ANALYSIS OF SKIPJACK CATCH PER UNIT OF EFFORT (CPUE)

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Goal: Develop an index of relative abundance from purse seine catch and effort data on floating objects

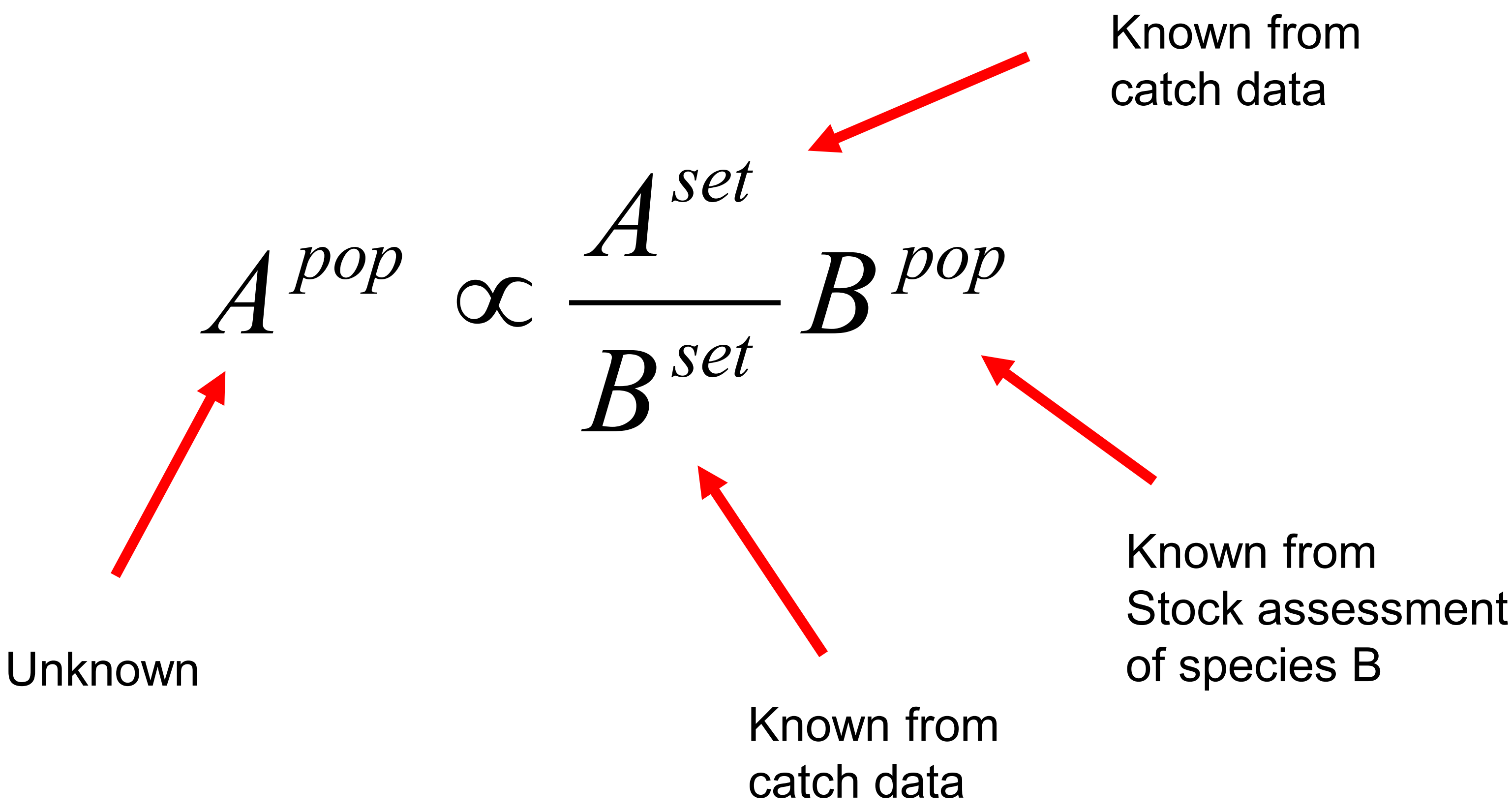
Problem: Catch per set is not related to abundance and there is no reliable measure of search time

Concept: The temporal change in the ratio of one species to another in a set is the same as in the population

