Updated Japanese longline standardized trends for bigeye tuna in the eastern Pacific Ocean from operational-level data

SAC-05-08b

Background

- Trends in longline catch-per-unit-effort (CPUE) are an influential component in the EPO bigeye tuna assessment.

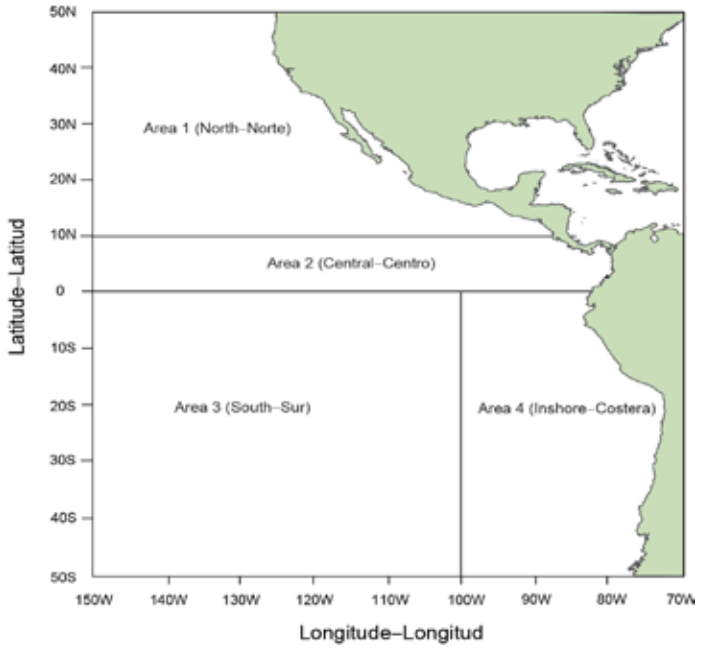
- A recent analysis of operational-level Japanese longline data for the western Pacific identified differences in fishing efficiency among vessels.

- Incorporating vessel effects in the CPUE standardization model had some affect the long-term trend of the index.

- Results of a similar analysis for the EPO were presented last year (SAC-04-05b).

Background

- Last year's analysis focused on standardized trends in the 'Central' stock assessment area for 1979-2011.
- The long-term trend in the index for the Central area was slightly more pessimistic when mean differences in CPUE among vessels were taken into consideration.
- This year, standardized trends have been computed for all four stock assessment area through 2012.



CPUE analysis

- This work was conducted at the National Research Institute of Far Seas Fisheries in Shimizu, Japan, during December, 2013, through January, 2014, in collaboration with IATTC staff in La Jolla.

- The Japanese Fishery Agency made available operational-level longline data (by-set data) for this work.

- Analyses were limited to 1979-2012 because data on vessel identifiers were not available prior to 1979.

CPUE analysis

- Negative binominal generalized linear regression models were fitted to the CPUE data, by assessment area.
- Response variable: bigeye tuna catch (number of fish)
- Predictor variables:

  number of hooks
  year-quarter effect
  5° area effect
  number of hooks between floats
  vessel call sign

- Models:

$$\log(\mu) = \text{constant} + \beta \bullet \log(\text{number of hooks}) + \text{year-quarter effect} + 5^\circ \text{ area effect} + f(\text{hooks between floats})$$

