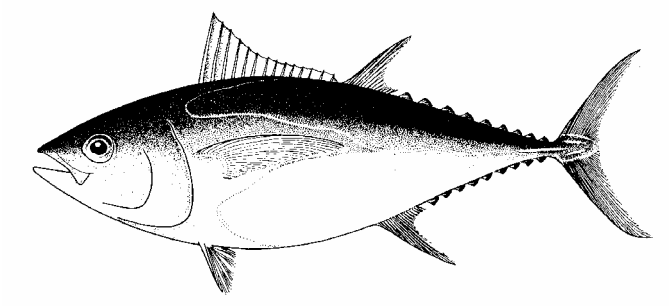
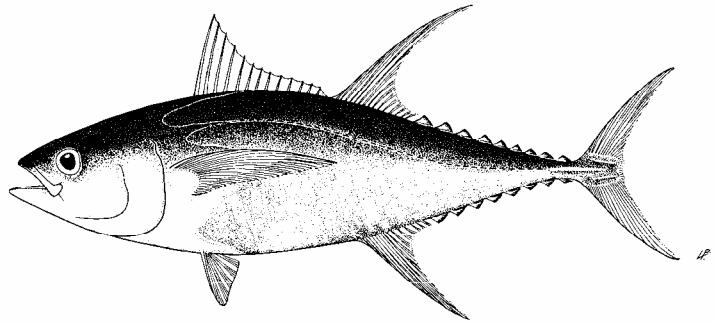




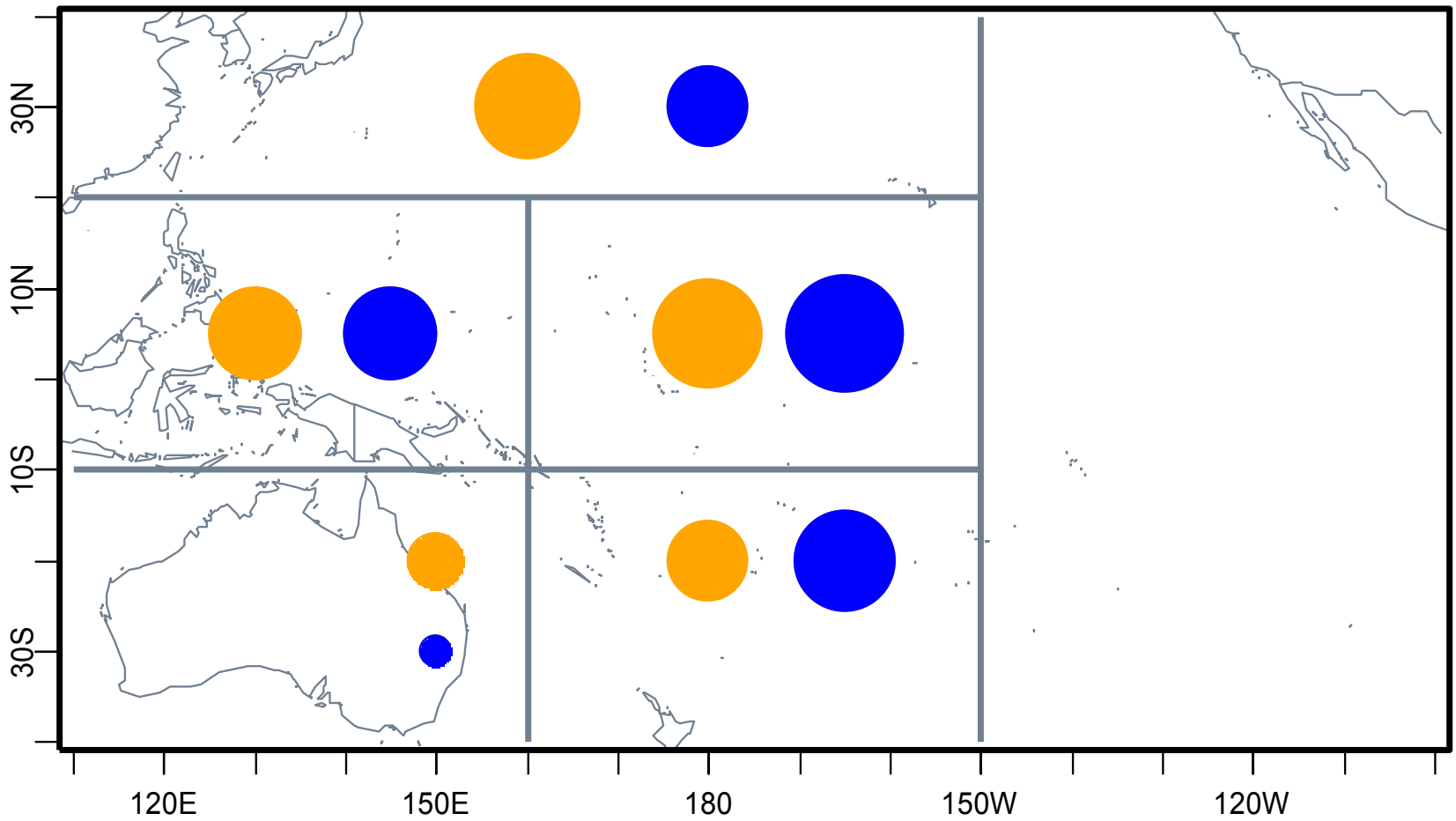
BET and YFT longline CPUE Indices, GLM and statHBS (SA WP-8).

A. Langley, K. Bigelow, M. Maunder and N. Miyabe

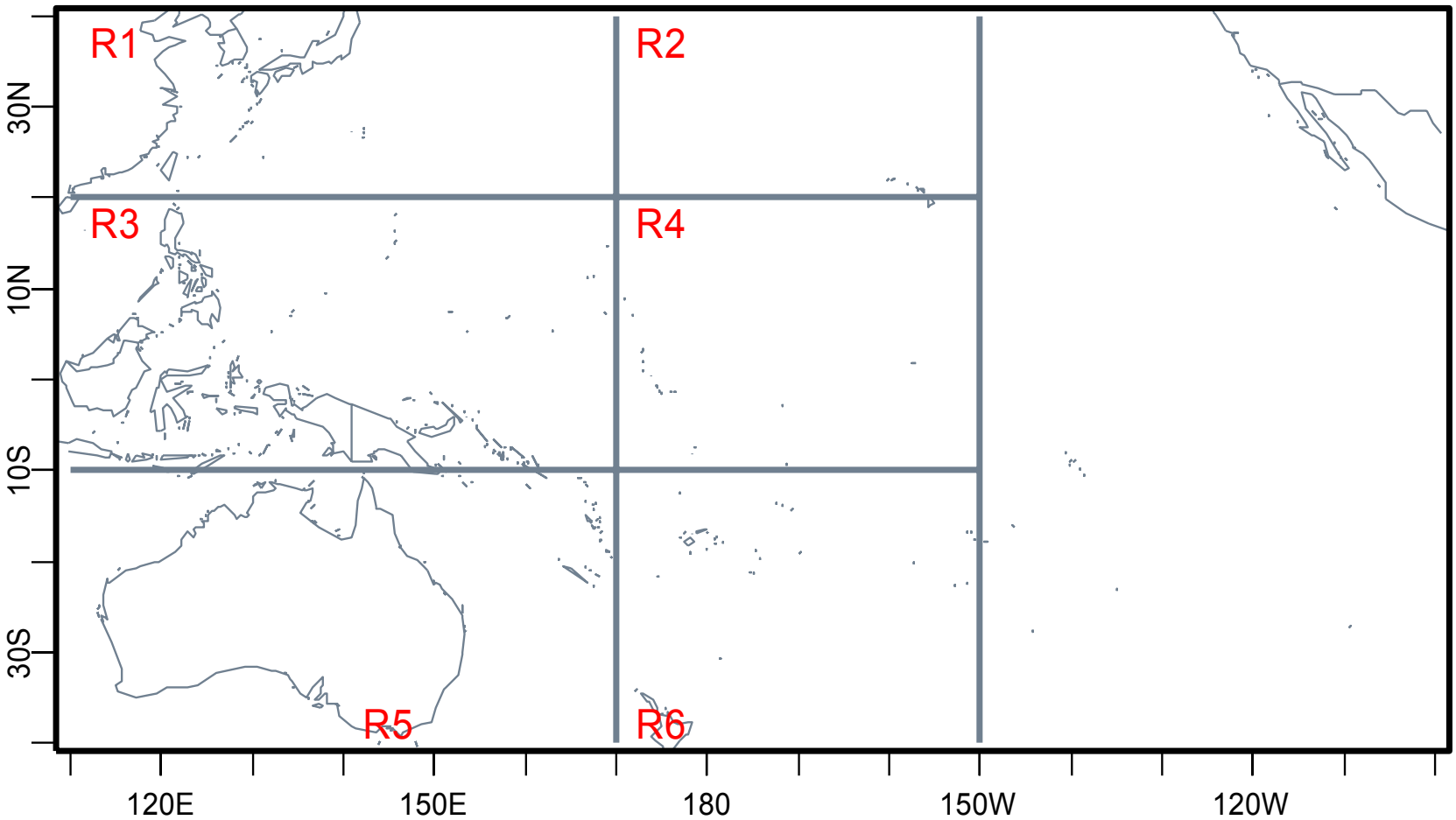
Introduction

- Describes the calculation of standardised longline CPUE indices for BET and YFT.
- Key index of LL exploitable biomass in MFCL stock assessment models.
- Japanese LL data, 1952-2004. Year/quarter.
- Region specific index. WCPO = 6 regions.
- Standardise using GLM and statHBS techniques to correct for changes in catchability.
- Scale CPUE indices between regions to account for relative abundance and region size (NEW).

Regional structure 2004



Regional structure 2005



Area weighted GLM index

CPUE indices comparable between regions and reflect relative biomass in each region.

