10.3 North Pacific Albacore Tuna Stock Assessment

An example of an international data-rich tuna stock assessment with important US fisheries, focusing on US data sources

NOAA FISHERIES
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Stock Assessment Methods

- International stock assessment by ISC Albacore Working Group (ALBWG) in 2011
- Canada, Chinese-Taipei, Japan, USA, IATTC, SPC
- Stock Synthesis v3.11b
- Seasonal, length-based, age-structured forward simulation population model from 1966 to 2009
- Used fishery-dependent data sources and biological parameters from previous studies

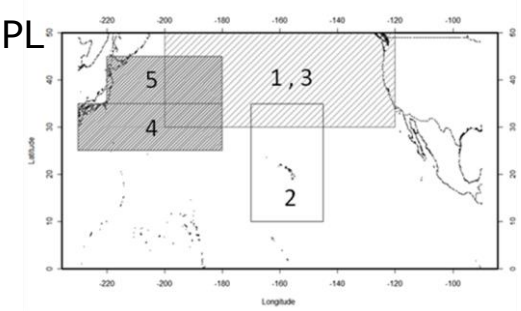
Fishery-Dependent Data Sources

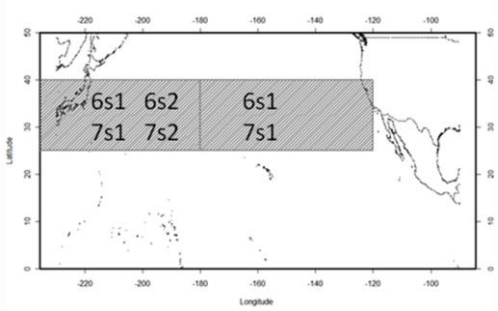
- 16 fisheries defined by gear, location, season, and units of catch
  - US/Canada Troll/Pole-and-Line based in West Coast
  - Longline based in Hawaii
  - Eastern Pacific Miscellaneous
- Quarterly catch for each fishery
- Quarterly length comps (26-140 cm; 1, 2, and 4 cm bins)
- 8 standardized CPUE indices
  - US has 2 indices from above fisheries (Troll/PL & Longline)
- Conditional age-length data from otoliths (Wells et al. 2011)

Fishery	Description
F1	CAN/USA Troll
F2	USA LL
F3	EPO Miscellaneous
F4	Japan Pole-and-line (south)
F5	Japan Pole-and-line (north)
F6s1	Japan offshore longline (north/season 1/number of fish)
F6s2	Japan offshore longline (north/season 2/numbers of fish)
F7s1	Japan coastal longline (north/season 1/weight)
F7s2	Japan coastal longline (north/season 2/weight)
F8	Japan offshore longline (south/north season 3-4/number of fish)
F9	Japan coastal longline (south/north season 3-4/weight)
F10	Japan gillnet
F11	Japan miscellaneous
F12	Taiwan longline
F13	Korea and others longline
F14	Taiwan and Korea gillnet

Spatial Definition of Fisheries

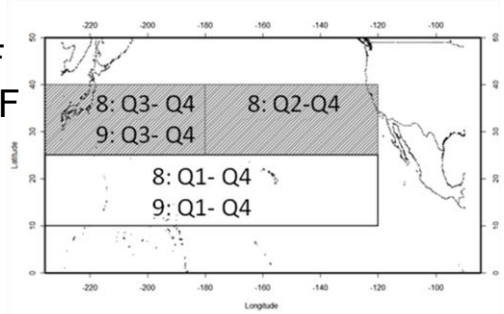
F1 – US/CA Troll/PL
F2 – USA LL
F3 – EPO misc.
F4 – JPN PL LF
F5 – JPN PL SF