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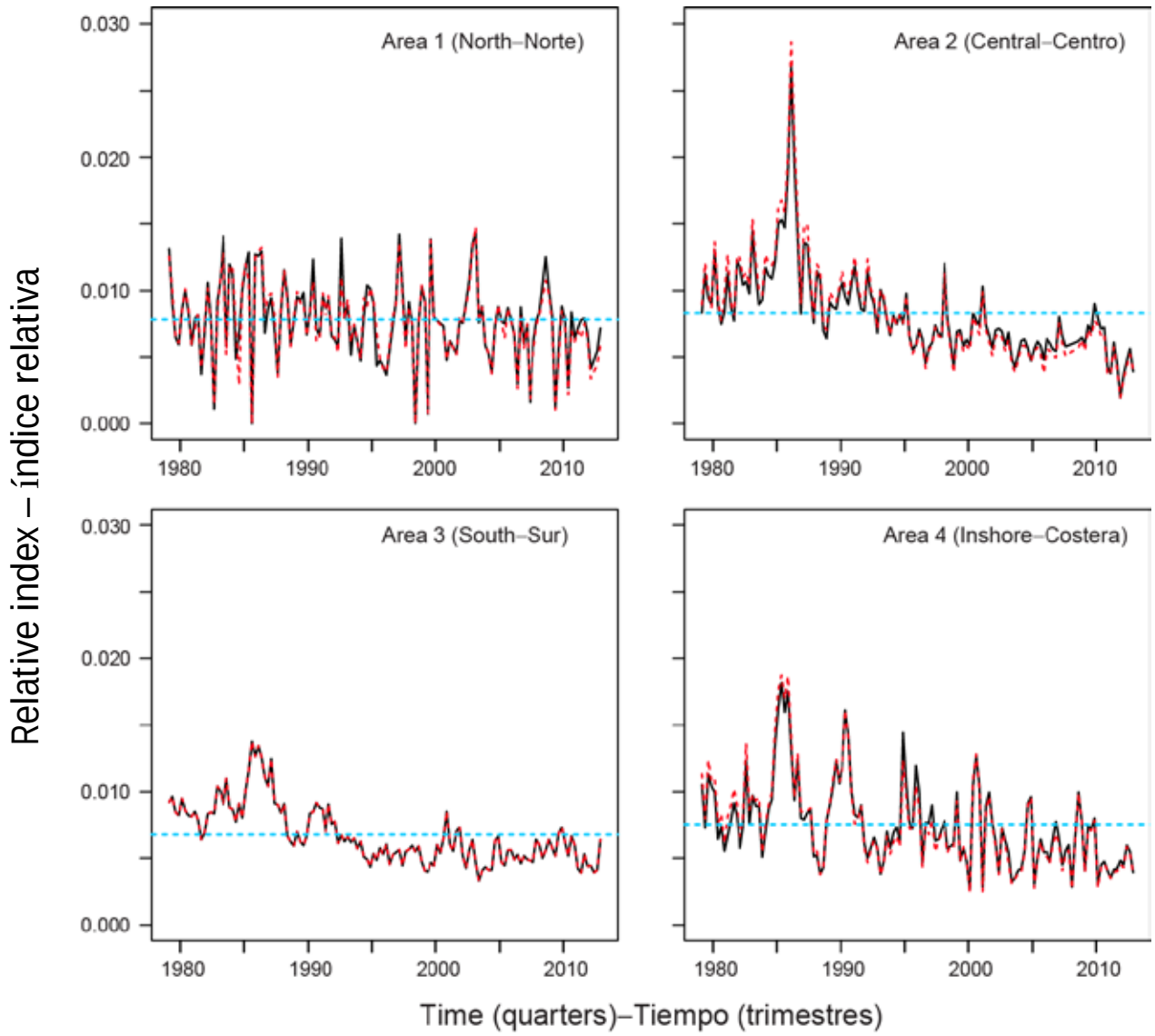