1. GLM model for each region.

Data aggregated 5*5 lat/long, HBF, month. YR/QTR index.

$$\ln(CATCH_{(u,v)}) = aYRQTR_{(u)} + bLATLONG_{(v)} + cHBF + dHBF^2 + eHBF^3 + fHOOKS + gHOOKS^2 + hHOOKS^3 + iCPUE\_YFT + jCPUE\_YFT^2 + kCPUE\_YFT^3 + \varepsilon_{(u,v)}$$

2. Region scalar.

Pacific-wide model.

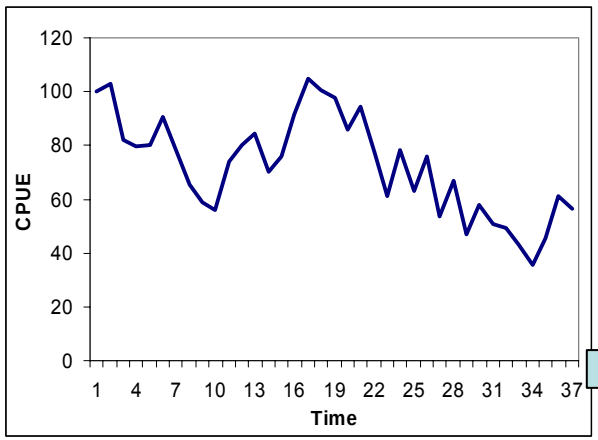
Sum of latlong coefficients in region.

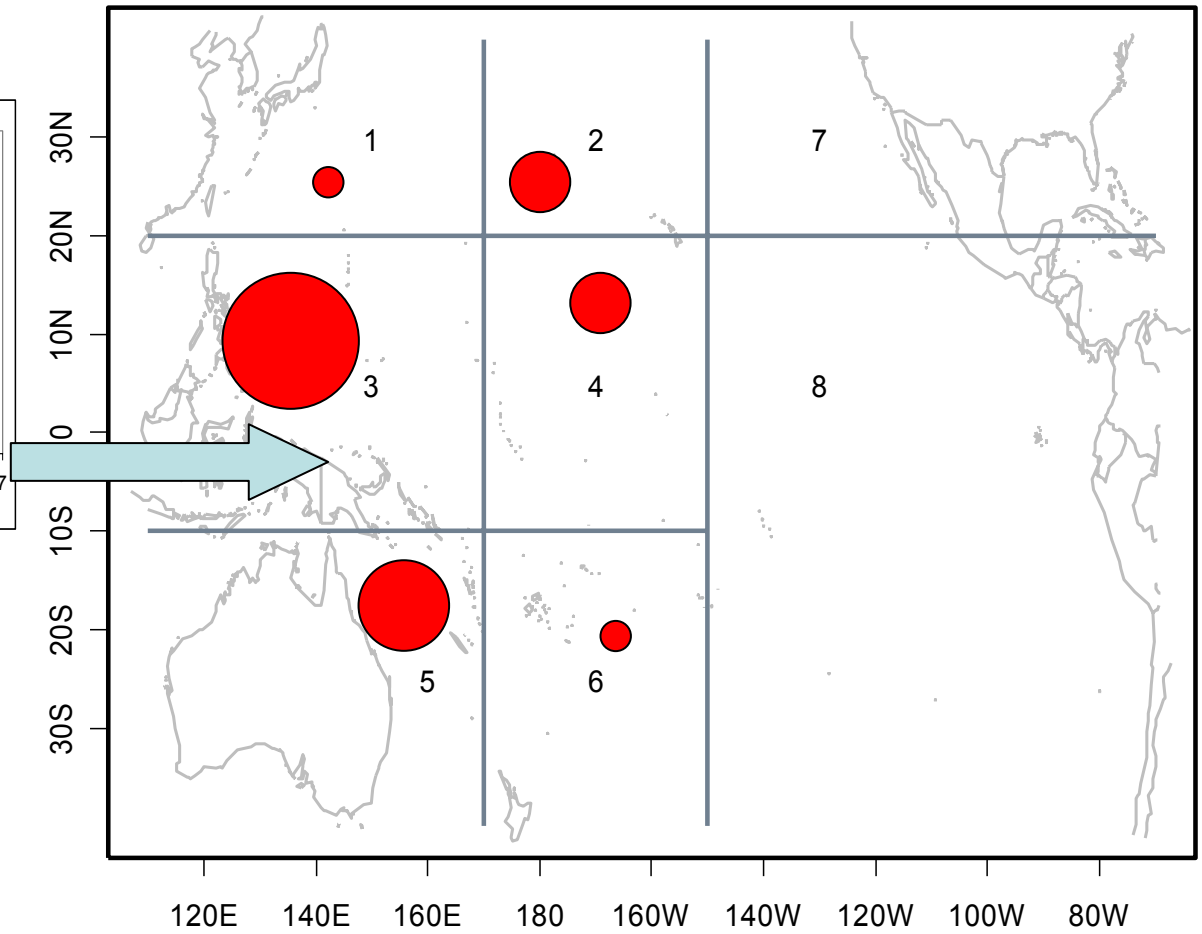
$$CPUE_{(k,j)} = aLATLONG_{(k)} + bHPB_{(j)} + \varepsilon_{(k,j)}$$

3. YR/QTR index multiplied by region scalar.

Overview

Region specific CPUE index





Previous assessments have included “qualitative” area weights within the MFCL model.

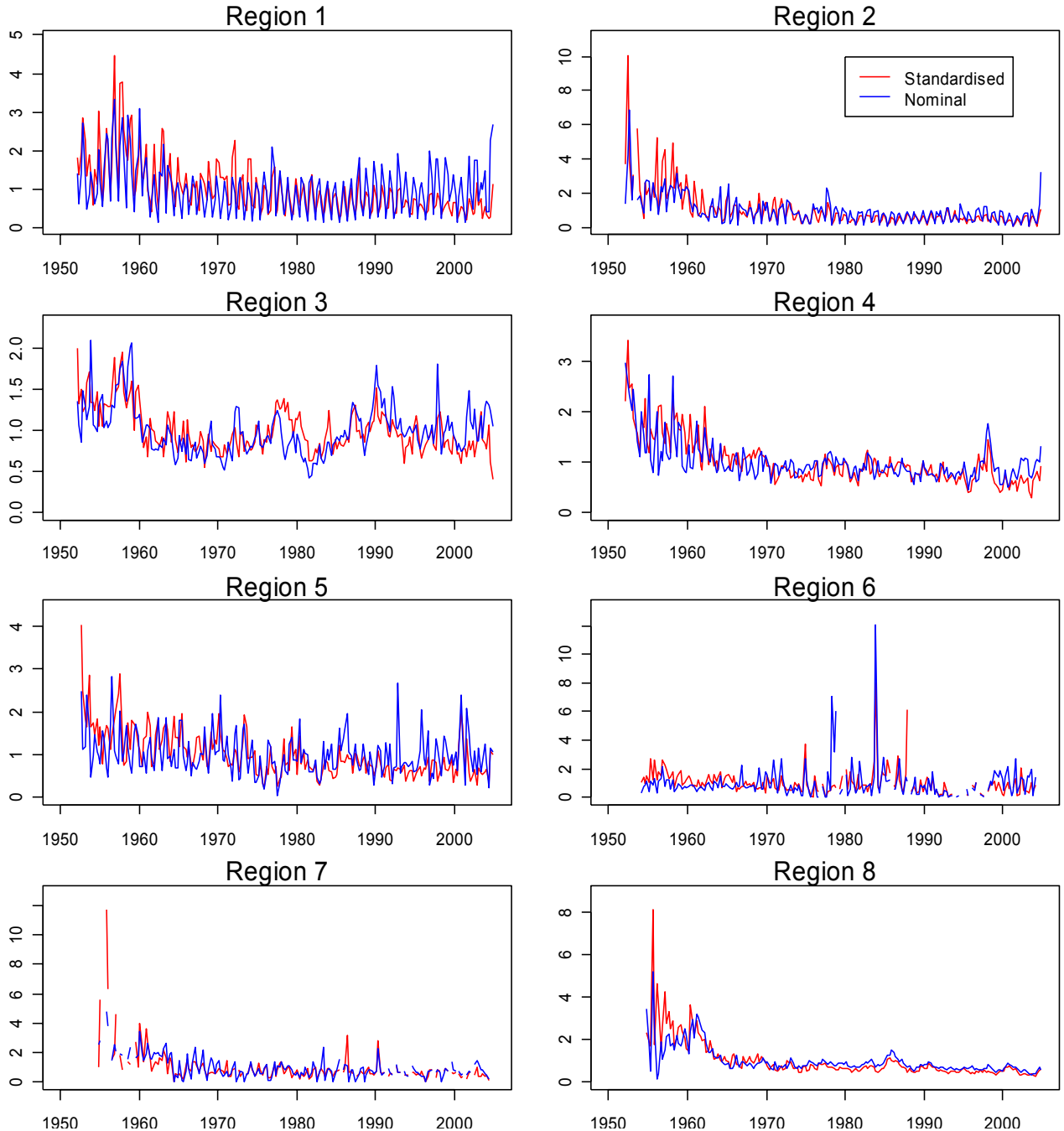
= relative abundance between regions
i.e. region scaling factors.

Step 1

BET GLM Indices.

Generally comparable to nominal CPUE, although more pessimistic in the more recent period.