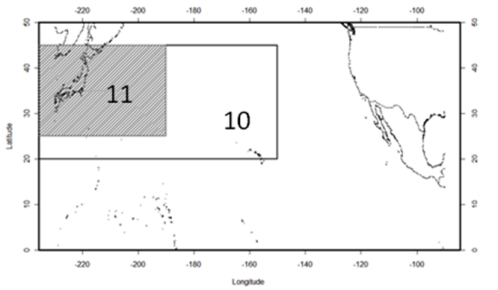




F6 – JPN OLLF1 SF
F7 – JPN CLLF1 SF

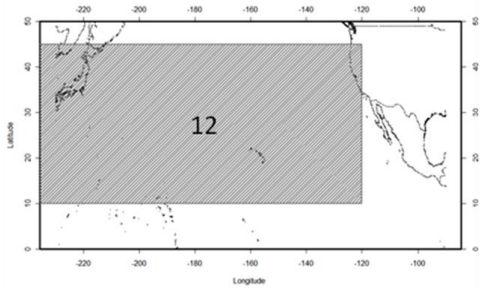
F8 – JPN OLLF2 LF
F9 – JPN CLLF2 SF

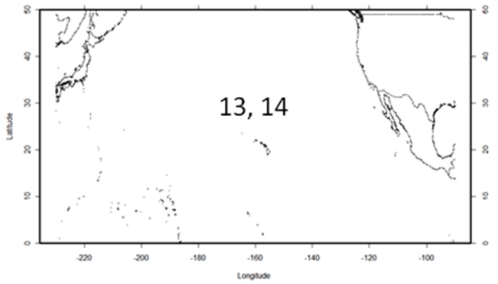




F10 – JPN GN
F11 – JPN Misc.