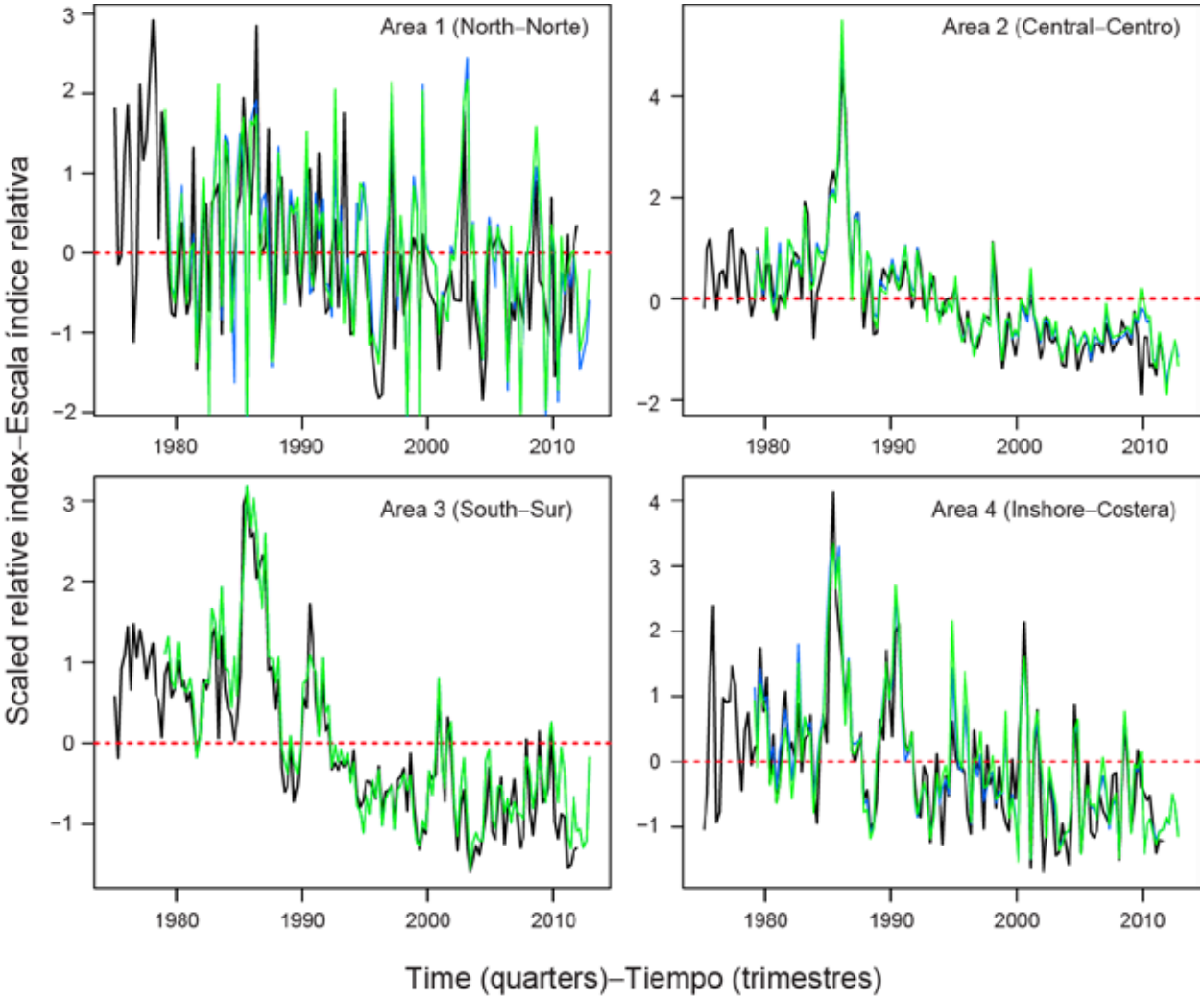
- Standardized trends computed by method of partial dependence.

