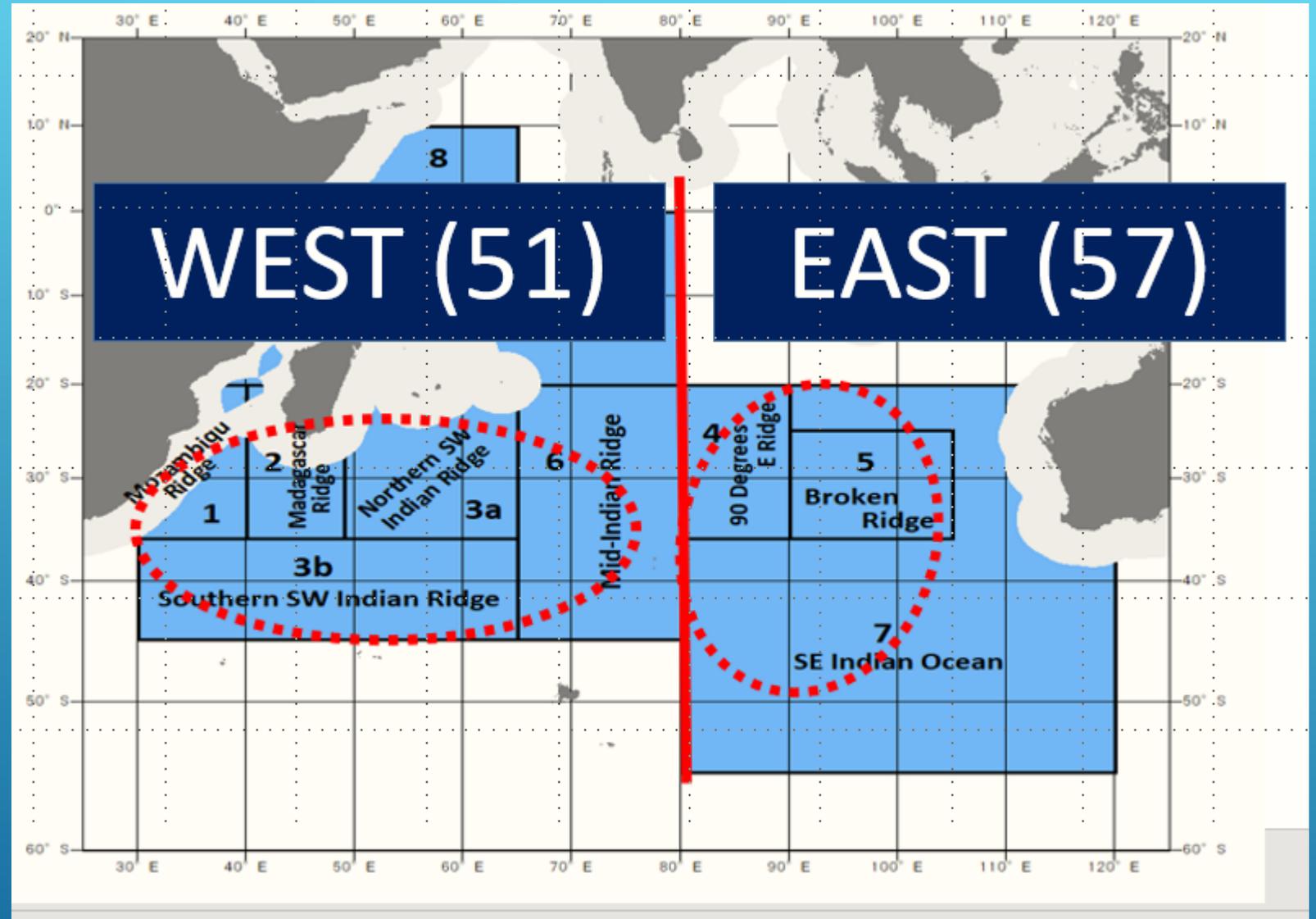


Standardised CPUE series for the Alfonsino resource in the SIOFA area of the Indian Ocean

Anabela Brandão and Doug S. Butterworth

MARAM (Marine Resource Assessment and Management Group)
Department of Mathematics and Applied Mathematics
University of Cape Town, Rondebosch 7701, South Africa

Management units:
(West and East)
together with SIOFA
statistical areas
and FAO fisheries
statistical areas
(F51 and F57)



Note: Figure extracted from
Terms of Reference document

Data

➤ Two management unit areas: West and East

➤ Three fleet series:

Series	Gear	CPUE unit
S1	trawl	catch per tow
S2	mid-water trawl	catch per hour trawled
S3	mid-water trawl (bottom trawl and trawl data too few)	catch per hour trawled

➤ % zeros:

Series	West	East
S1	31.2	0.74
S2	3.7	0.71
S3	34.1	5.21

Basic analysis approach

- **Basic bifurcation depending on proportion of zero catches**
 - For small proportions, the Negative Binomial was used, with the Quasi-Poisson applied to check sensitivity
 - For large proportions, the Hurdle and Zero-inflated Negative Binomial were used, with AIC indicating a preference for the former
- **Covariate selection was determined using AIC**

Note:

- Data were pre-checked and outliers excluded
- No information on targeting was available