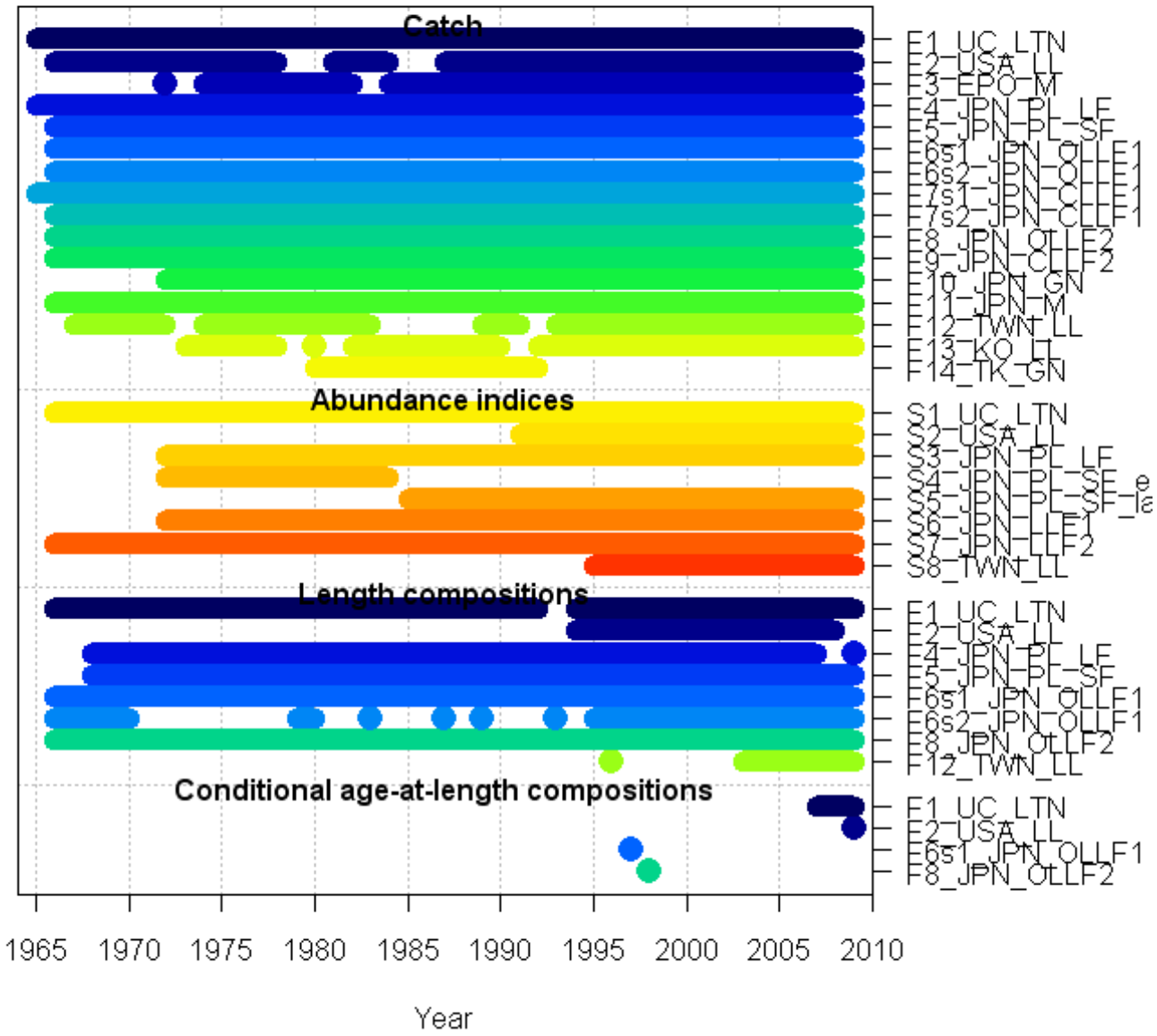
F12 - TWN LL



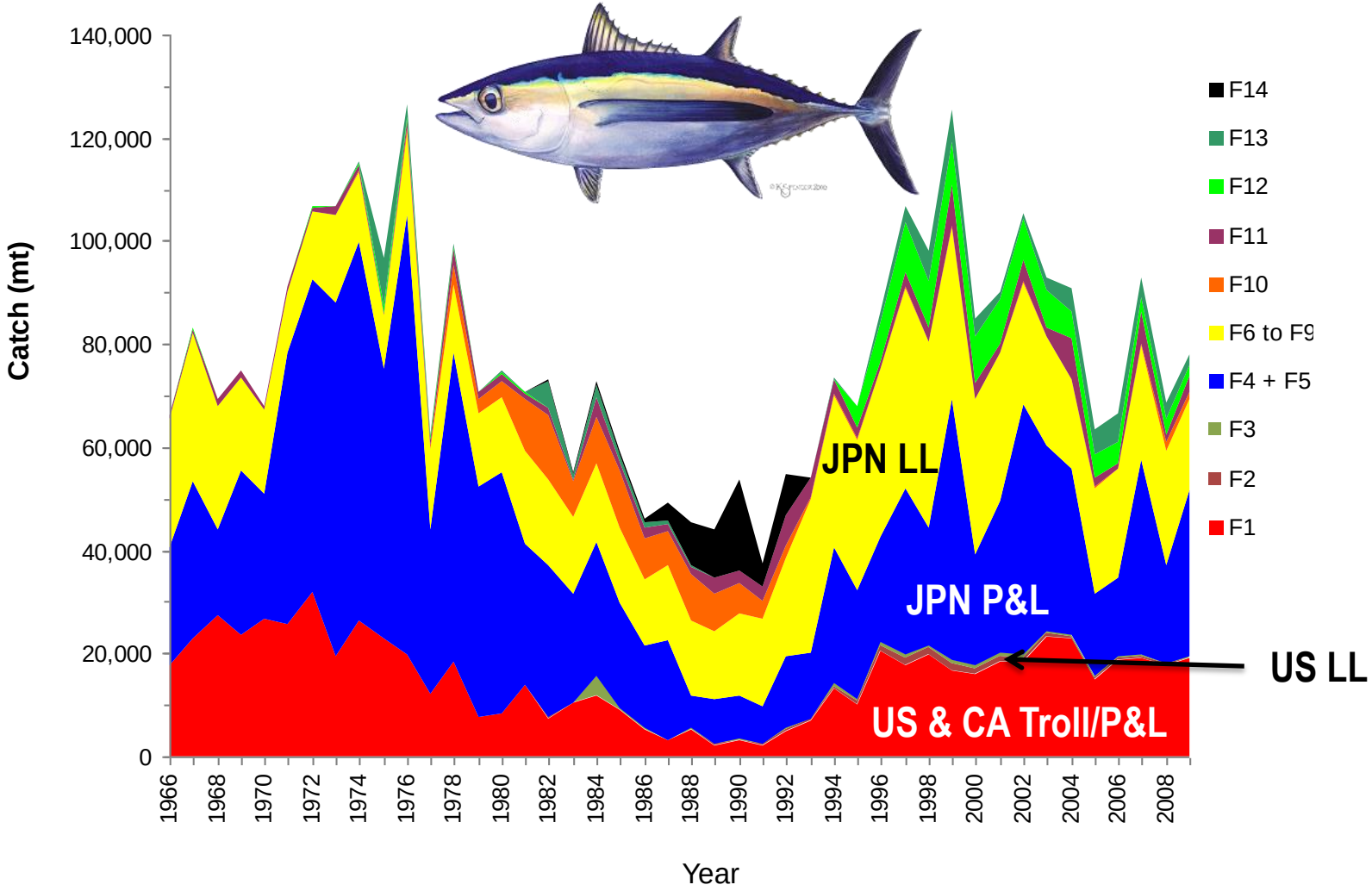


F13 – KO LL (Korea & others)
F14 – TK GN (Taiwan & Korea)