Standardized trends



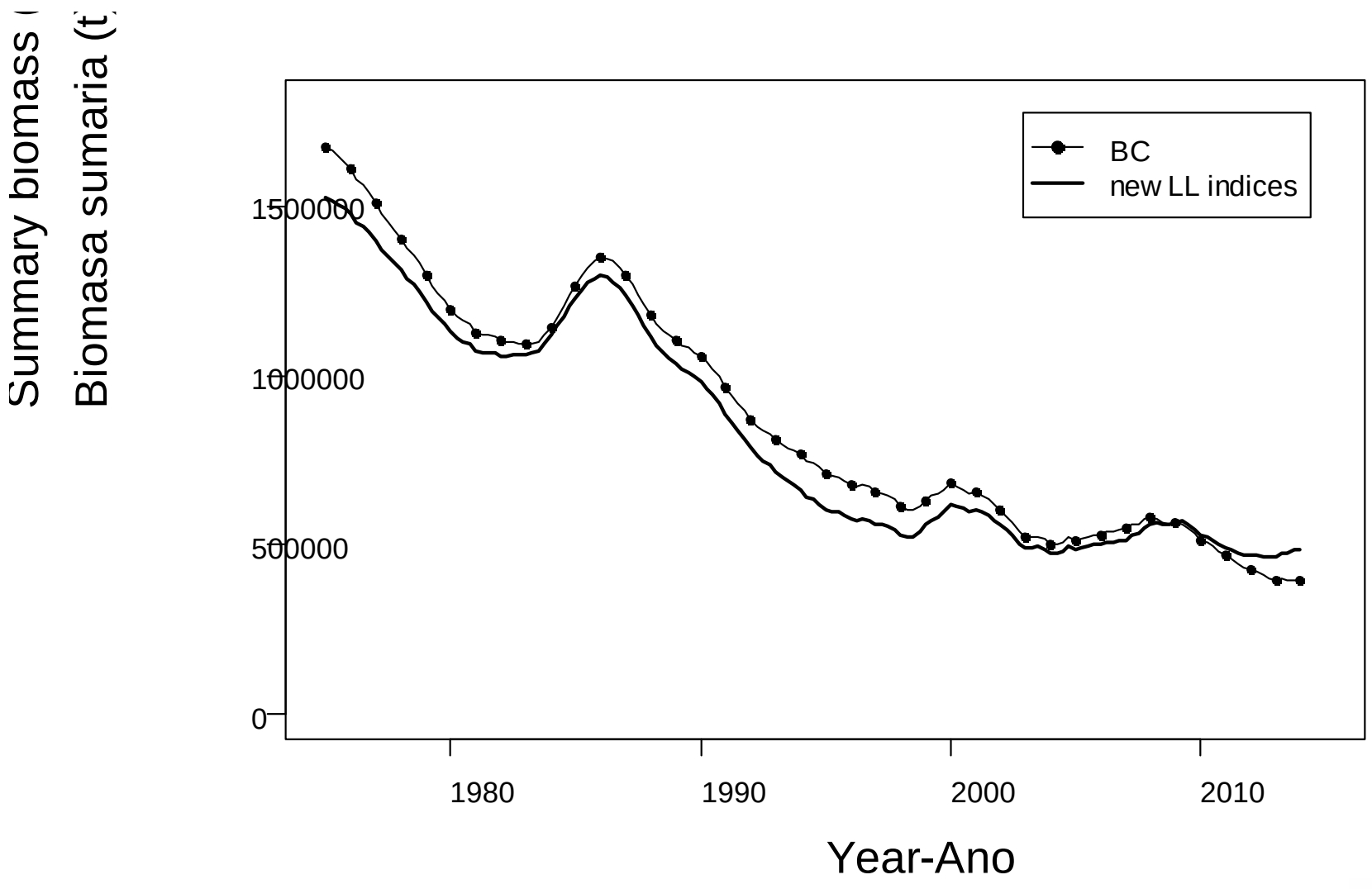
Black: no vessel effect
Red: vessel effect