Main assumption

$$\frac{A^{set}}{B^{set}} = q\,\frac{A^{pop}}{B^{pop}}$$

The data



$$A^{pop} \propto \frac{A^{set}}{B^{set}} B^{pop}$$

Known from
catch data

Unknown

Known from
catch data

Known from
Stock assessment
of species B

GLM approach

Let $\hat{r}_i = \exp[\boldsymbol{\beta}\mathbf{X}_i]\dfrac{A_t^{pop}}{B_t^{pop}}$

where $r_i = \dfrac{A_i^{set}}{B_i^{set}}$

The log-linear model is

$$\ln[r_i] = \boldsymbol{\beta}\mathbf{X}_i + \ln\left[A_t^{pop}\right] - \ln\left[B_t^{pop}\right] + \varepsilon_i$$

Temporal Effect
(i.e. index of relative abundance)

Known abundance
as offset

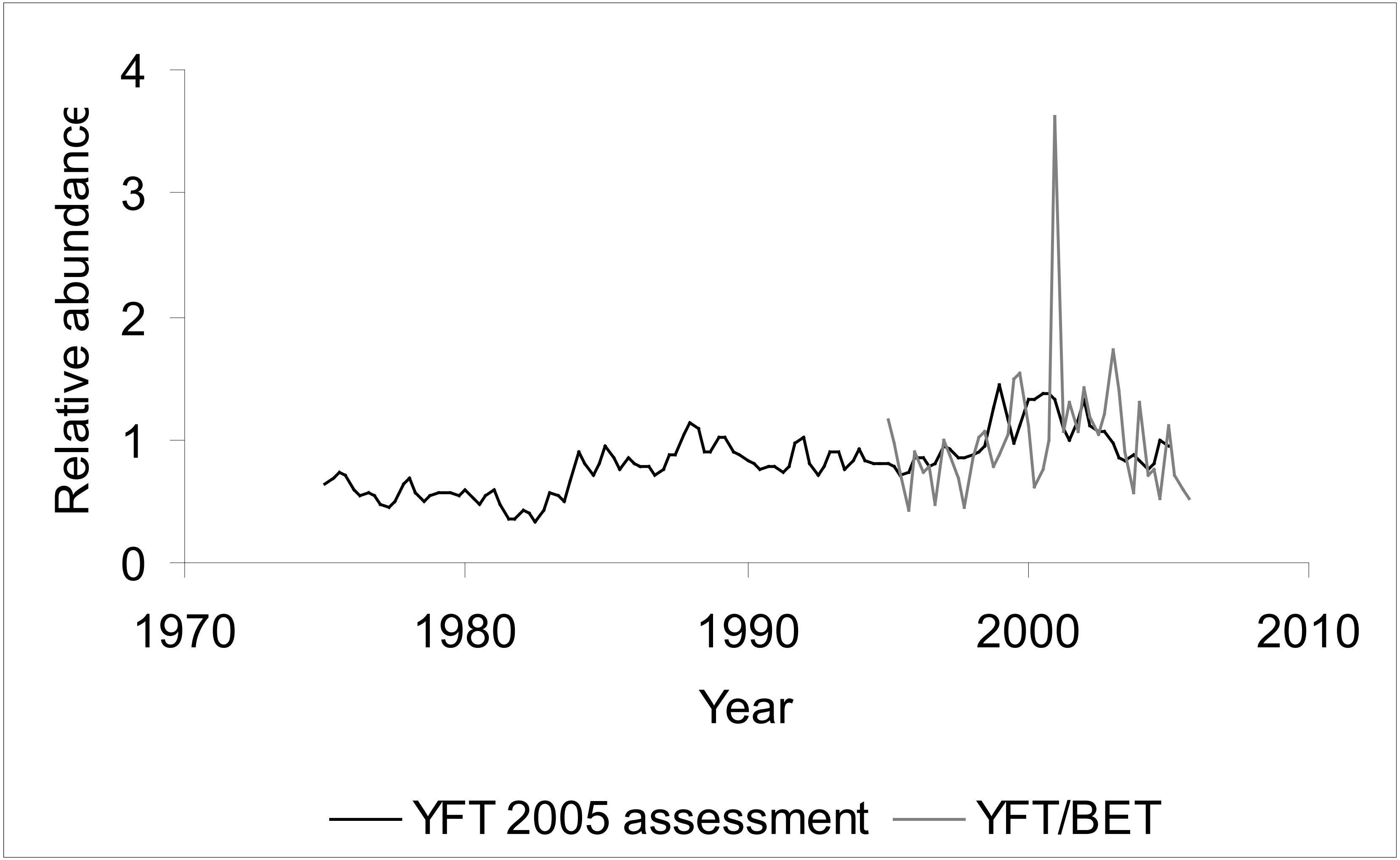
Test

- Species of interest: Yellowfin
- Species of known abundance: Bigeye
- Compare with yellowfin stock assessment estimates of abundance