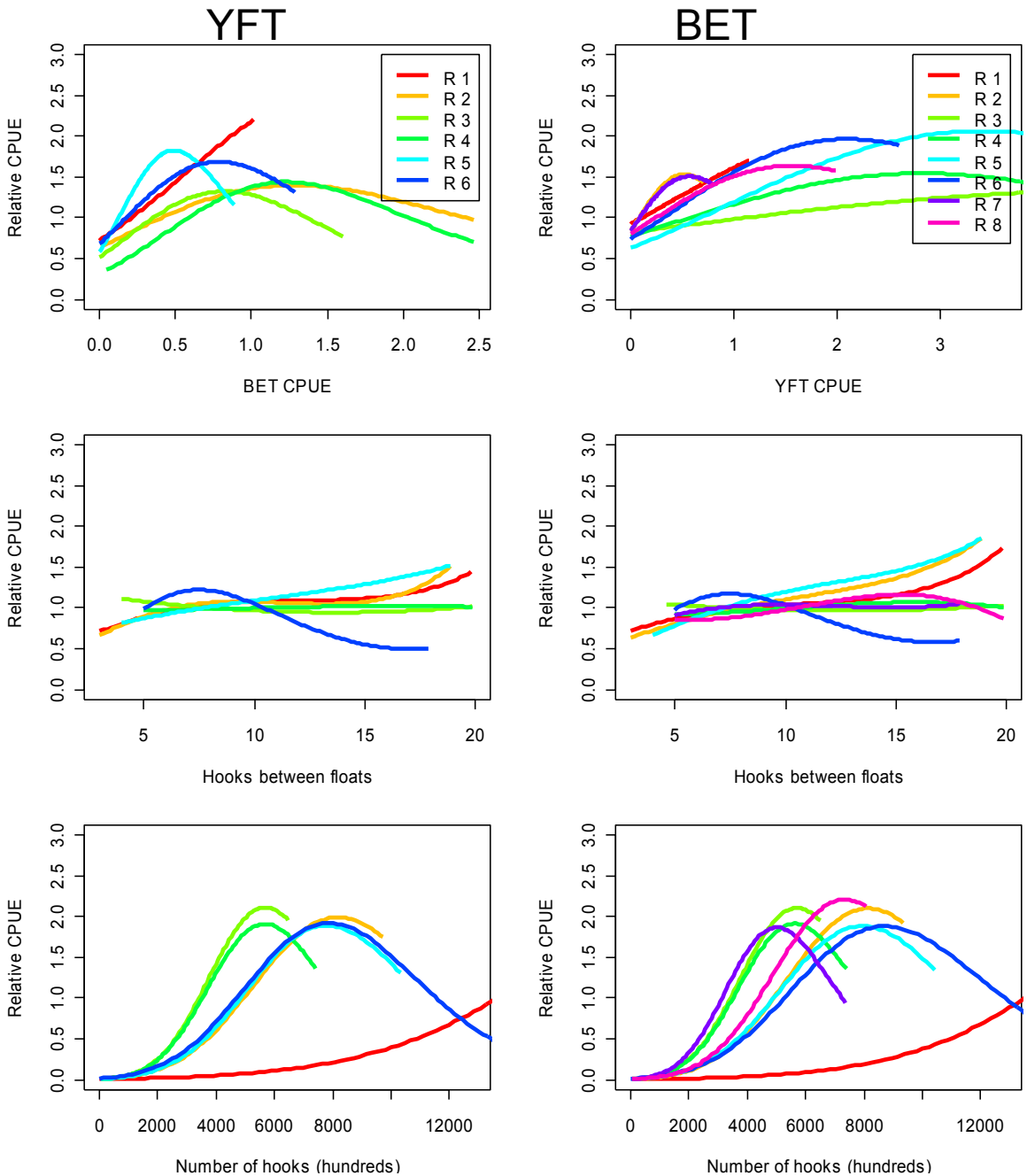
Low precision on indices at start of period and in regions 6 and 7.



Step 1

<u>Main explanatory variables.</u>

Year/qtr and area presented in later slides.

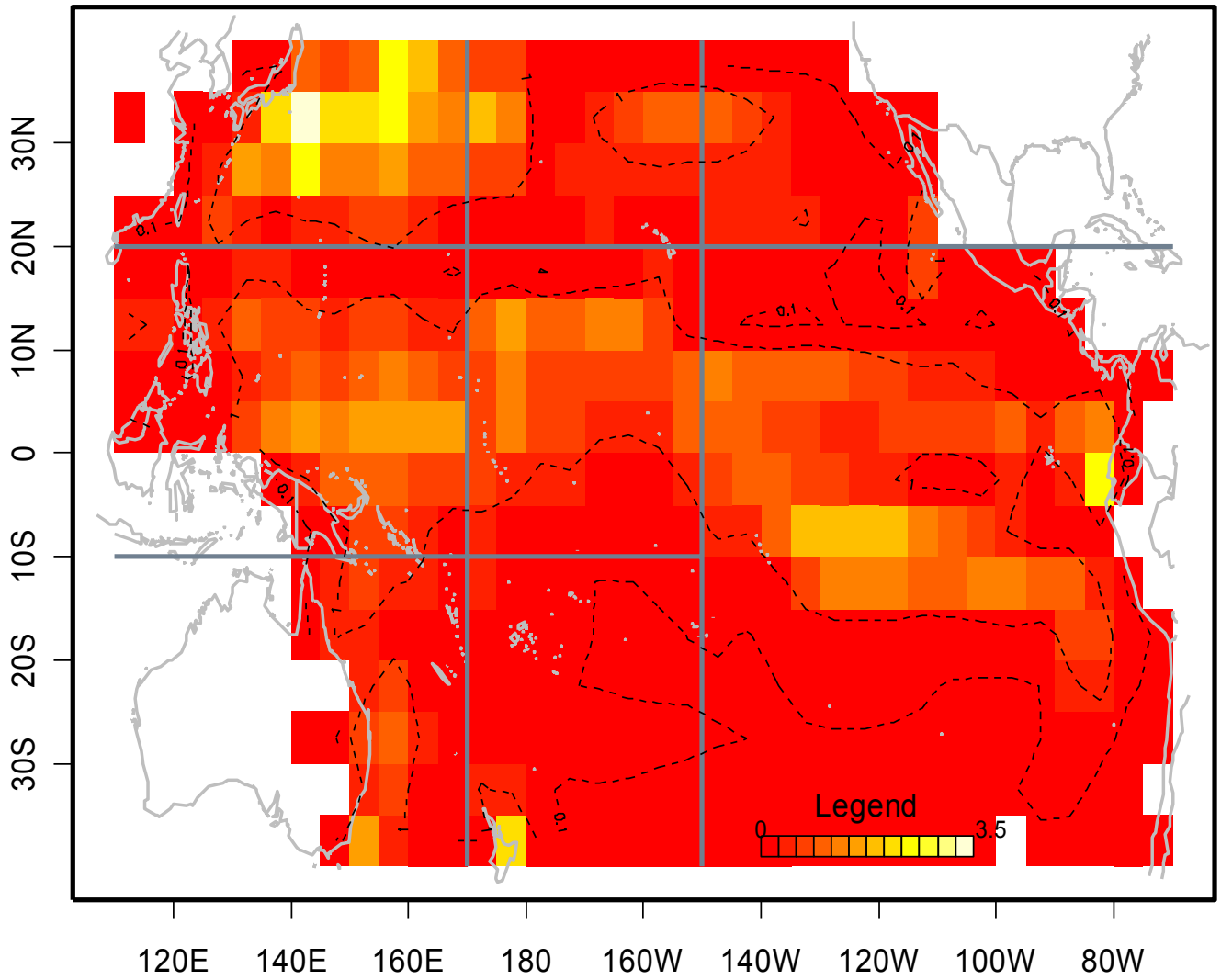


Step 2

Japanese LL effort 1960-1986 (relative)

Data included in calculation of area weighting factors.

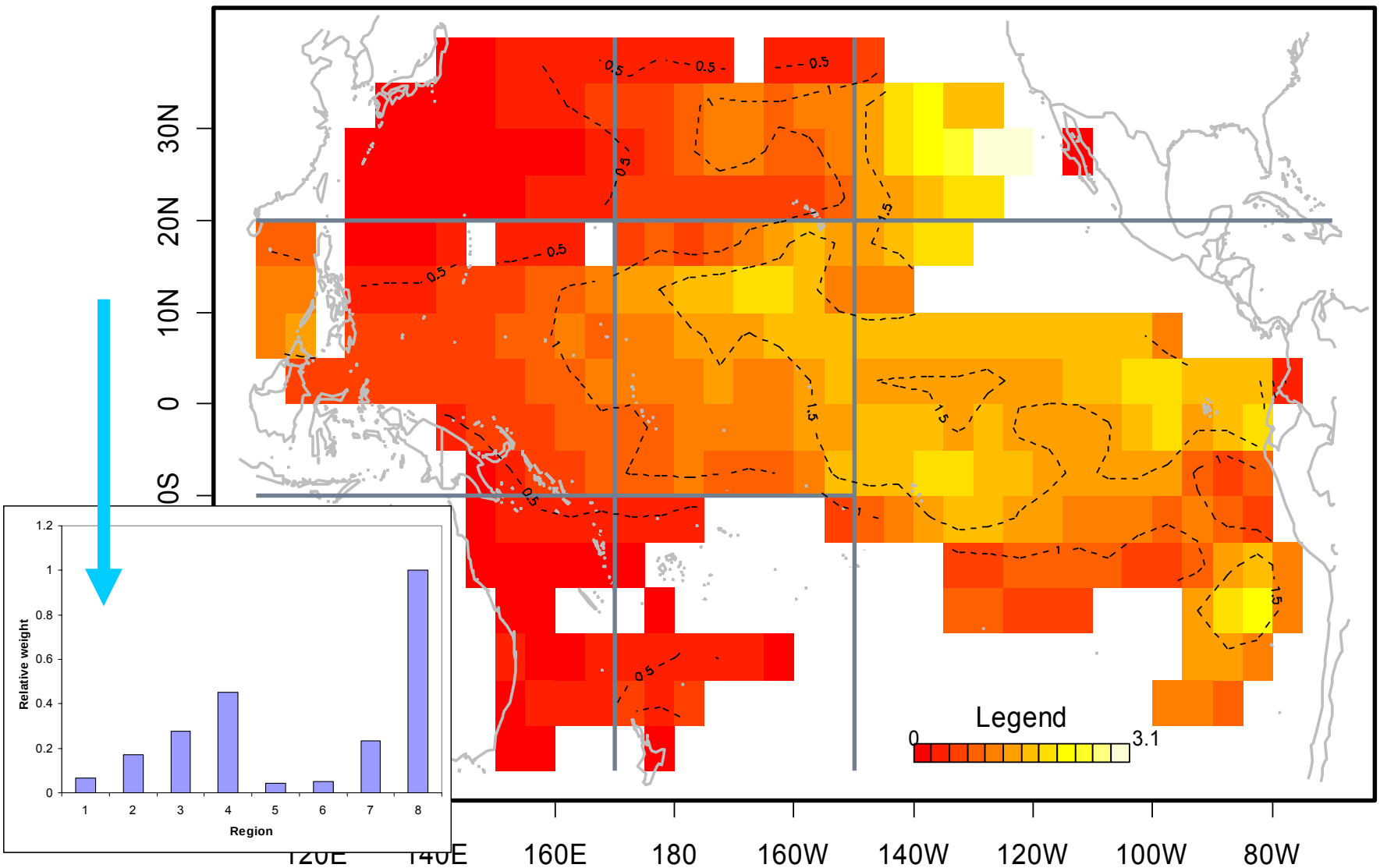
Cells with very low effort/catch excluded from analysis.