Standardized trends



Green: no vessel effect
Blue: vessel effect
Black: SAC-04 index

Affect on assessment results



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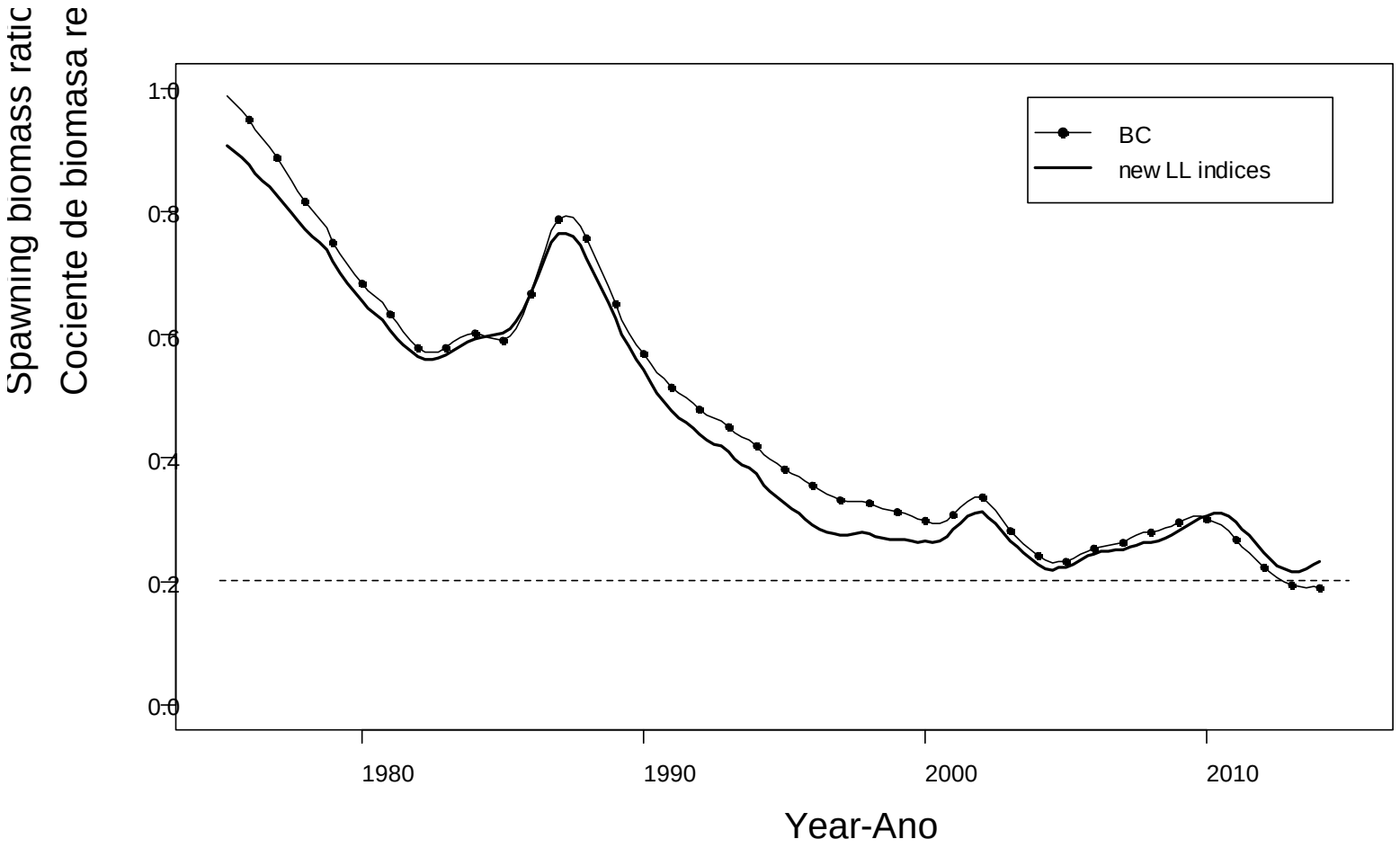

Summary and Discussion

- When mean differences among vessels in fishing efficiency were taken into consideration, the standardized index was slightly more pessimistic, depending on the area.
- Operational-level indices were generally similar to the indices currently used in the bigeye tuna assessment model, which are based on aggregated data.
- The new LL index gives a more optimistic perception of the current stock state. (However, the confidence intervals are wide.)
- Work on model improvements, e.g. GAMs that account for any smaller-scale spatial variability in hooks between floats, was initiated but not completed due to computational challenges that need to be addressed.