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1884

DAFF Department of Agriculture Fisheries and Forestry

Fisheries

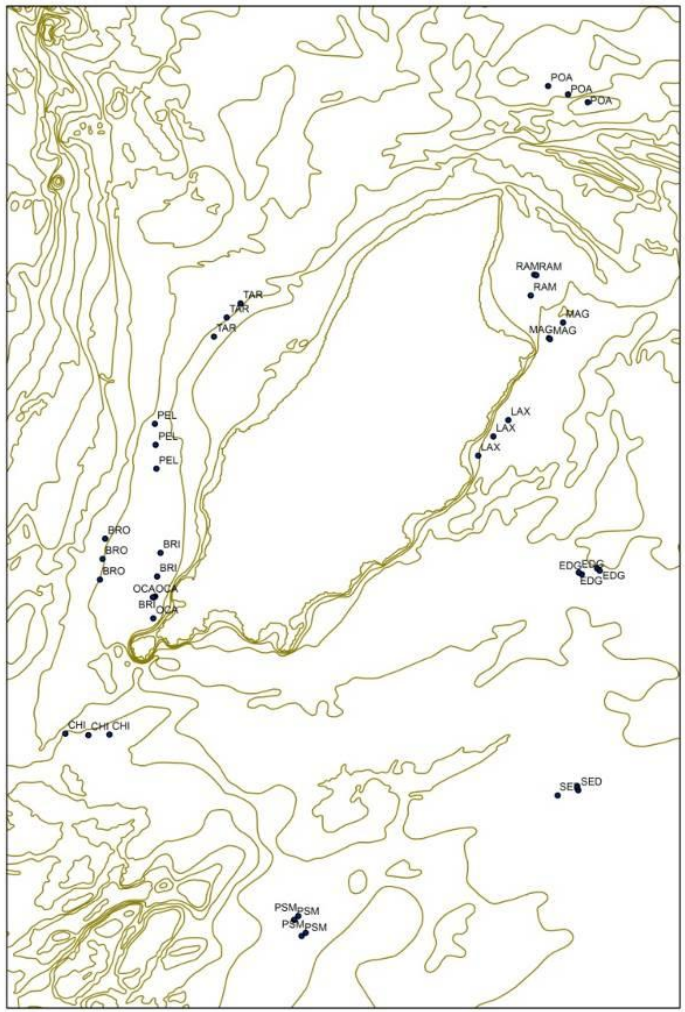
How effective is management of the Isle of Man scallop fishery?

Management measures

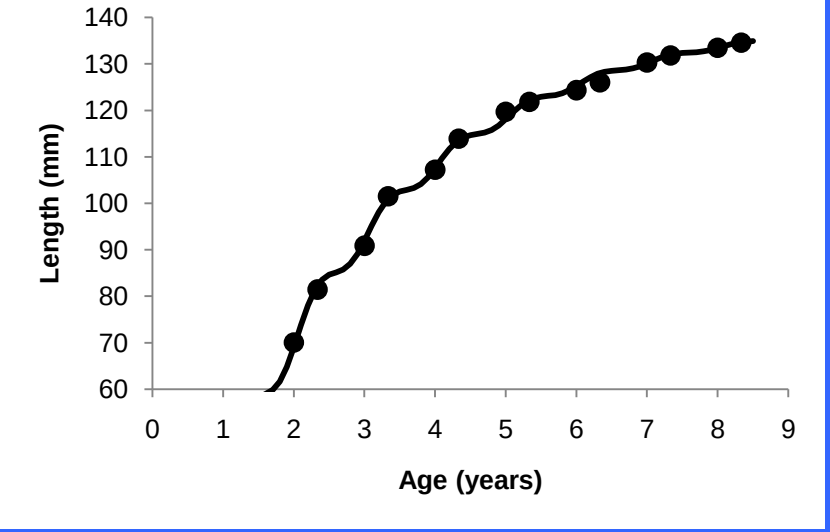
- 110 mm minimum landing size
- Closed season
- Curfew
- Dredge limit
- Gear restrictions
- Fishing exclusion zones

Historical data

- Biannual scallop surveys undertaken since 1992
- 13 survey sites
- Queen and king scallop dredges used