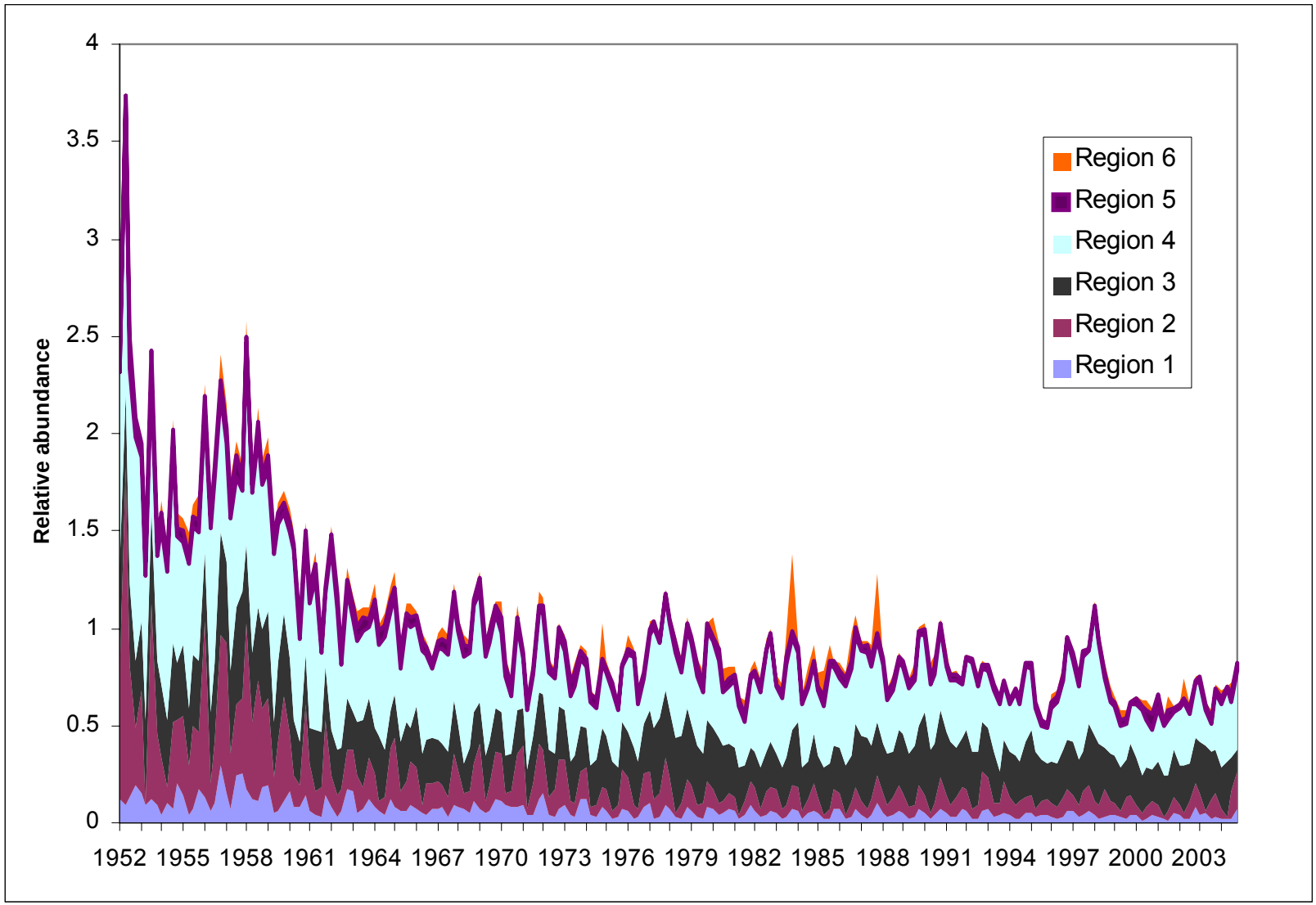
Step 2

Relative BET CPUE – from Pacific-wide GLM.

Region scaling factors.



Step 3 BET area weighted CPUE indices - WCPO

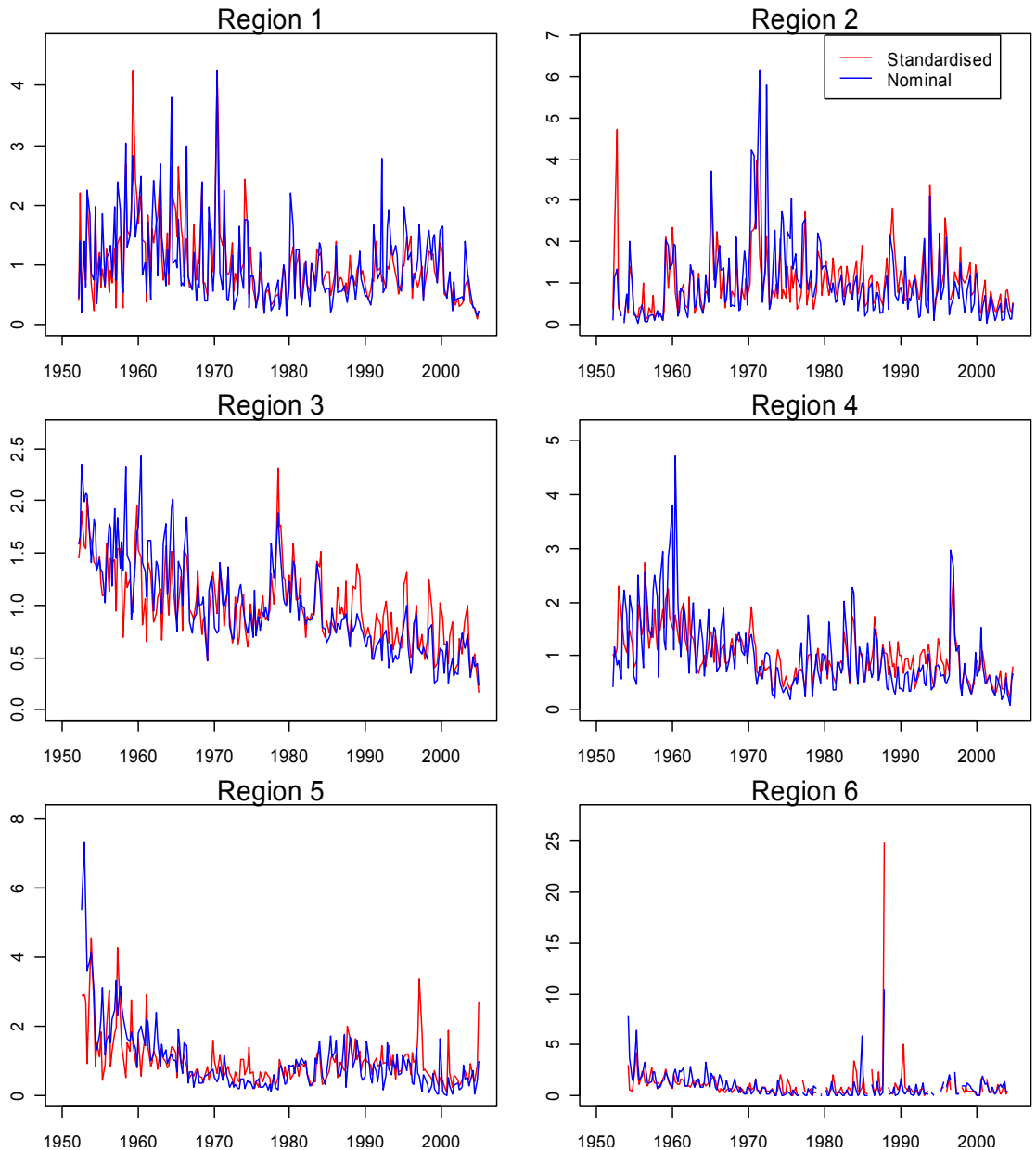


Step 1

YFT GLM indices

Generally comparable to nominal CPUE, although more optimistic in the more recent period, esp. region 3.