GLMs and factors used

Series	Model	Factors
S1 (West)	Hurdle-NB or ZINB	year, month, vessel, subarea
S1 (East)	Negative Binomial	year, month, vessel
S2 (West)	Negative Binomial	year, season, vessel, depth200
S2 (East)	Negative Binomial	year, month
S3 (West)	Hurdle-NB or ZINB	year, season, subarea, depth100
S3 (East)	Negative Binomial	year, season, vessel, depth200

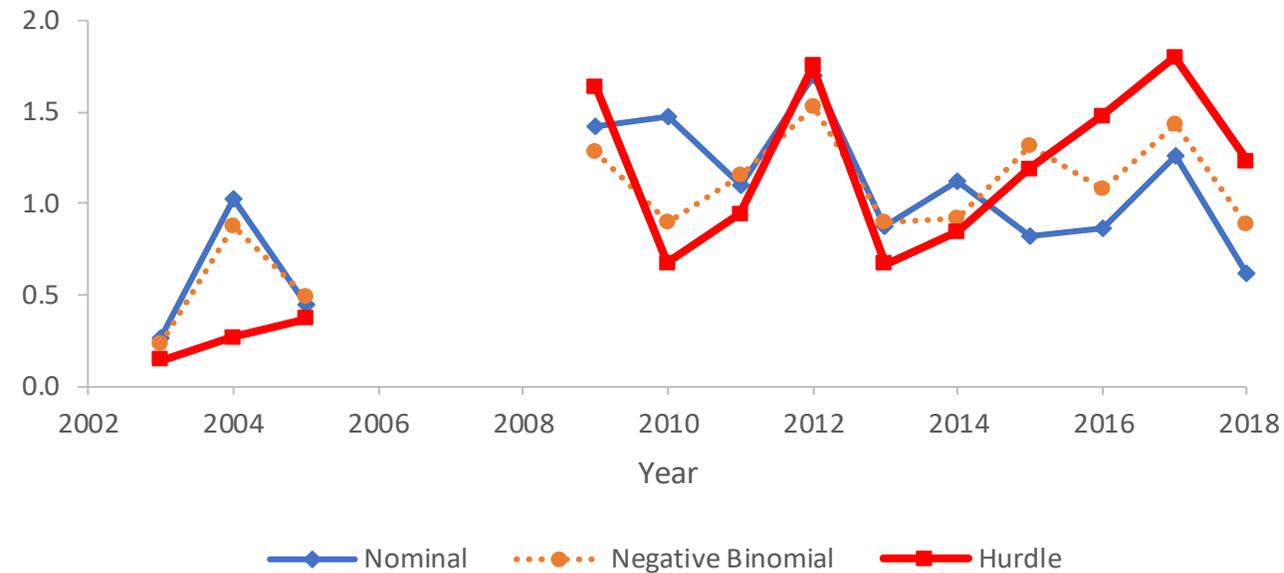
Notes:

- Hurdle-NB or ZINB GLMs are compared with a NB GLM
NB=Negative binomial; ZINB = Zero-inflated Negative Binomial
- NB GLMs are compared with a Quasi-Poisson GLM
- **month** is a factor with 12 levels, while **season** is a factor in which months with similar characteristics have been grouped
- **depth100** and **depth200** are factors associated with 100m and 200m depth classes respectively

Sensitivities considered included

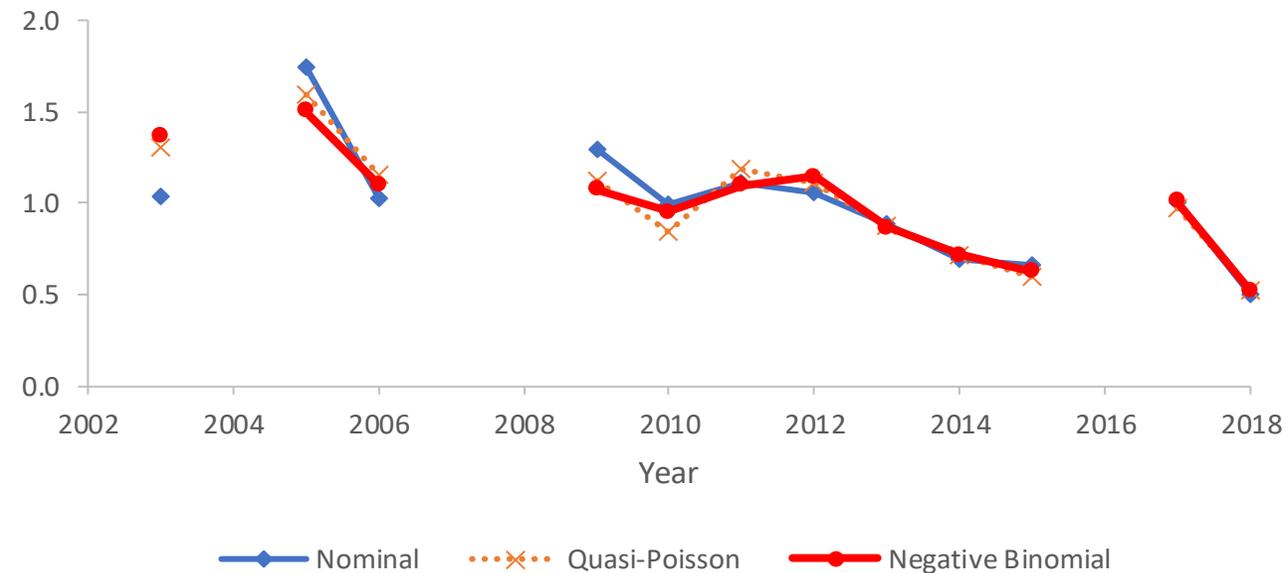
- Bycatch is considered to address the problem that there is little or no information as to which species was being targeted. The simple approach of omitting records for which the Alfonsino catch fell below a certain percentage of the total catch was adopted. The percentages investigated were 40, 50, 60 and 70%.
- Records for trawls of a very short duration (less than 0.17 hours) are omitted because some trawls are carried out opportunistically for a very short time. This was investigated for the S3 series only, which has data on a tow-by-tow basis so that short trawls are evident.
- Earlier years are omitted when their pattern seems rather different to that shown for later years, or if there is a large gap with no data between earlier and later periods.

