-series since 1960 of dissolved O2 near 170°W at the equator (5°S-5°N) showing expansion of Oxygen Mimum Zone. (Stramma et al. 2008)





Trends in dissolved oxygen concentration and temperature stratification will (very likely) increase catchability by purse seiners of skj & yft (& juvenile bigeye) in the surface layer in the central and EPO.

Conclusions (Personal)

- **WCPFC has still to demonstrate that fishing effort/mortality can be controlled over the whole convention area.**
- **Given the importance of tuna for PNA Countries ,they have developed innovative approach both to increase their revenue from the resource and to control fishing effort and sustainability of tuna exploitation in their area.**
- **However, this is not sufficient as the fishing effort continue to increase outside PNA area.**
- **Climate change is likely to impact skj (and yft) tuna stocks by shifting /extending their habitat eastward and poleward, increasing access to this resource in international waters, more difficult to control.**
- **Climate change is likely to increase catchability in the surface layer in the central-eastern tropical Pacific.**
- **Both international commissions should work more and more closely and integrate CC impacts with decadal fishing effort scenarios**
- **Central Pacific Is. Countries (Polynesian) could follow or join the PNA initiative.**

Thanks to PICES for the support to attend this conference