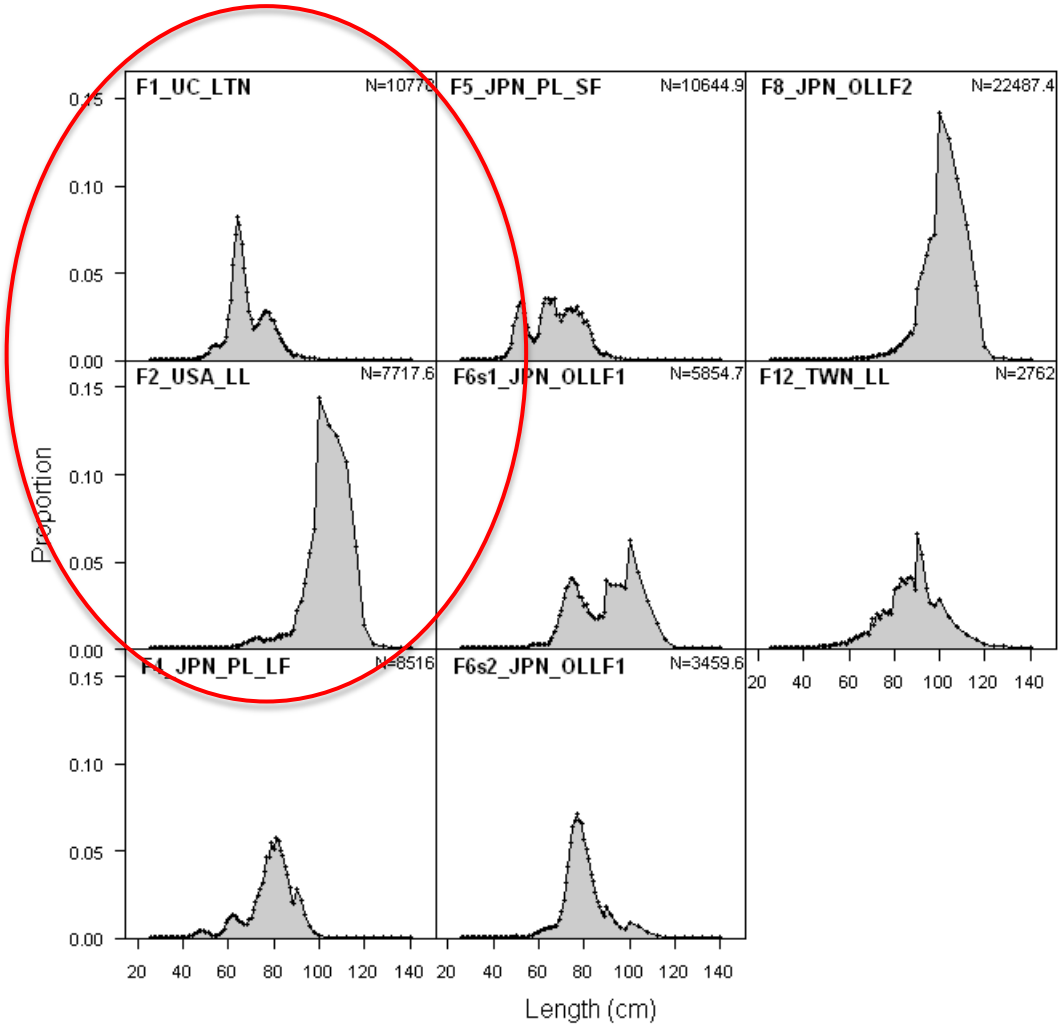
Data by type and year



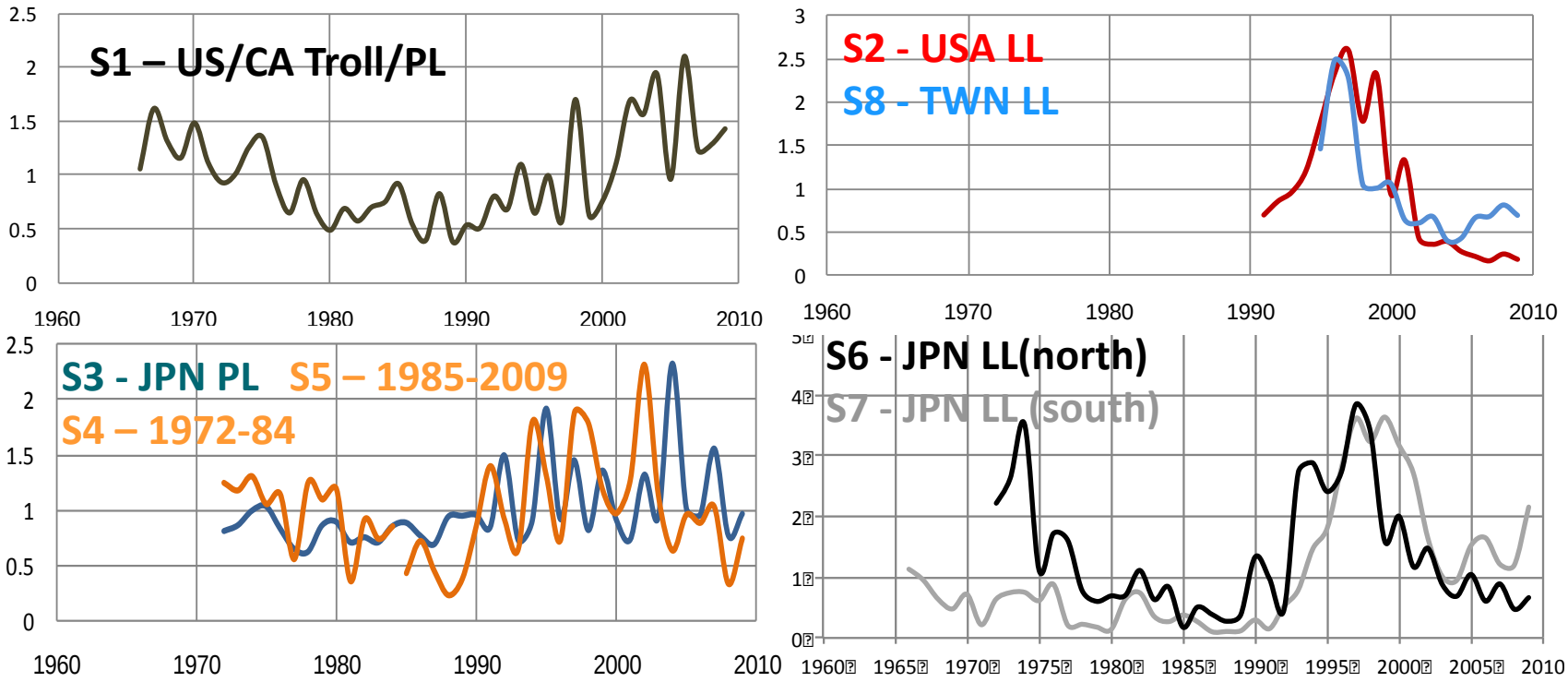
Catch History



Length Compositions



Eight Standardized CPUE indices



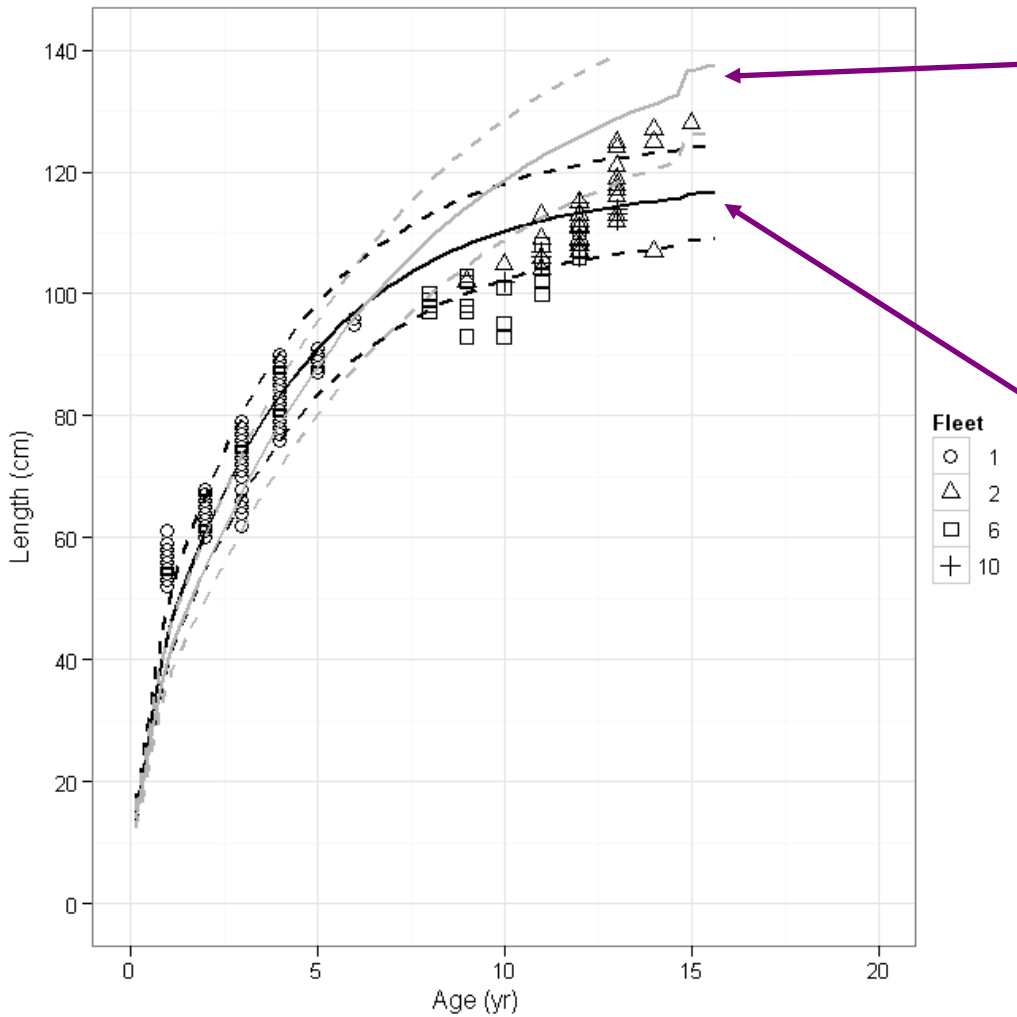
US Fishery-dependent data

- Quarterly catch
  - US troll/PL (ISC reports & logbook)
  - US Longline (PIFSC – ISC reports & logbook)