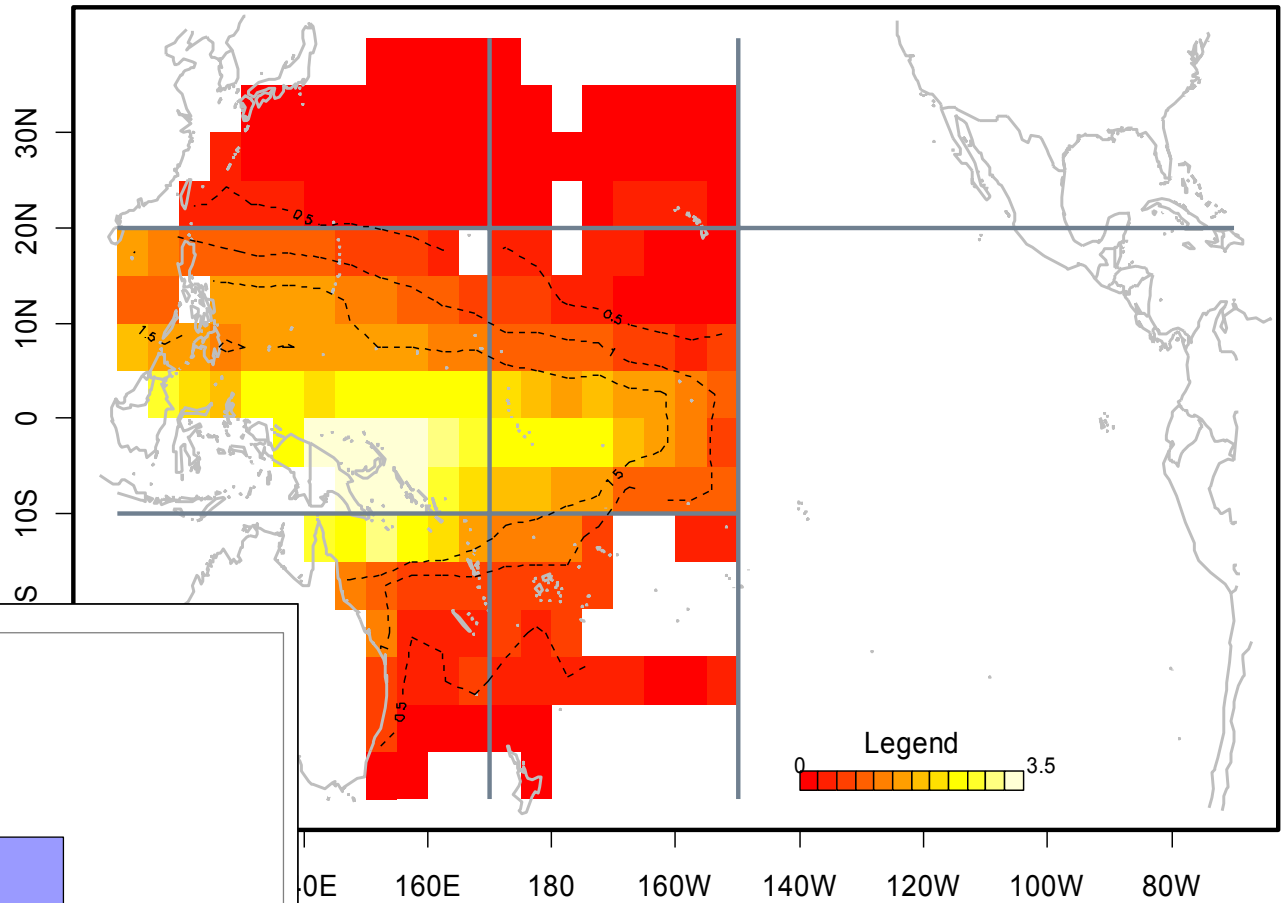
Low precision on indices from regions 1, 2, and 6 (later).

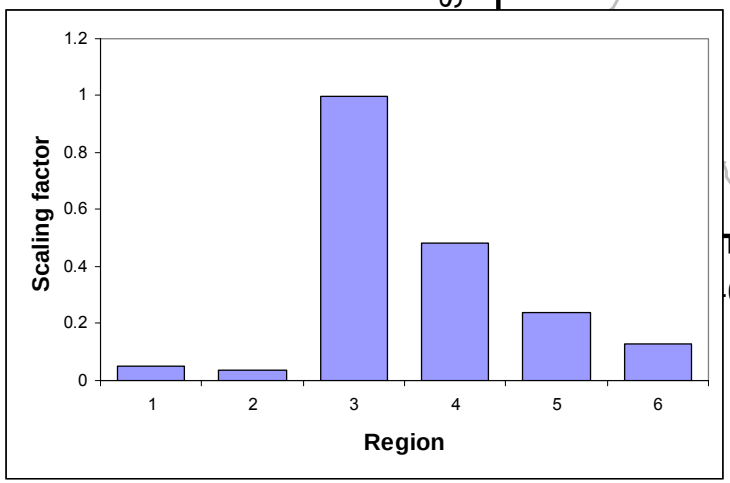


Step 2

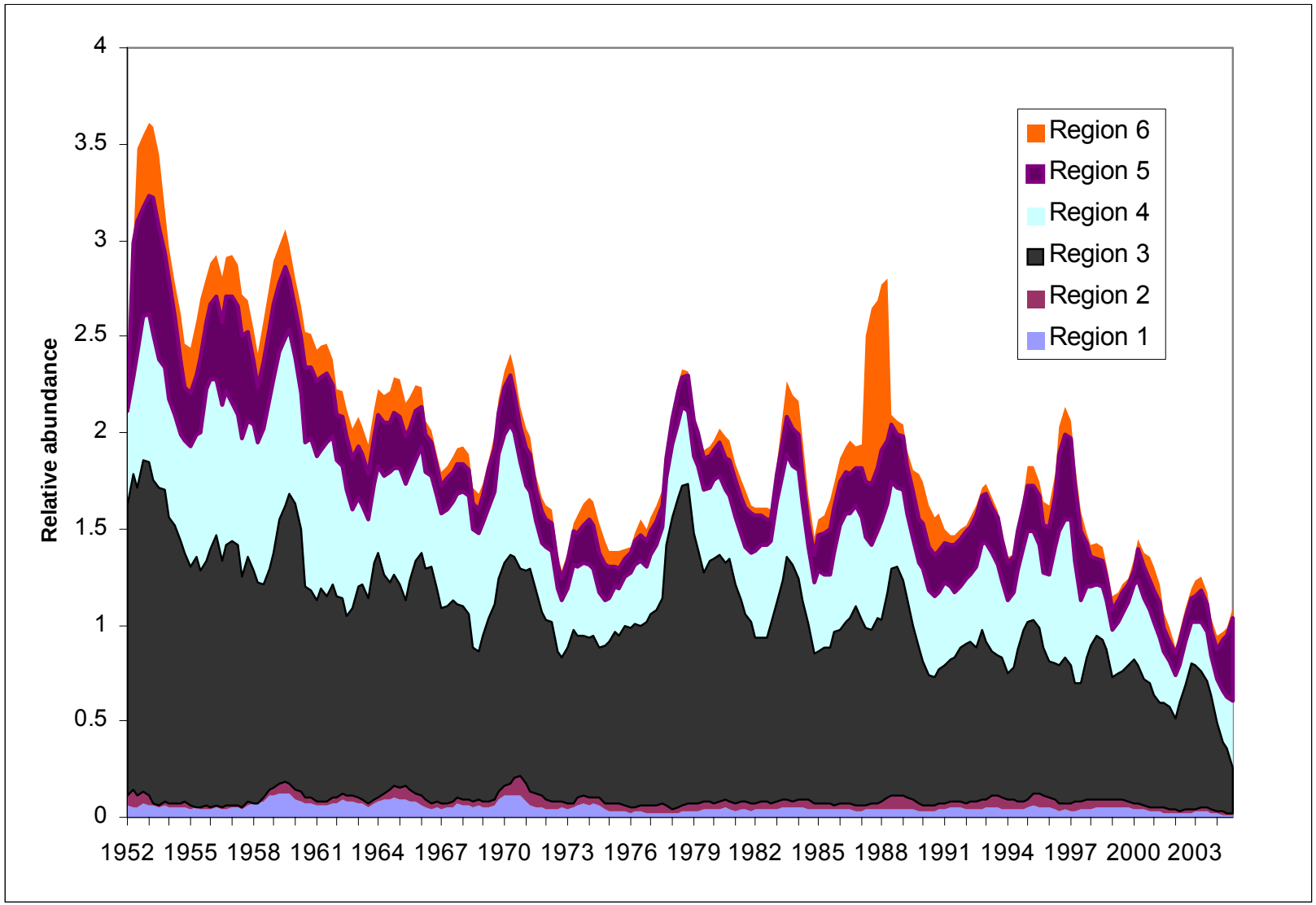
Relative YFT CPUE – from WCPO GLM.

Region scaling factors.