CPUE for S1 West



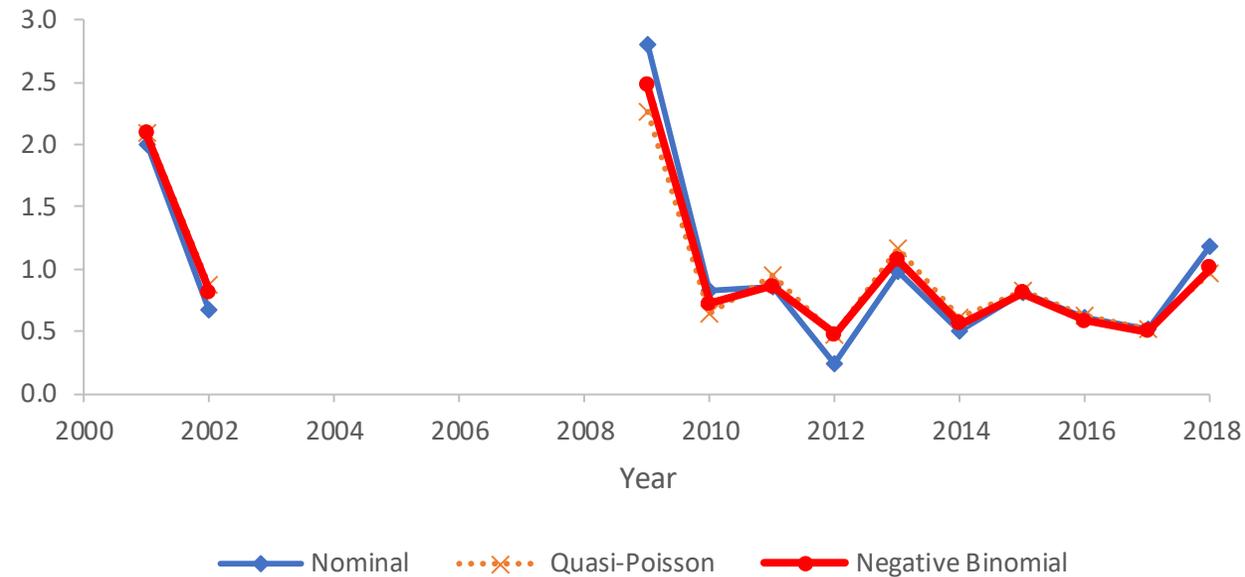
GLM-standardized CPUE values for S1 "West"

CPUE for S1 East



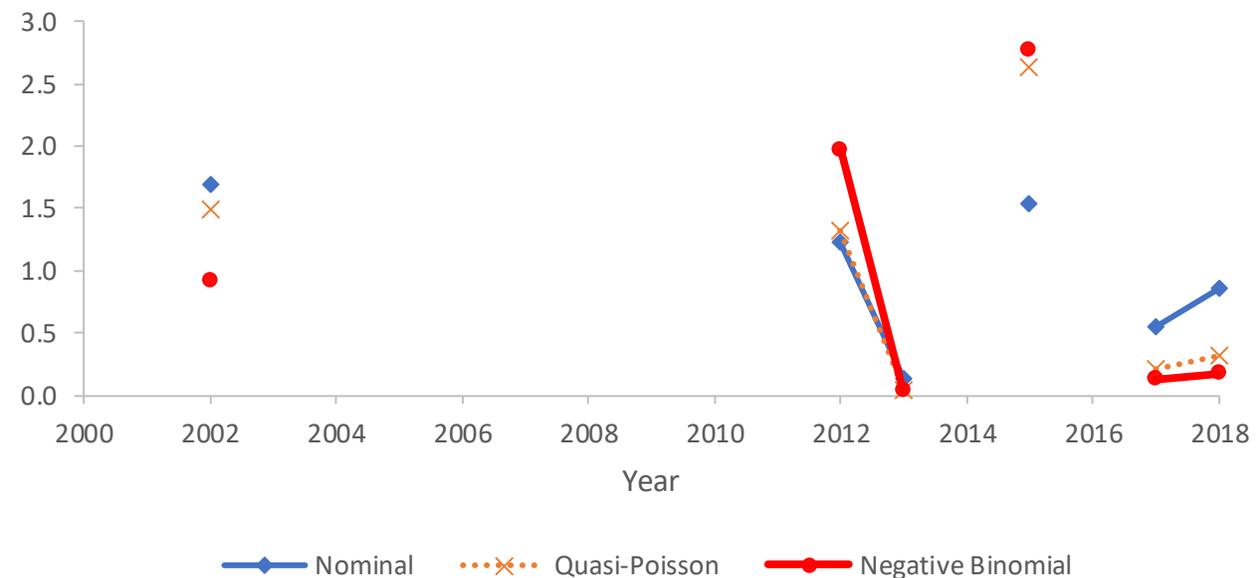
GLM-standardized CPUE values for S1 "East"