- Quarterly length composition
  - US troll/PL (port samples)
  - US Longline (PIFSC - observer data)
- CPUE indices
  - US troll/PL (logbook)
  - US Longline (PIFSC - logbook)

Biological Parameters - Growth

- Key change from 2006 assessment
- 2006 assessment used fixed growth parameters from Suda (1966) study using scale readings from mostly juvenile fish
- Von Bertalanffy growth model parameters estimated with SS model
- Conditional age-at-length data from otoliths (SWFSC scientists in 2011; ISC/11/ALBWG/02)

Biological Parameters - Growth



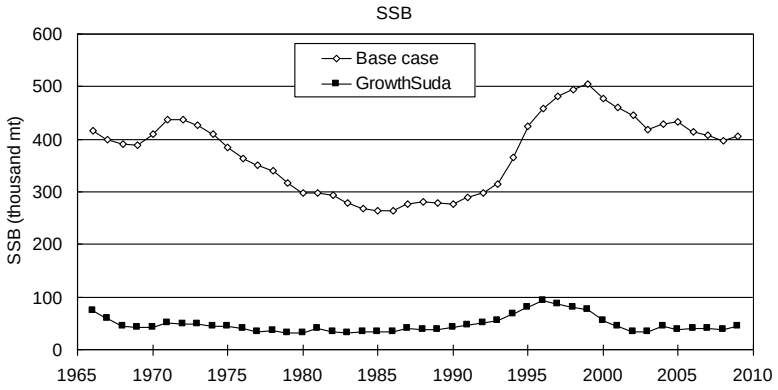
Suda curve
L1 =40.2 cm
L∞ = 146.46 cm
K = 0.149 yr^{-1}

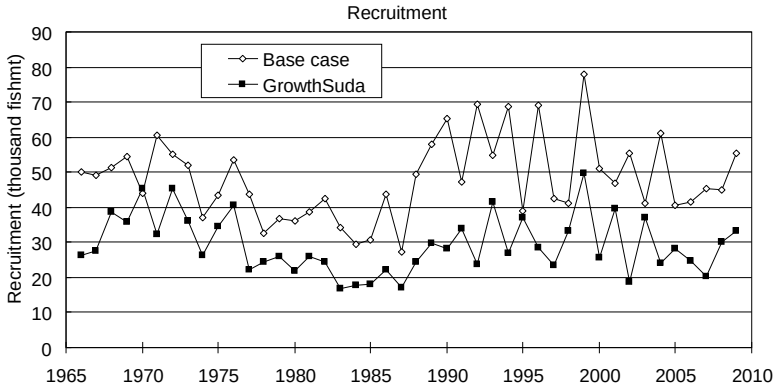
Model estimates
L1 = 44.4 cm
L∞ = 118.0 cm
K = 0.2495 yr^{-1}