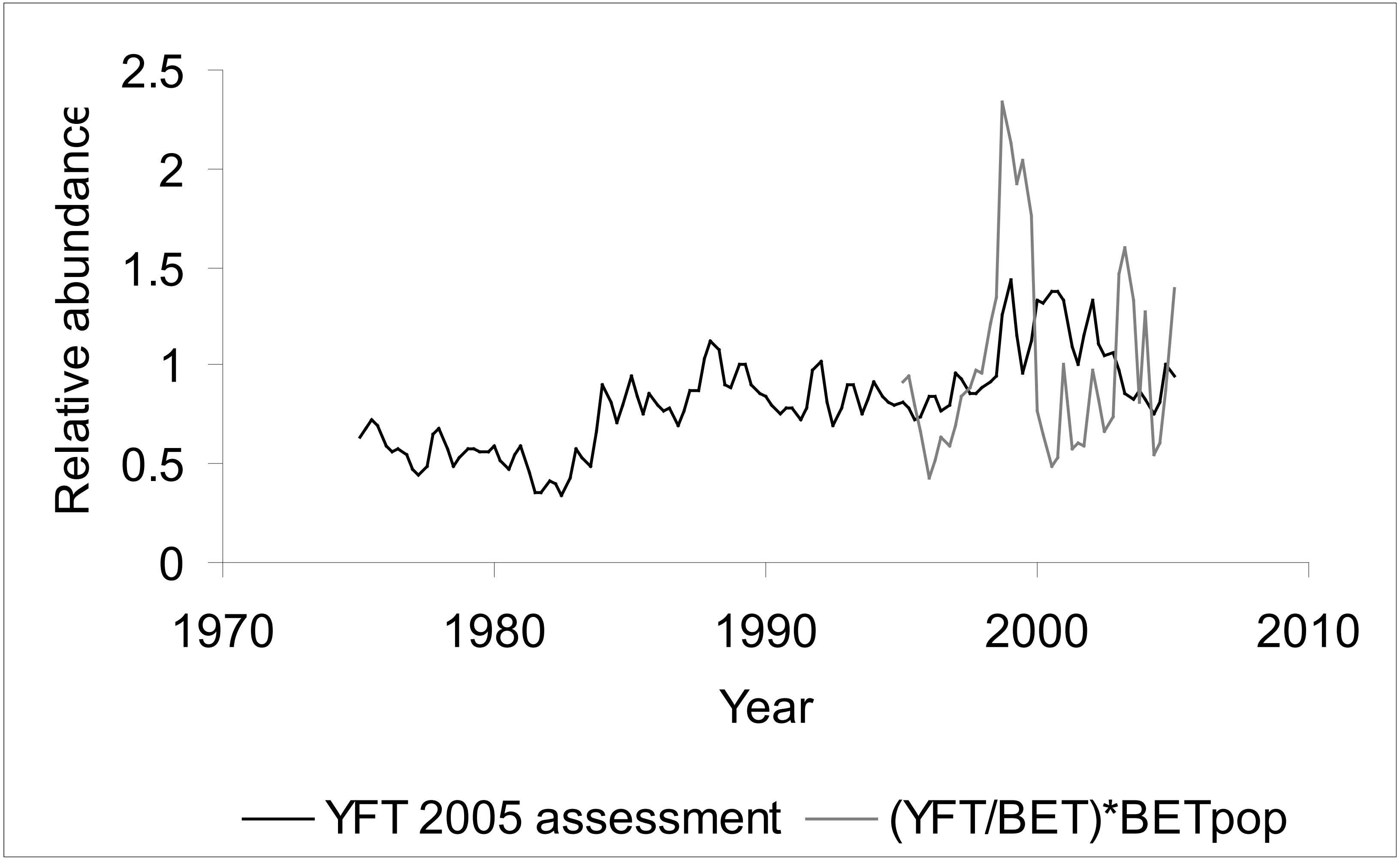
Application

- Species of interest: Skipjack
- Species of known abundance: Bigeye
- Explanatory variables
  - Time in months
  - Latitude
  - Longitude
  - Sea-surface temperature
  - Vessel