CPUE for S2 West



GLM-standardized CPUE values for S2 "West"

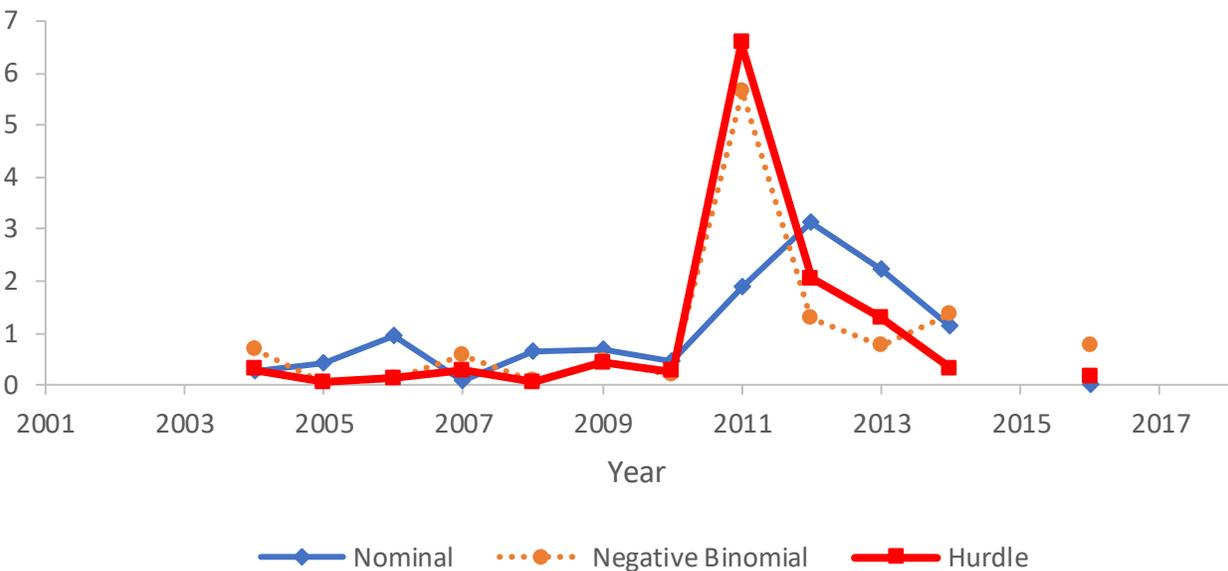
CPUE for S2 East



GLM-standardized CPUE values for S2 "East"

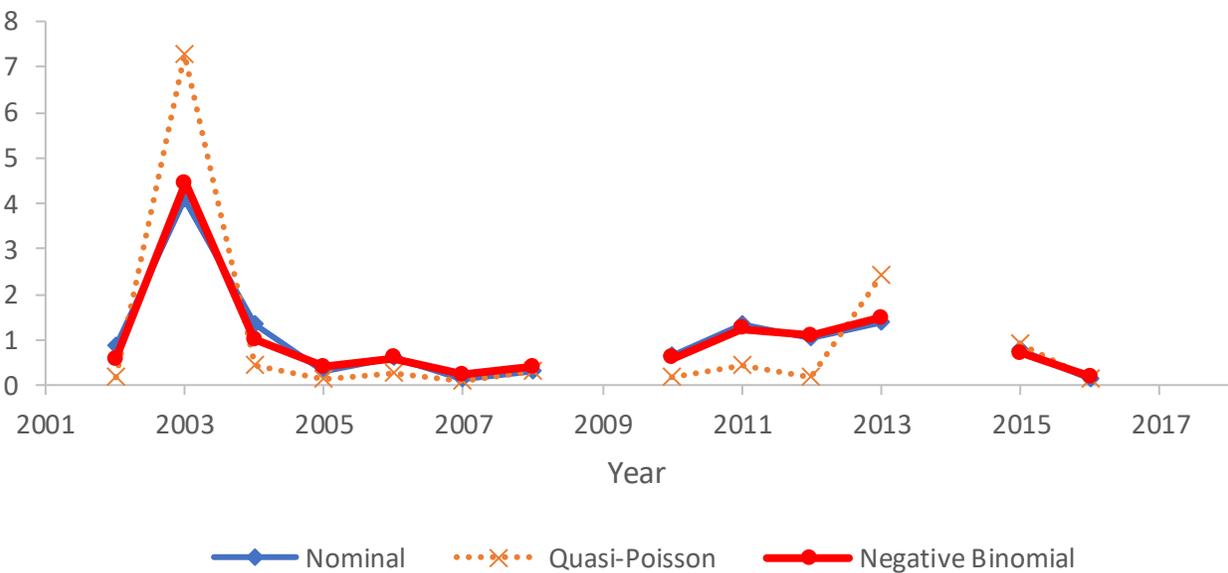
Not used for stock assessment given as data are few and uninformative