Wells et al. (2011)
L1 ~ 50 cm
L∞ = 120.0 cm
K = 0.184 yr^{-1}

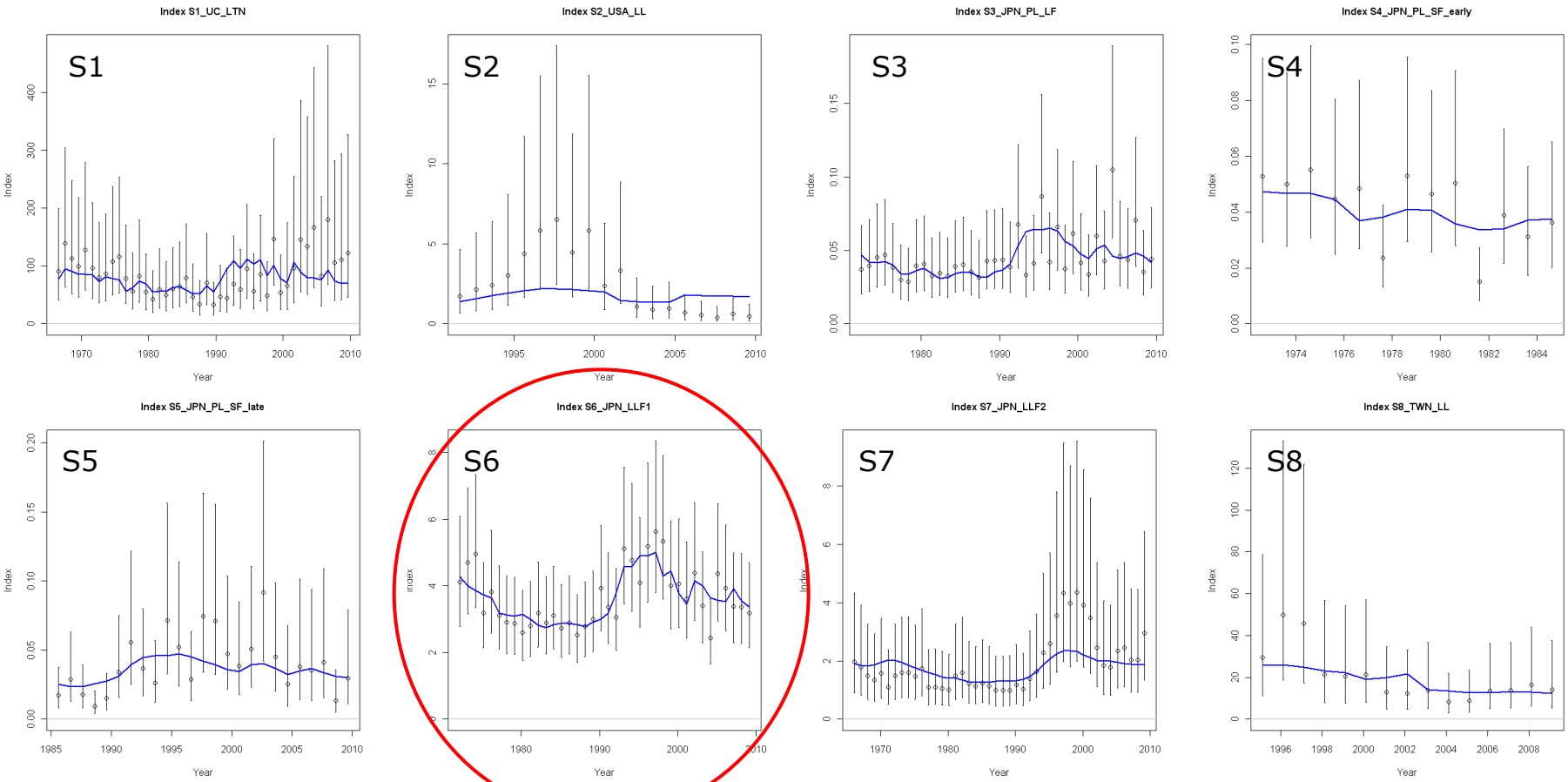
Sensitivity to Growth Parameters

- Estimated spawning biomass (SSB) & recruitment decreased relative to the base-case model, when using old growth curve from Suda (1966)
- Total likelihood of the base-case model was more than 100 units better than the Suda growth curve sensitivity run