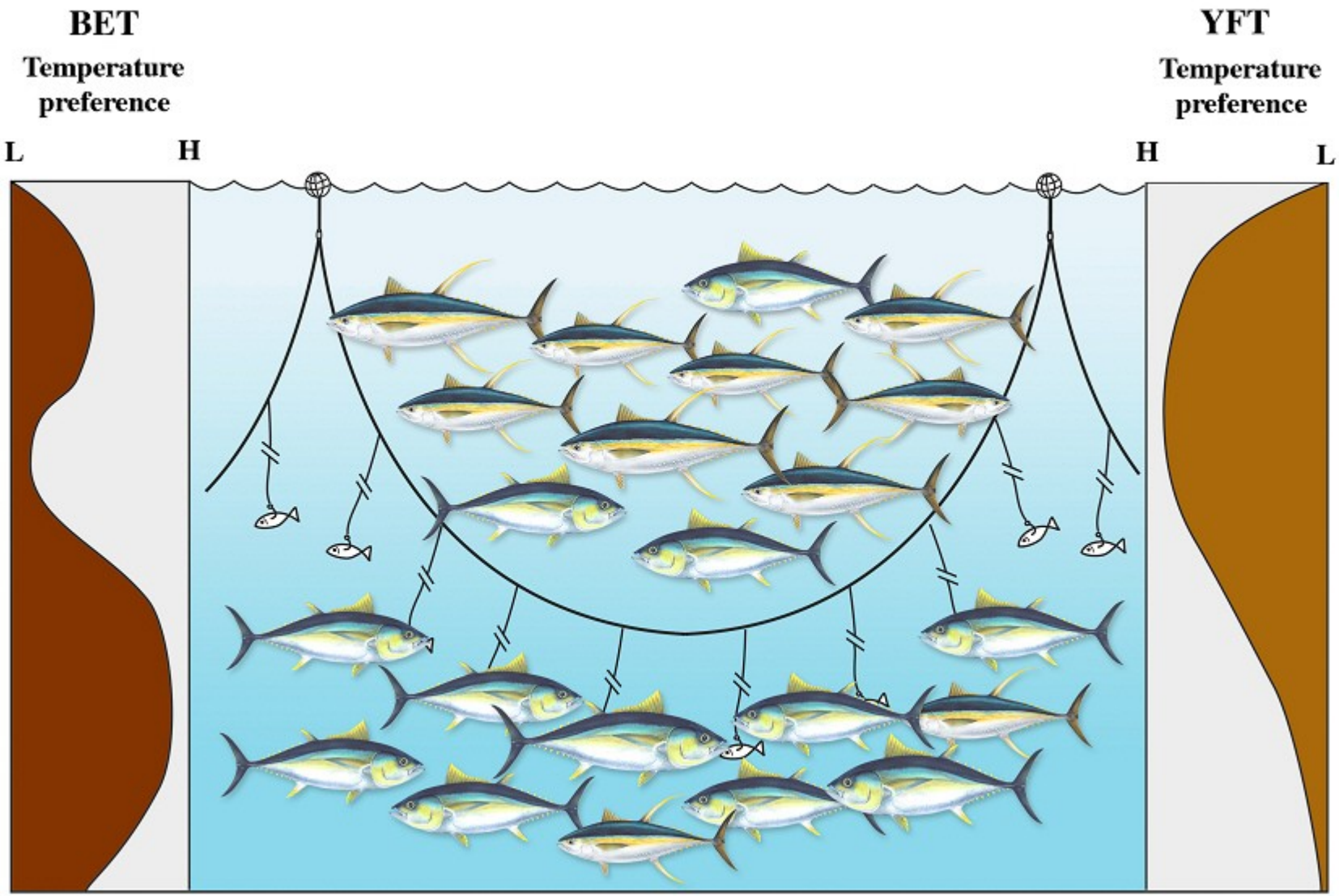


Step 3 YFT area weighted CPUE indices - WCPO



Statistical HBS indices

- Development of the HBS and statHBS approaches to standardise JP LL CPUE.
- Assumed (HBS) or estimated (statHBS) species habitat preferences.
- Habitat related to temperature and O_2.
- statHBS 2004 (Bigelow et al 2004) regional indices – different preferences for each region. Base-case index 2004.
- Current analysis – Pacific-wide habitat preferences + area effects. Regional weighting factors.


BET
Temperature preference
L
H
YFT
Temperature preference
H
L

statHBS Indices

Step 1. Pacific-wide statHBS, 1975-2004.

Data 5*5, month, HBF, 1975 onwards.

Model region*yr/qtr, lat*long, temp at depth, O_2 at depth.

-> Lat*long coefs, habitat preferences 1, 2.

Step 2. Pacific-wide statHBS, 1952-2004.

Fix Lat*long coefs, habitat preferences 1, 2.

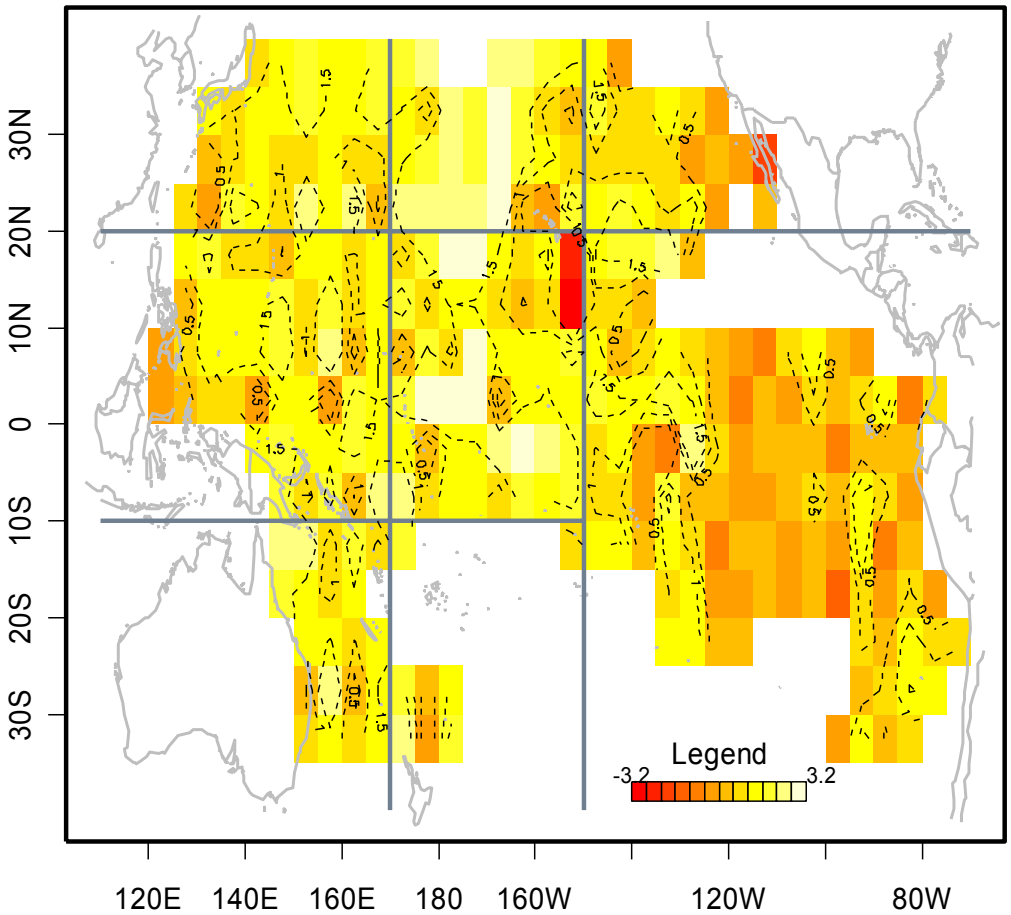
Estimate region*yr/qtr coefficients.

Step 3. Final Index

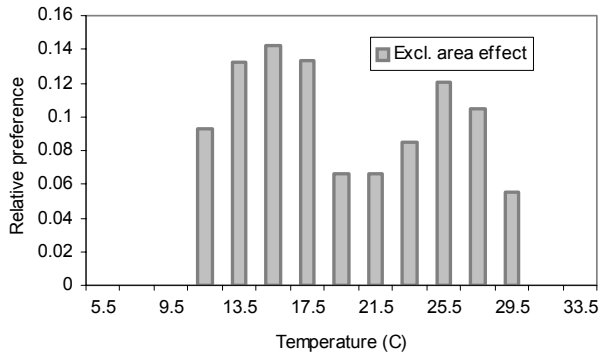
region*yr/qtr_R scaled by sum(lat*$long_R$).

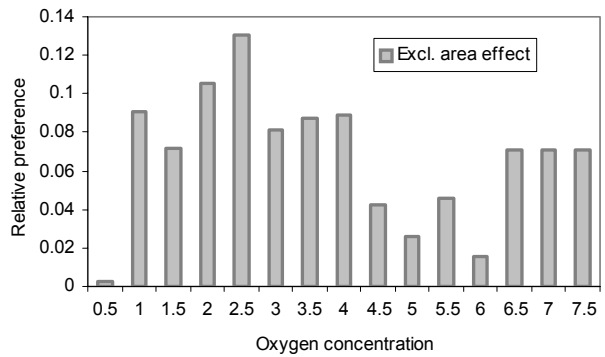
BET statHBS model, excluding area effect