CPUE for S3 West



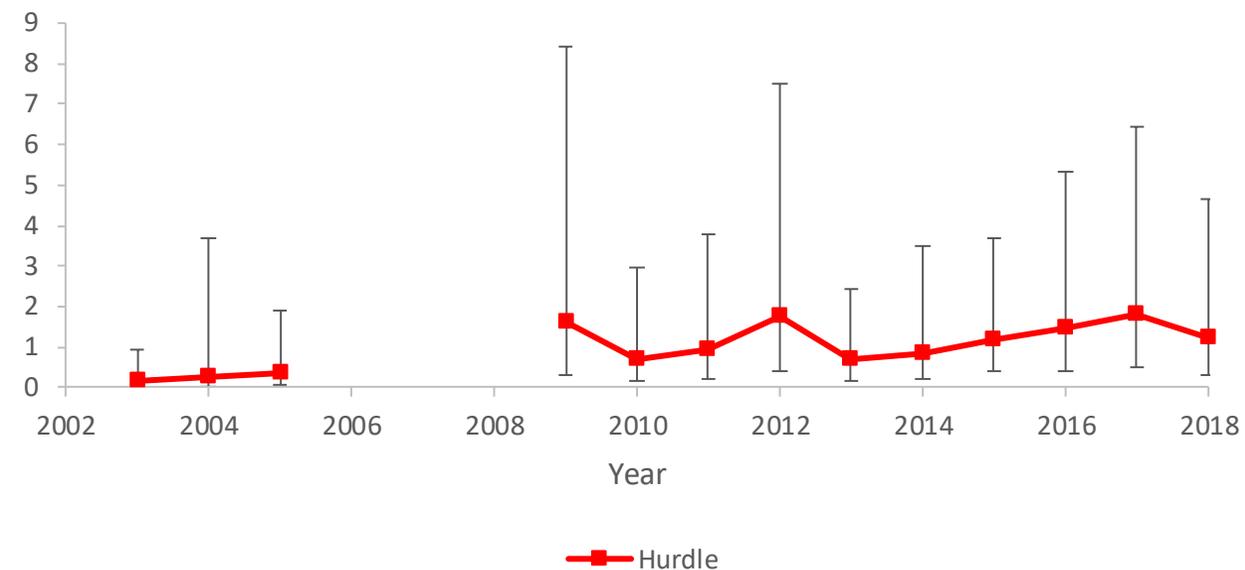
GLM-standardized CPUE values for S3 "West"

CPUE for S3 East



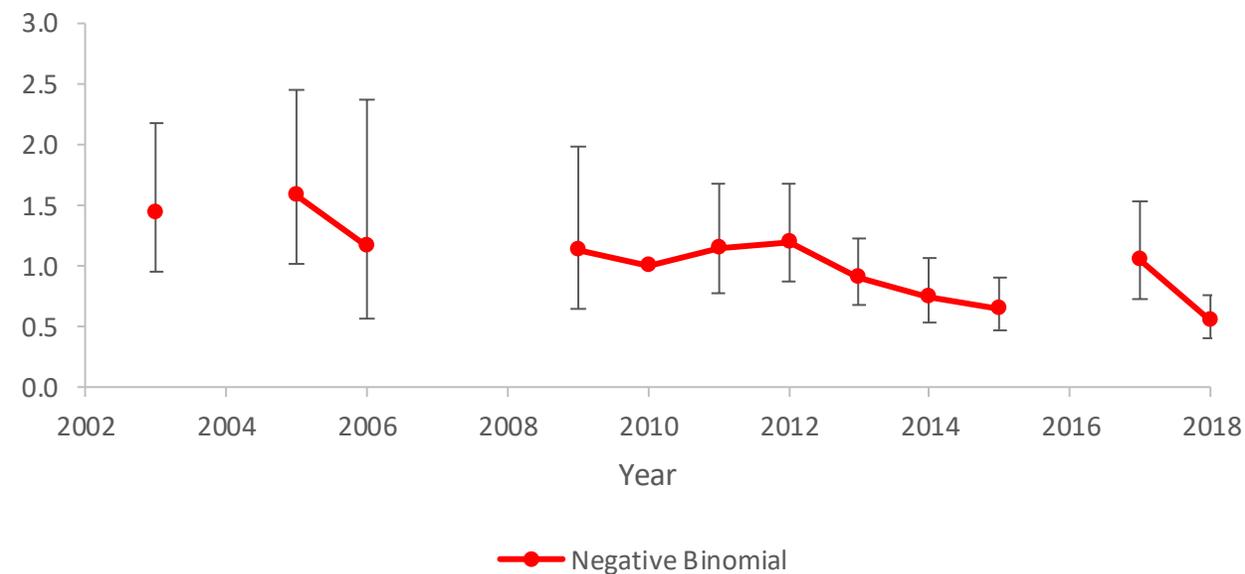
GLM-standardized CPUE values for S3 "East"