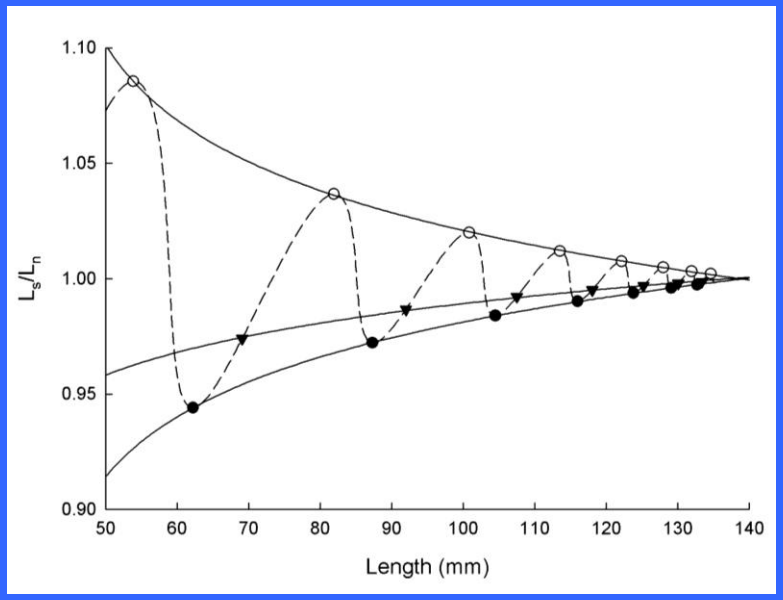


Growth



- Length at age estimated using non-seasonal and seasonal growth models

- Seasonal adjustment applied based on scallop length and time of year



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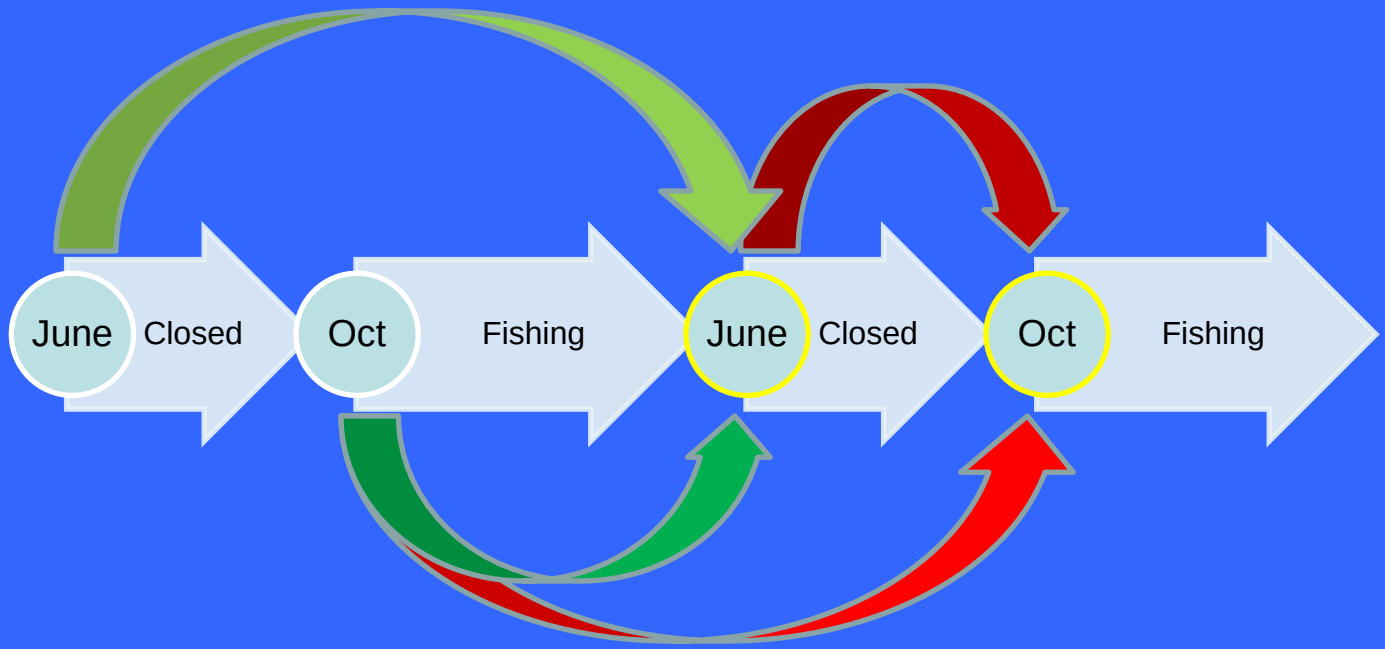
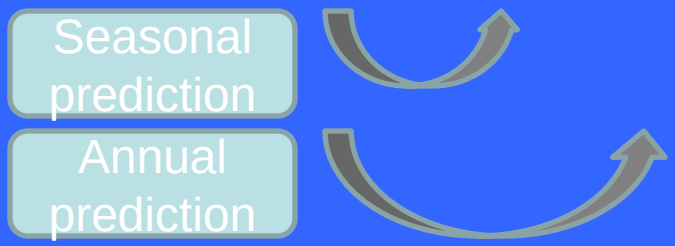
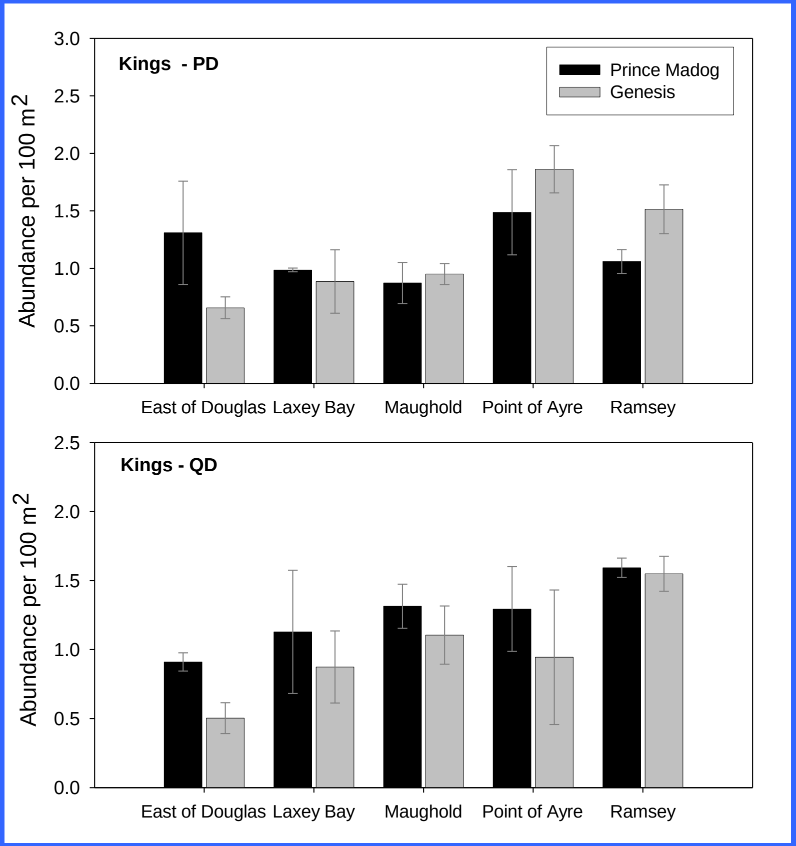
Forecasting recruitment