Model residuals – no area effect



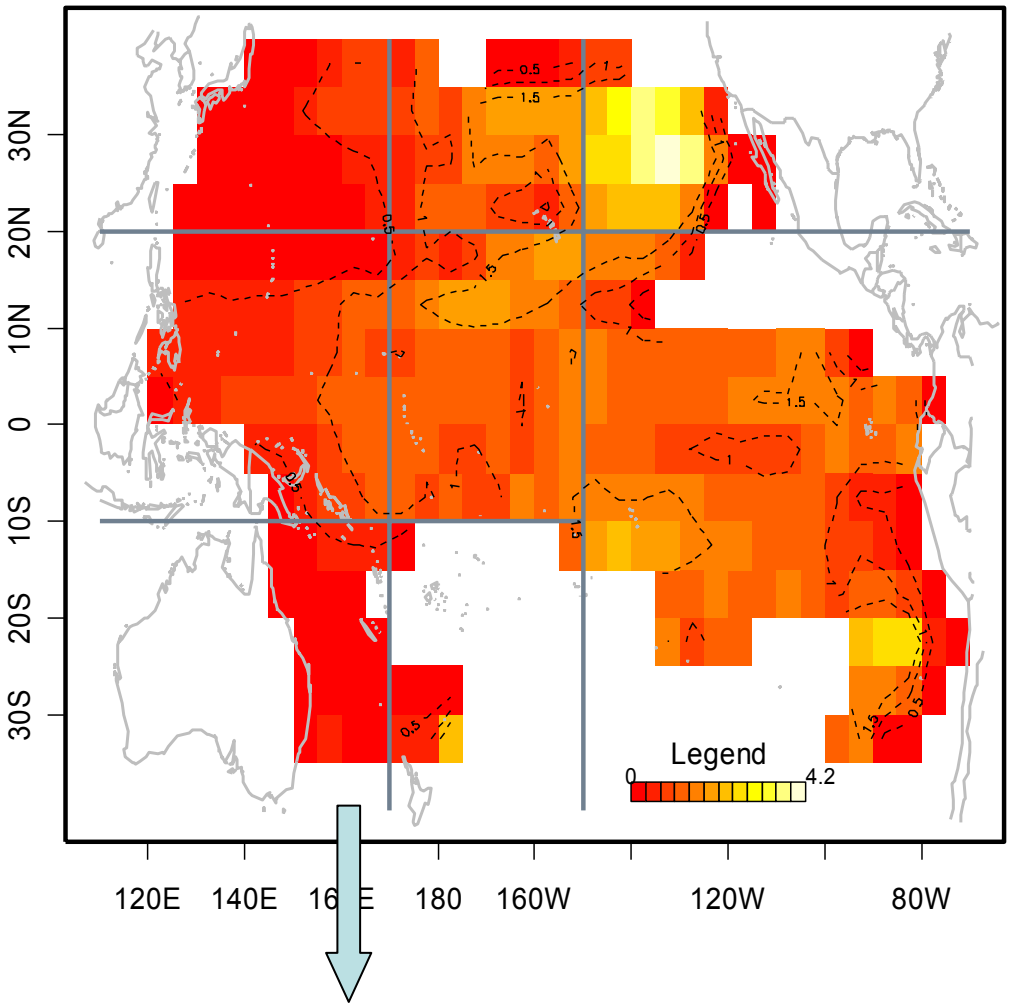
Habitat preferences





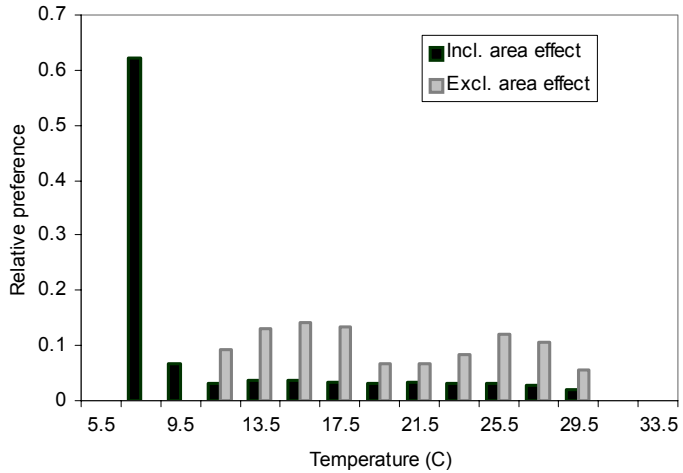
BET statHBS model, including area effect

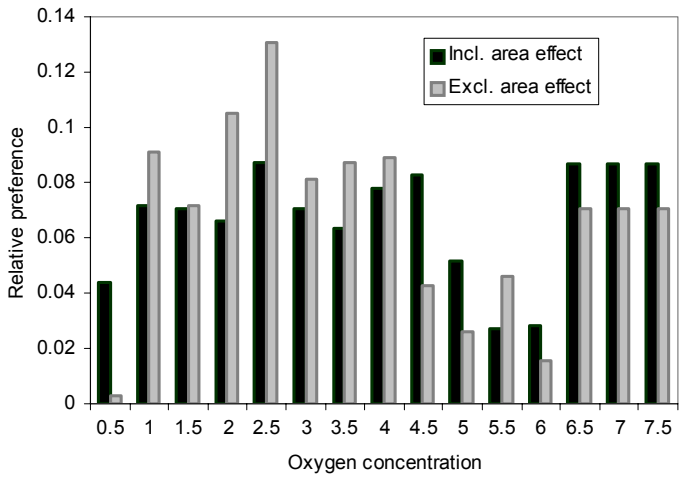
Lat*long coefficients



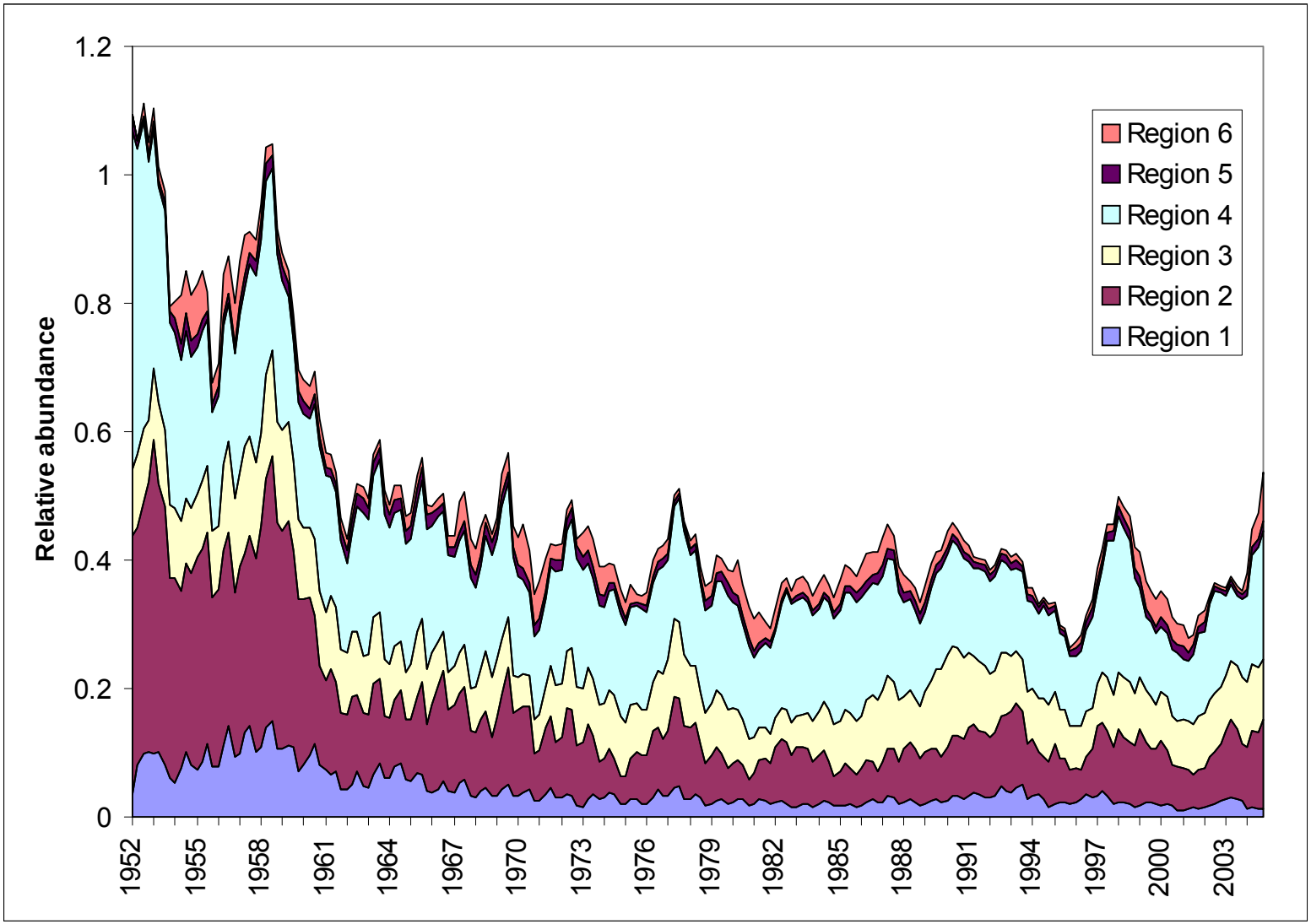
Regional scaling factors

Habitat preferences





Year/quarter$_R$ indices * scaling factor$_R$ → Area-weighted indices

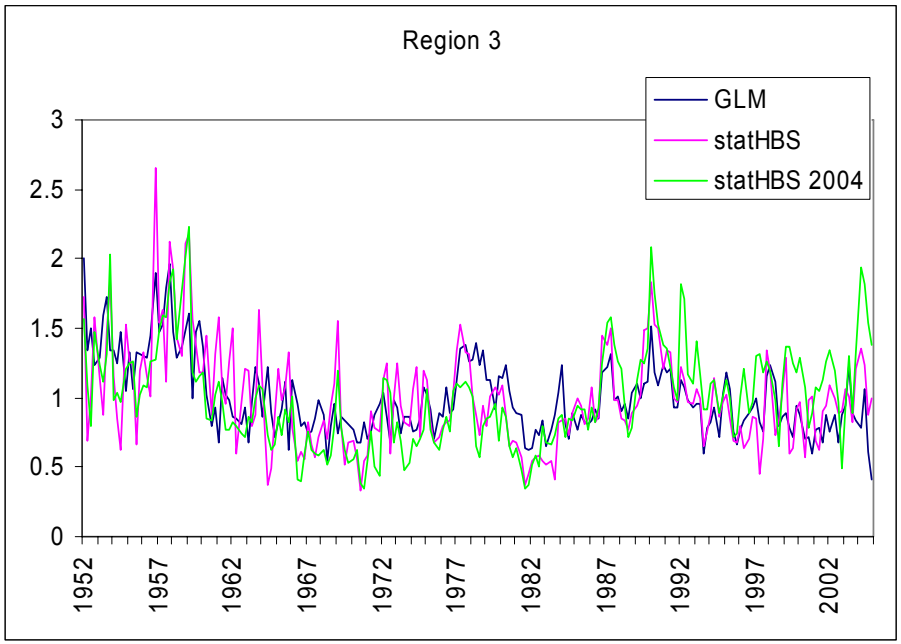


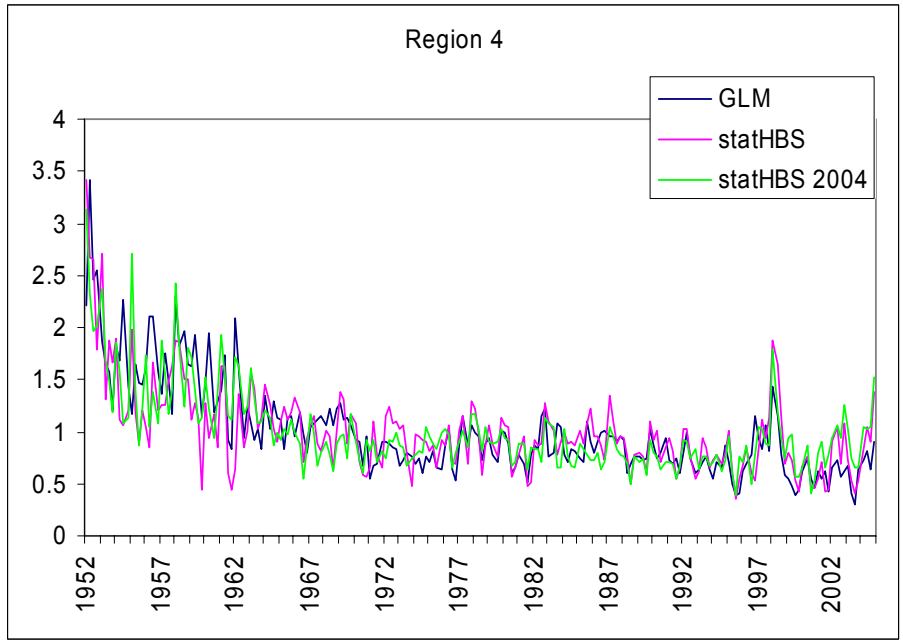
GLM cf statHBS - BET

Bigeye indices – main regions

statHBS (2005) approximates GLM indices.

statHBS (2005) more pessimistic than statHBS (2004) for last decade.