CPUE for S1 West



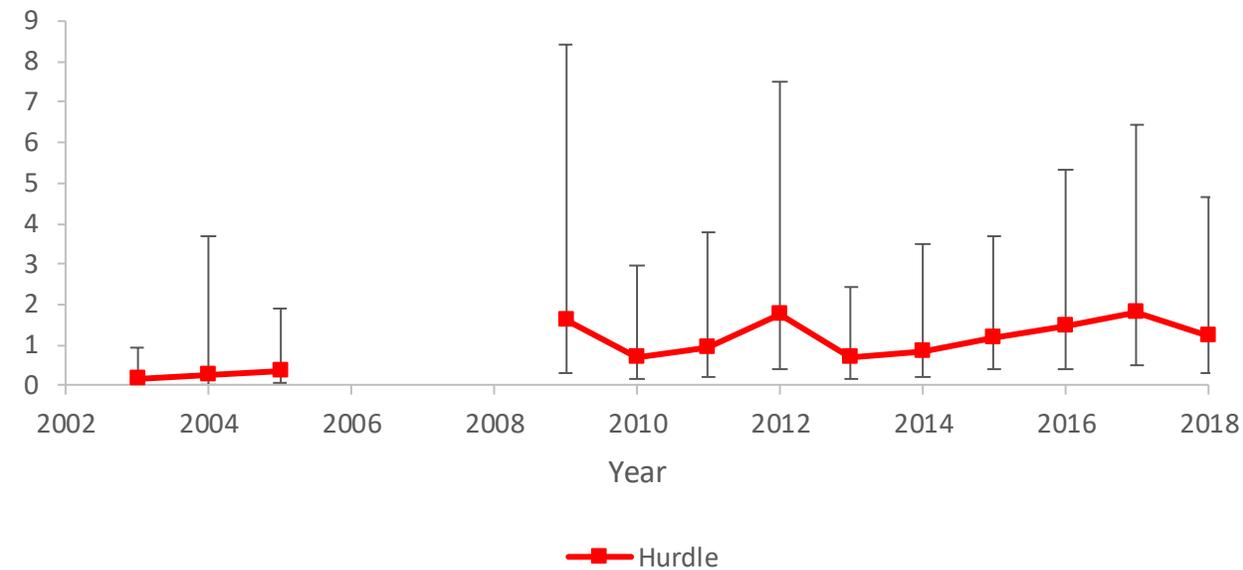
GLM-standardized CPUE values together with 95% confidence intervals for S1 "West"

CPUE for S1 East



GLM-standardized CPUE values together with 95% confidence intervals for S1 "East"

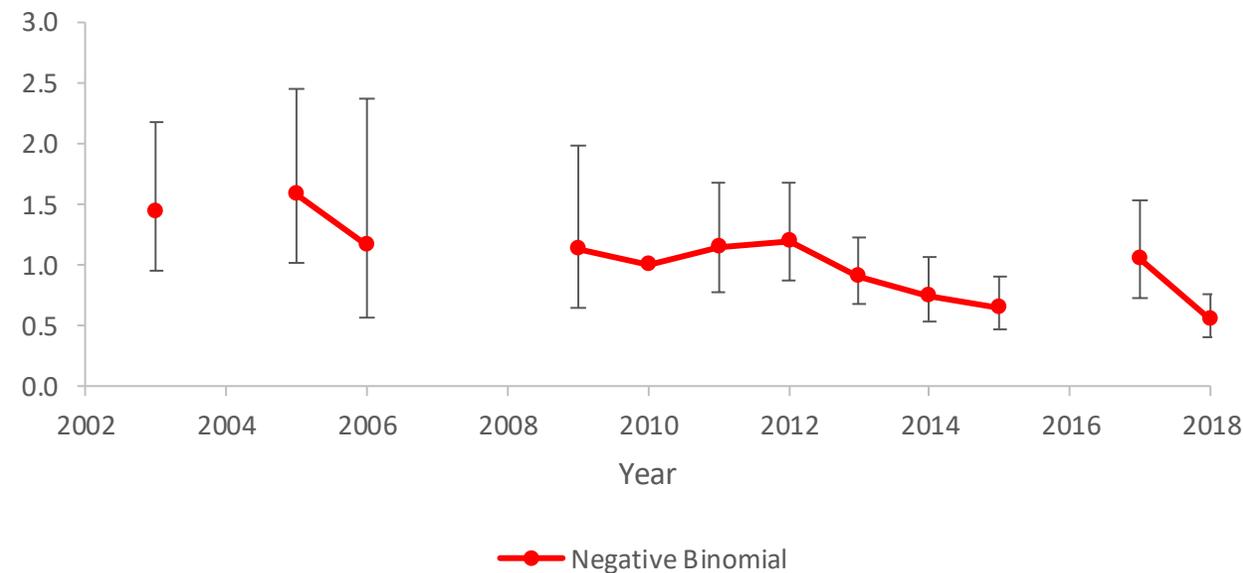
CPUE for S1 West



GLM-standardized CPUE values together with 95% confidence intervals for S1 "West"