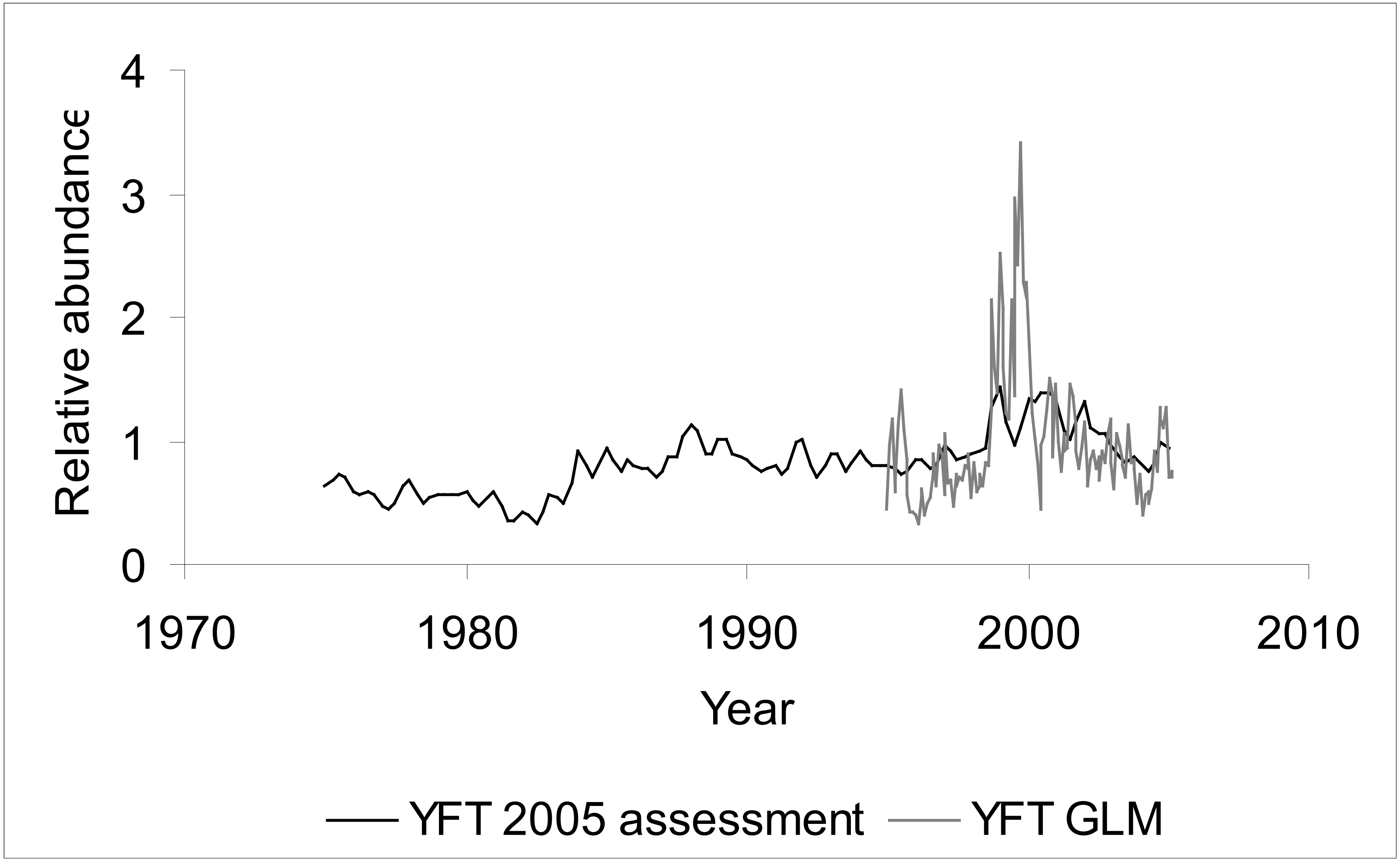
Yellowfin results: ratio of YFT to BET



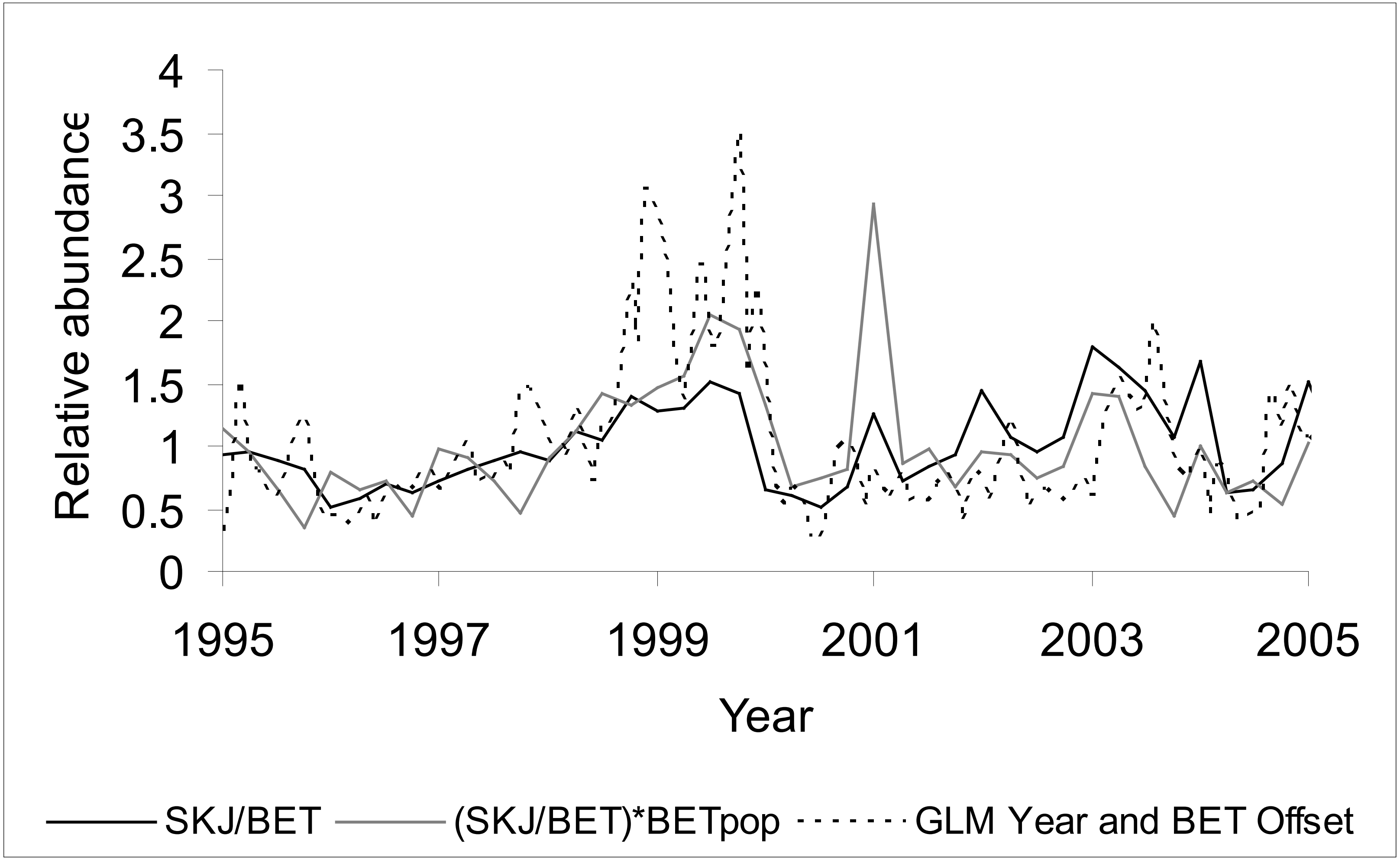
Yellowfin results: Adjusted by BET known abundance



Yellowfin results: Full GLM



Skipjack results



Discussion

- The yellowfin test did not validate the method
- The known bigeye tuna abundance off set or the GLM did not greatly change the index of relative abundance
- The estimated indices of relative abundance are consistent with previous stock assessments and show no major concern for the population

Future work

- Incorporate spatial structure or fish size into the analysis
- Include other explanatory variables in the analysis (e.g. the catch of other species).
- Apply the method to other species