Confounding factors

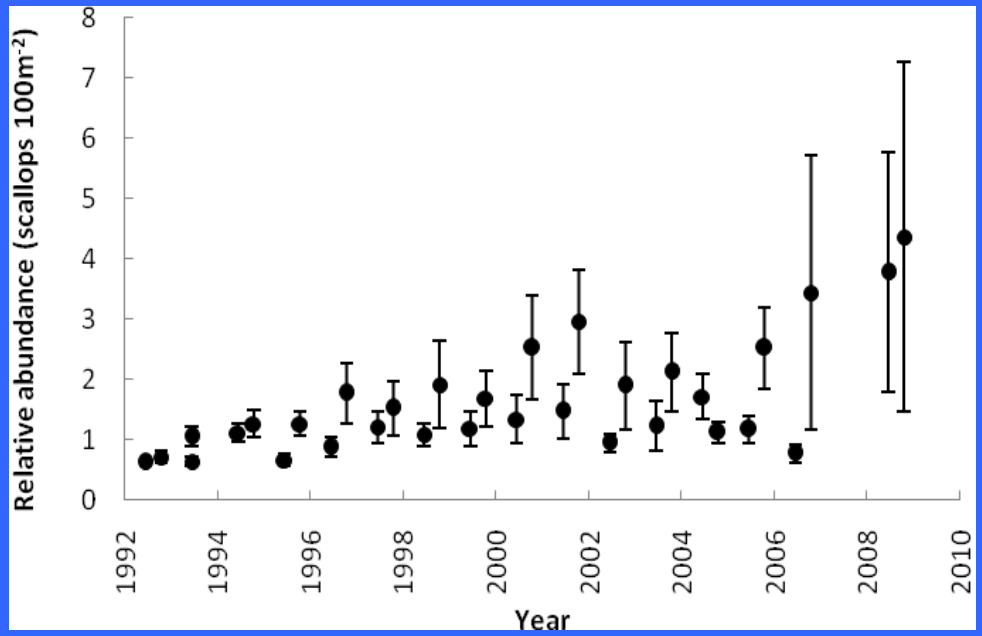
- Catchability
  - Weather
  - Vessel effects
  - Fishing activity
  - Density dependence
  - Size dependence
- Spatial variability
  - Inconsistent sampling
  - Patchy distribution