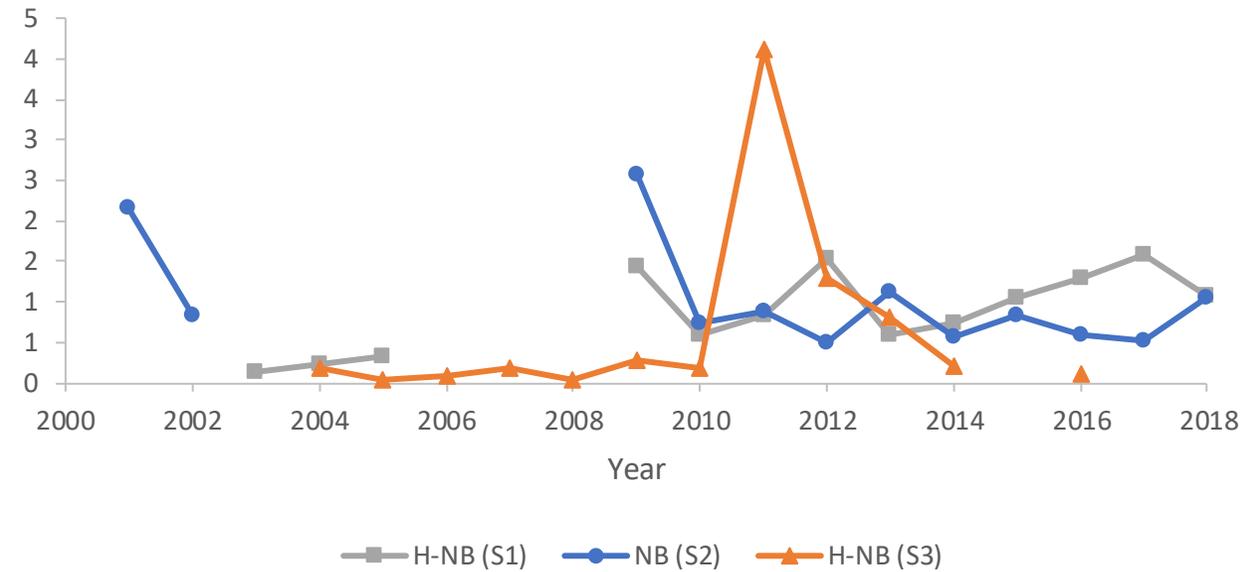
Note: The data are such that estimates have poor precision

CPUE for S1 East



GLM-standardized CPUE values together with 95% confidence intervals for S1 "East"

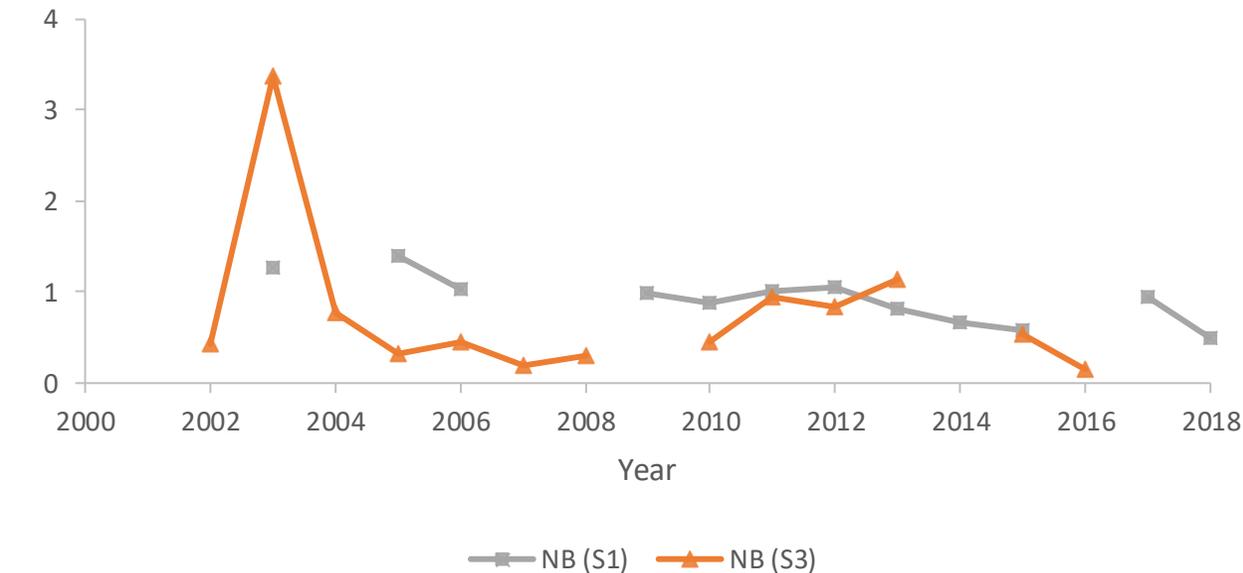
Base case CPUE for the West



GLM-standardised CPUE values for the “West” for each of the series

All series are normalised to the mean over years for which there are values for all the series being compared to make them more comparable