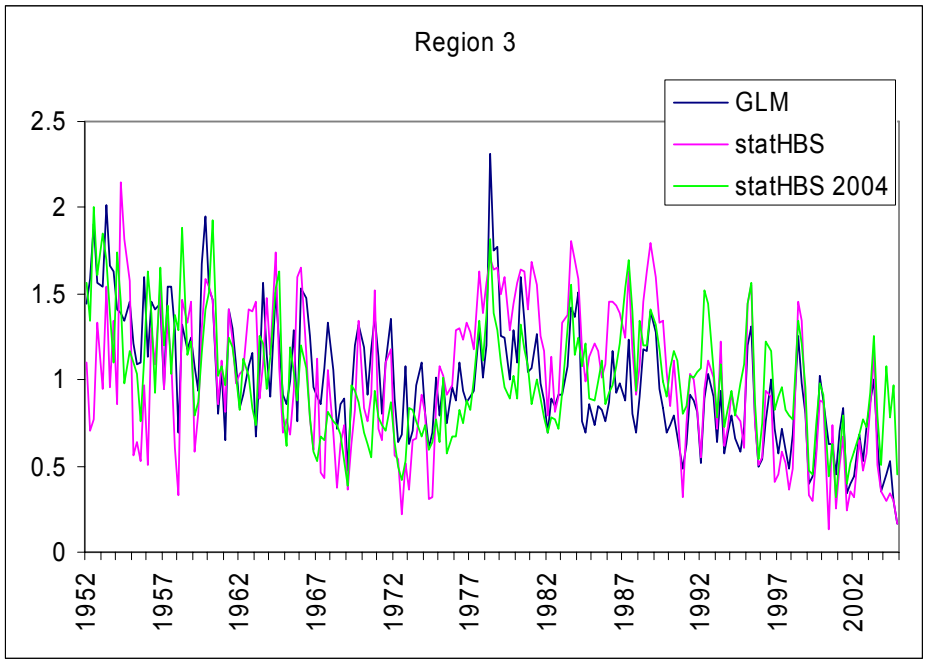


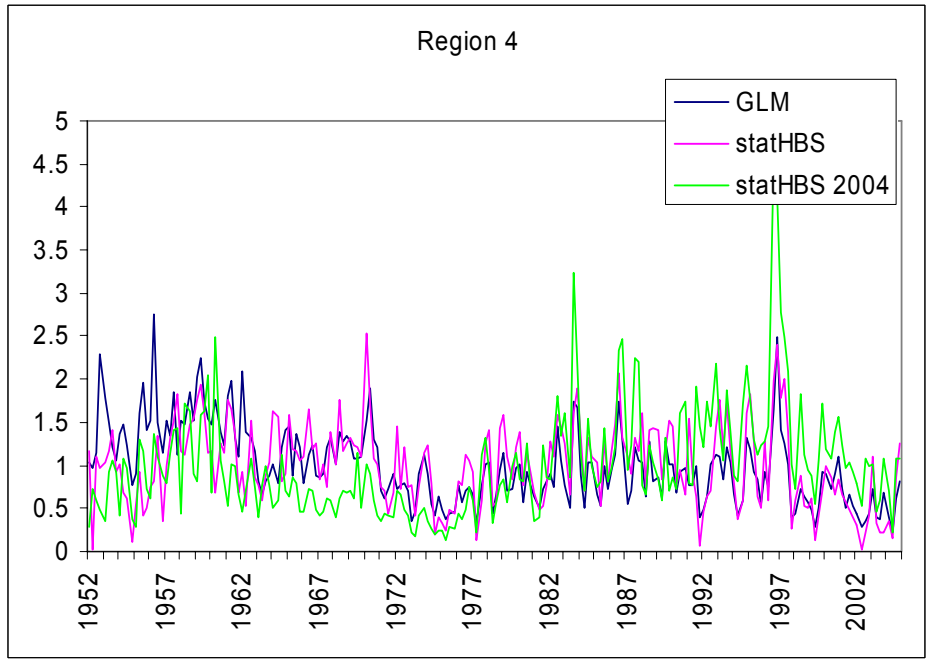
GLM cf statHBS- YFT

Yellowfin indices – main regions

statHBS (2005) approximates GLM indices.

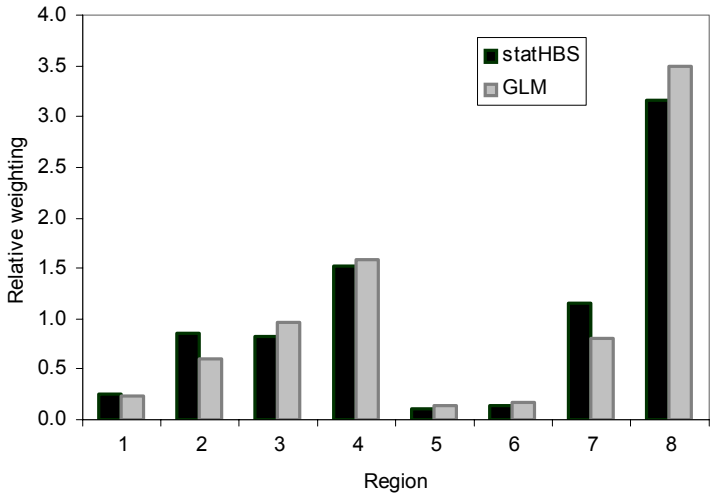
statHBS (2005) more pessimistic than statHBS (2004) for last decade.



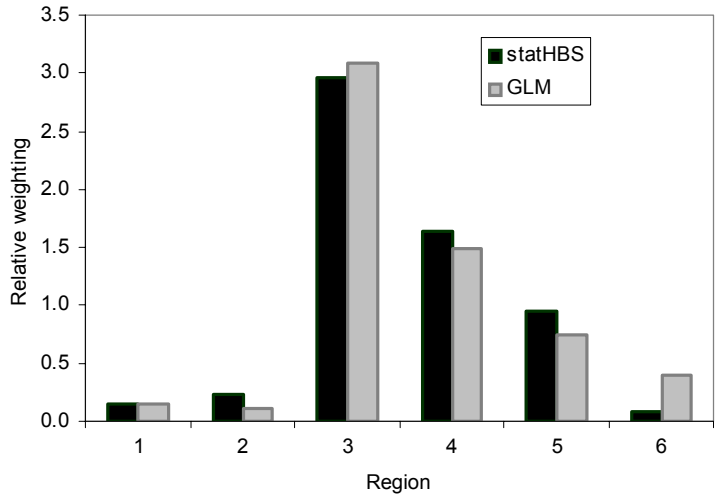


GLM cf statHBS - region scaling

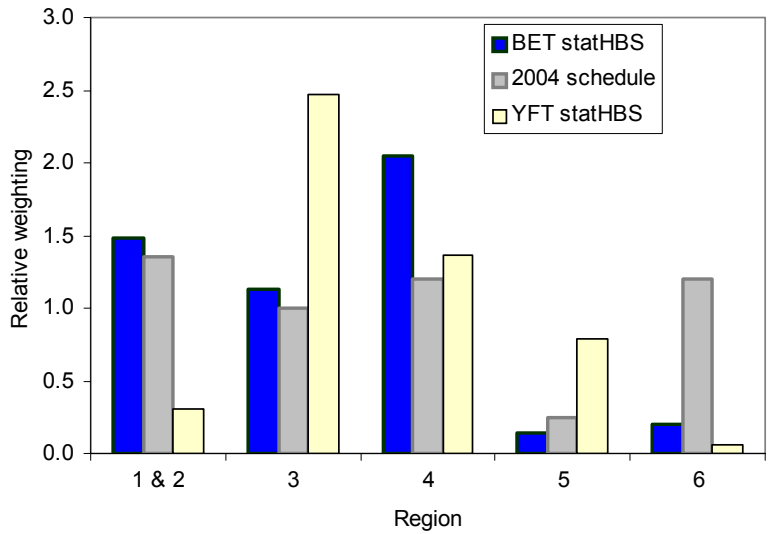
Bigeye



Yellowfin



How does this relate to the scaling used in the 2004 BET and YFT assessments?



Summary and conclusions

- statHBS performs poorly, without the inclusion of area (lat*long) effects.
- Investigate different parameterisation of the habitat preferences – ongoing work.
- GLM – more established methodology, less dependent on initial assumptions.
- GLM – better fit to other data sources in MFCL models – more consistent.
- GLM indices considered as “base-case” for BET and YFT assessments (2005).