King scallop catches by FV Genesis and RV Prince Madog

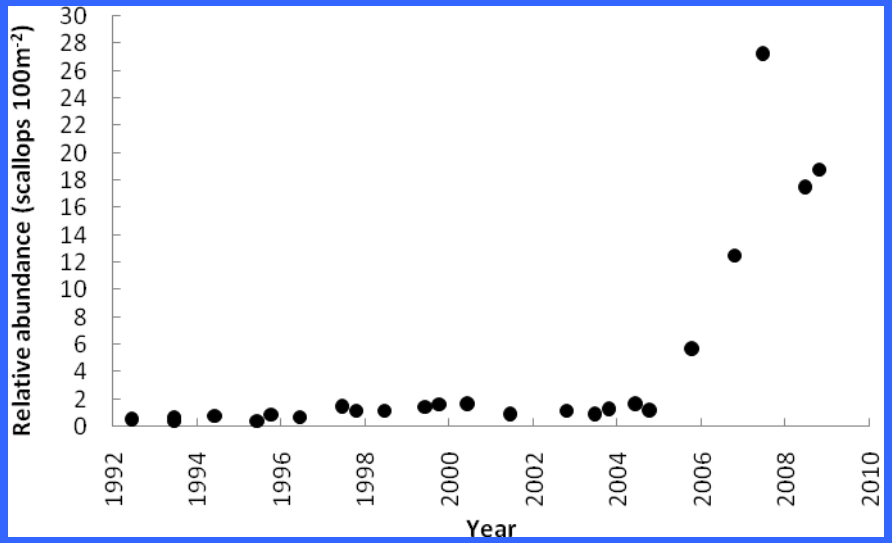
Mean scallop density over time from 1990 to 2008

Temporal variability



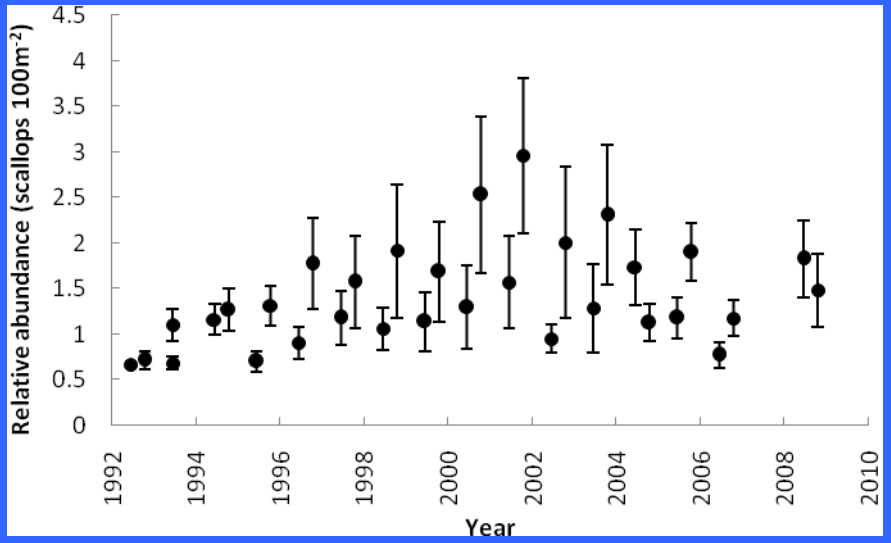
- Increasing mean relative abundance across all sites