Base case CPUE for the East

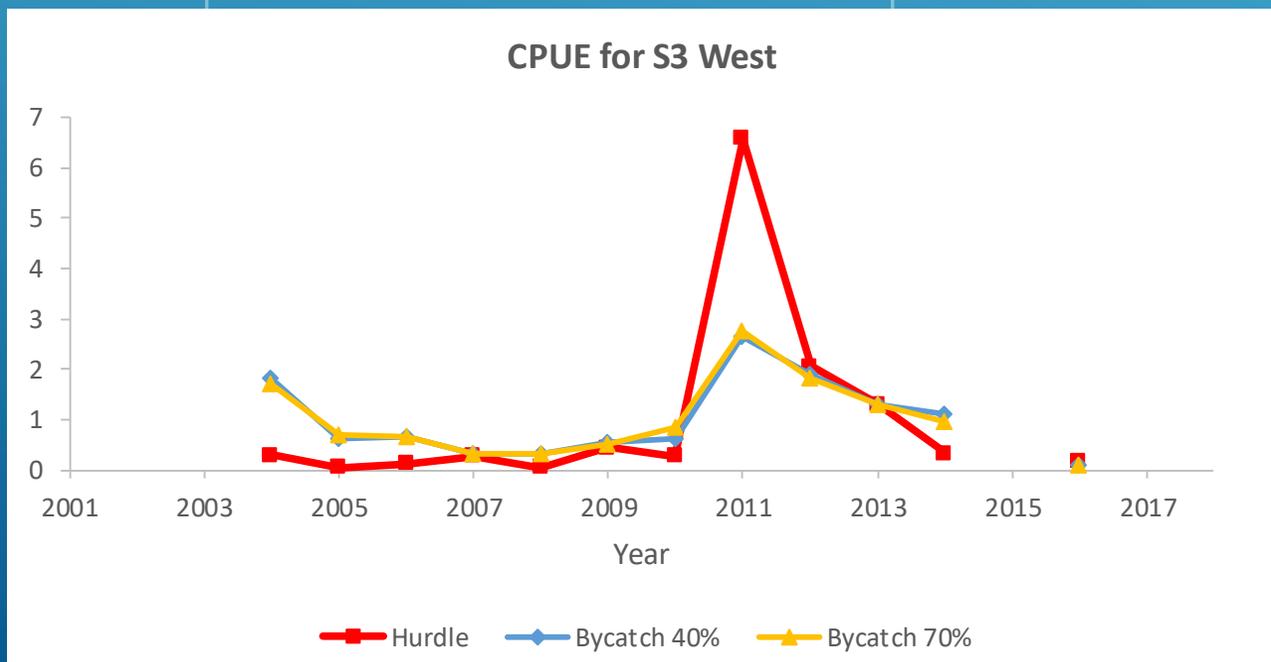
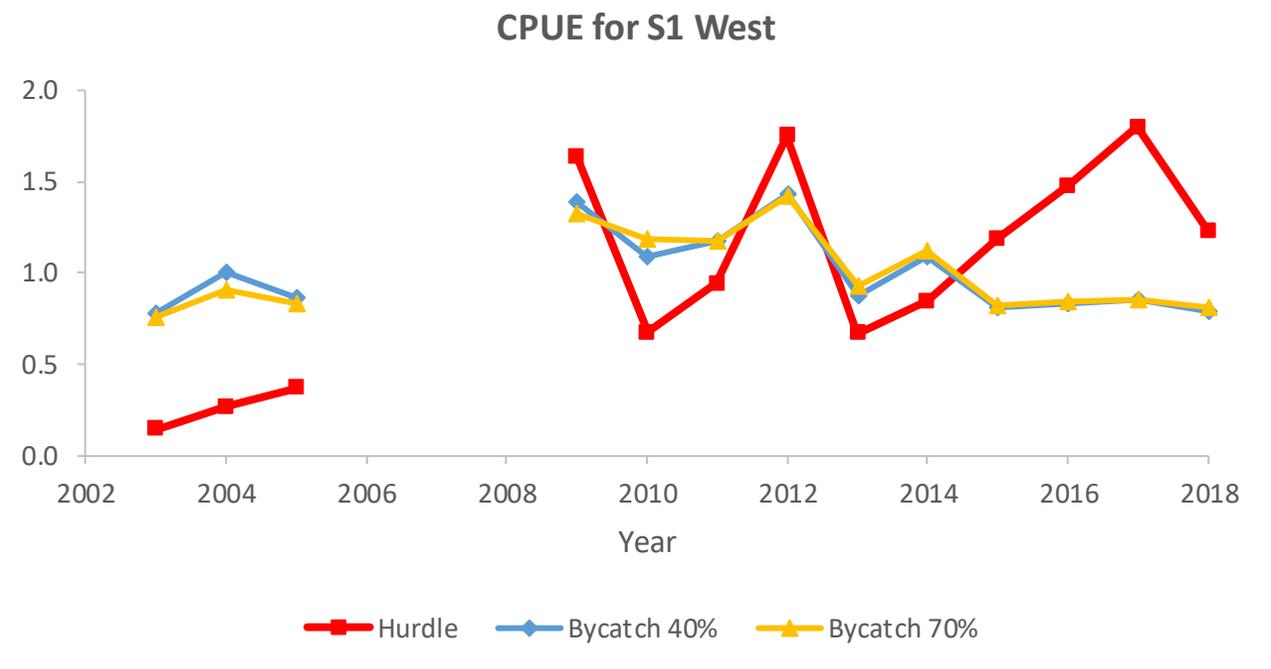


GLM-standardised CPUE values for the “East” for each of the series

Normalised as above

GLM-standardised CPUE values for the **S1 "West"** when accounting for bycatch

Records for which the catch is less than 40% or 70% of the total catch are omitted, with the results compared to the base case



GLM-standardised CPUE values for the **S3 "West"** when accounting for bycatch

Comparison as for **S1 "West"** above

Concluding Comments

- Fit diagnostics were checked and found to be reasonable
- In general, sensitivities did not give results that differed greatly
- **Though further approaches could have been explored, this was not seen to be of high priority because the stock assessment analyses showed estimates of stock status and productivity to be very insensitive to different CPUE standardisation approaches**

Thank you for your attention