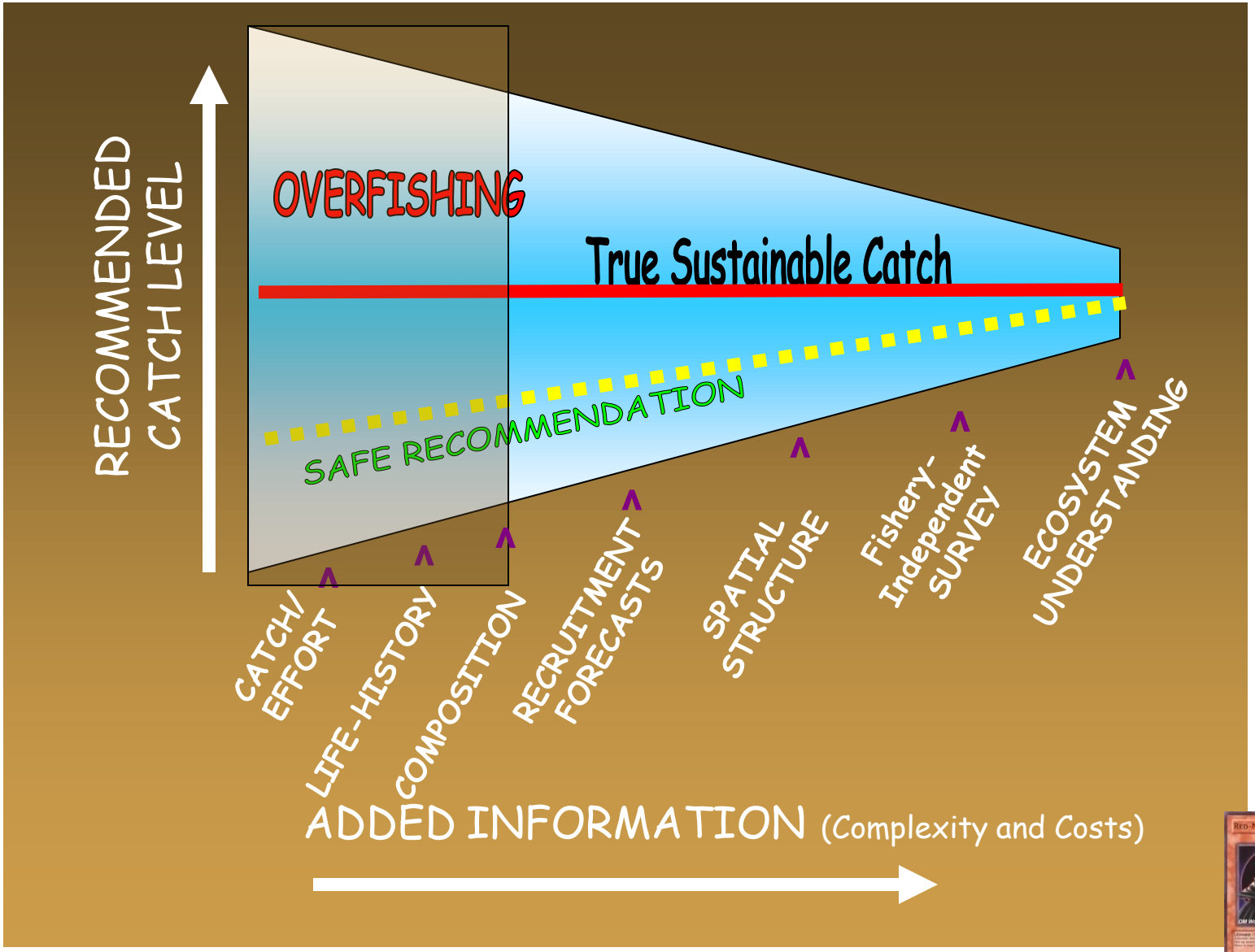


Model Fits to CPUE Indices



Model tuned to Japanese LL indices. US indices down-weighted, especially US Longline due to small spatial scale of fisheries

Where does the albacore assessment sit?



Strengths

- Relatively data rich compared to other HMS assessments in this review
- US catch, size composition, and logbook data is relatively good
- Some improvements in biological parameters

General Challenges

- Data can be of variable quality and very difficult to check non-US data
- Lag between last year of data and assessment
- CPUE indices and biological parameters need more improvement
- No fishery-independent survey
- Lack of explicit spatial structure and estimated movements in HMS stock
- Apparent regional differences in growth

US Data Challenges

- SWFSC albacore fishery database has been in transition to Oracle for an inordinately long time
- Relatively poor ease of use for Oracle database due to lack of frontend or user access
- Uses Hawaii longline data (PIFSC & PIRO) but obtaining data can be difficult
- US landings in Canadian ports can be uncertain and vice versa
- Improved data error checking needed

Strategies

- When I Dream …
  - Full access to data from other countries
  - Fishery-independent survey covering North Pacific
  - Well-designed tagging program in all regions
- Things We Can Do?
  - Ease user access to US databases
  - Improve CPUE indices
  - Improve biological inputs (e.g., stock structure, regional growth, movement, environment, natural mortality)
  - Alternative data & models (e.g., otolith microchemistry, genetic tags)