Temporal variability



Increasing mean relative abundance at Targets from 2006

Mean relative abundance across all sites excluding Targets



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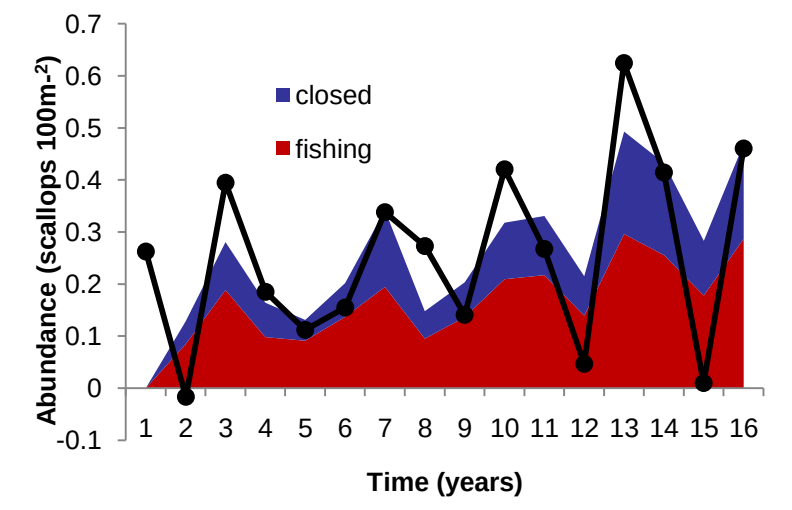
Spatial variability

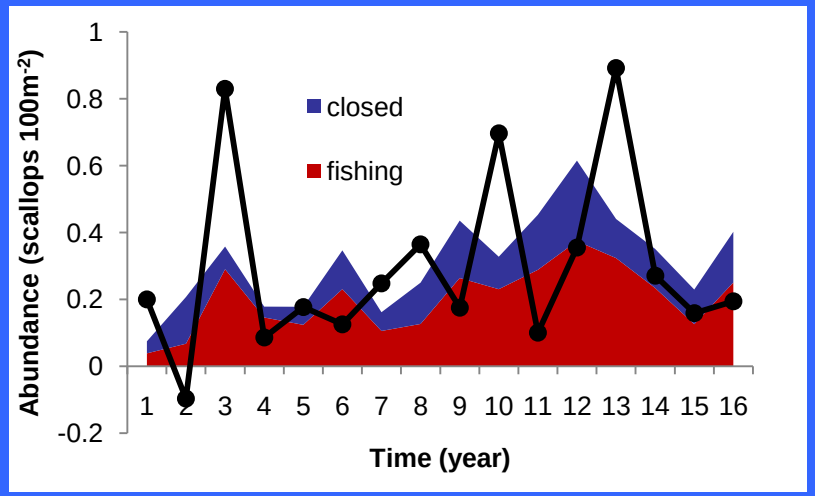
- Principal component analysis (PCA) revealed that Targets, Laxey and Chickens accounted for most of the variability in the data
- Sporadic large year classes
- Remove sites or years from analysis

Recruitment and mortality

Based on annual recruitment model and mortality of scallops ≥110 mm length

PCA selected sites





Bradda Inshore

Effects of closed season and MLS

- Relative abundance observed in June and October:
  - <110 mm (**p = 0.015)**
  - ≥110 mm (**p<0.001**)
- Observed and predicted relative abundance:
  - Annual: fishing season (logged data)
    - 100 – 109 mm (p = 0.156)
    - 110 – 119 mm (**p<0.001**)
    - ≥110 mm (**p<0.001**)
  - Seasonal: fishing season (logged data)
    - 100 – 109 mm (p = 0.674)
    - 110 – 119 mm (**p<0.001**)
    - ≥110 mm (**p<0.001**)

Effects of the closed season and MLS

- Observed and annually predicted relative abundance:
  - Seasonal: closed season
    - 100 – 109 mm ($F_{1,30}$ = 0.10, p = 0.748)
    - 110 – 119 mm ($F_{1,30}$ = 14.27, **p = 0.001**)
    - 120 – 129 mm ($F_{1,30}$ = 3.69, p = 0.064)
    - ≥110 mm (**p = 0.03**)
- Seasonal model underestimates recruitment:
  - Density dependent catchability?

Effectiveness of other management measures

- Curfews, gear restrictions, closed areas
  - Economics
  - Behaviour
    - Questionnaire
    - VMS
  - Larval transport
    - Genetics

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Conclusions

- Spatial variability in abundance is a major source of variance
- Most recruitment occurs during the fishing season
- Increasing recruitment during the past 17 years
- Catches of scallops ≥ recruitment during fishing season
- MLS is effective at reducing mortality of <110 mm scallops
- Density dependent catchability may need to be considered in abundance estimates