

Industry Science Anglerfish Surveys on the Northern Shelf



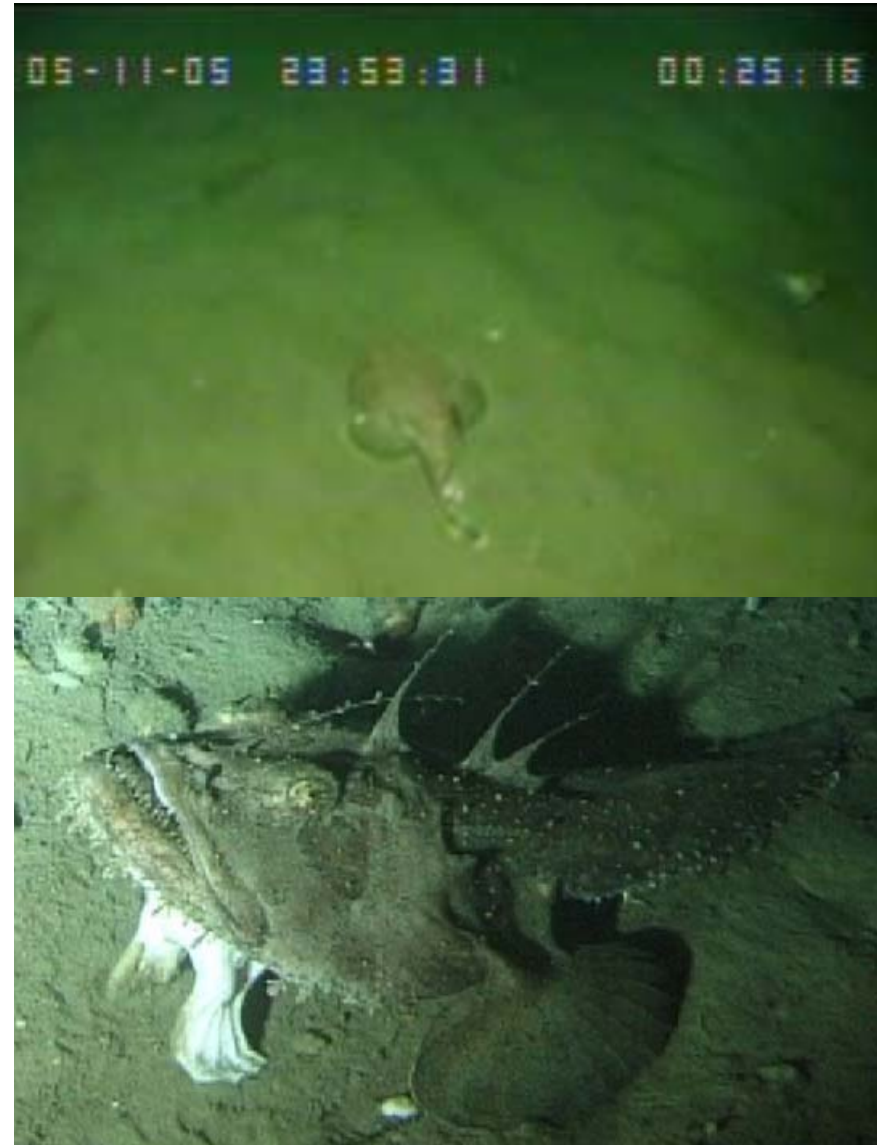
Paul G Fernandes
Marine Laboratory Aberdeen



marine scotland

Outline

- Anglerfish on the northern shelf
- Industry / science surveys
 - Methods
 - Results 2005-2009
- Next steps
 - Biology
 - Assessment
 - Management
- Megrin



Anglerfish on the northern shelf

Anglerfish = monkfish = *Lophius spp.*

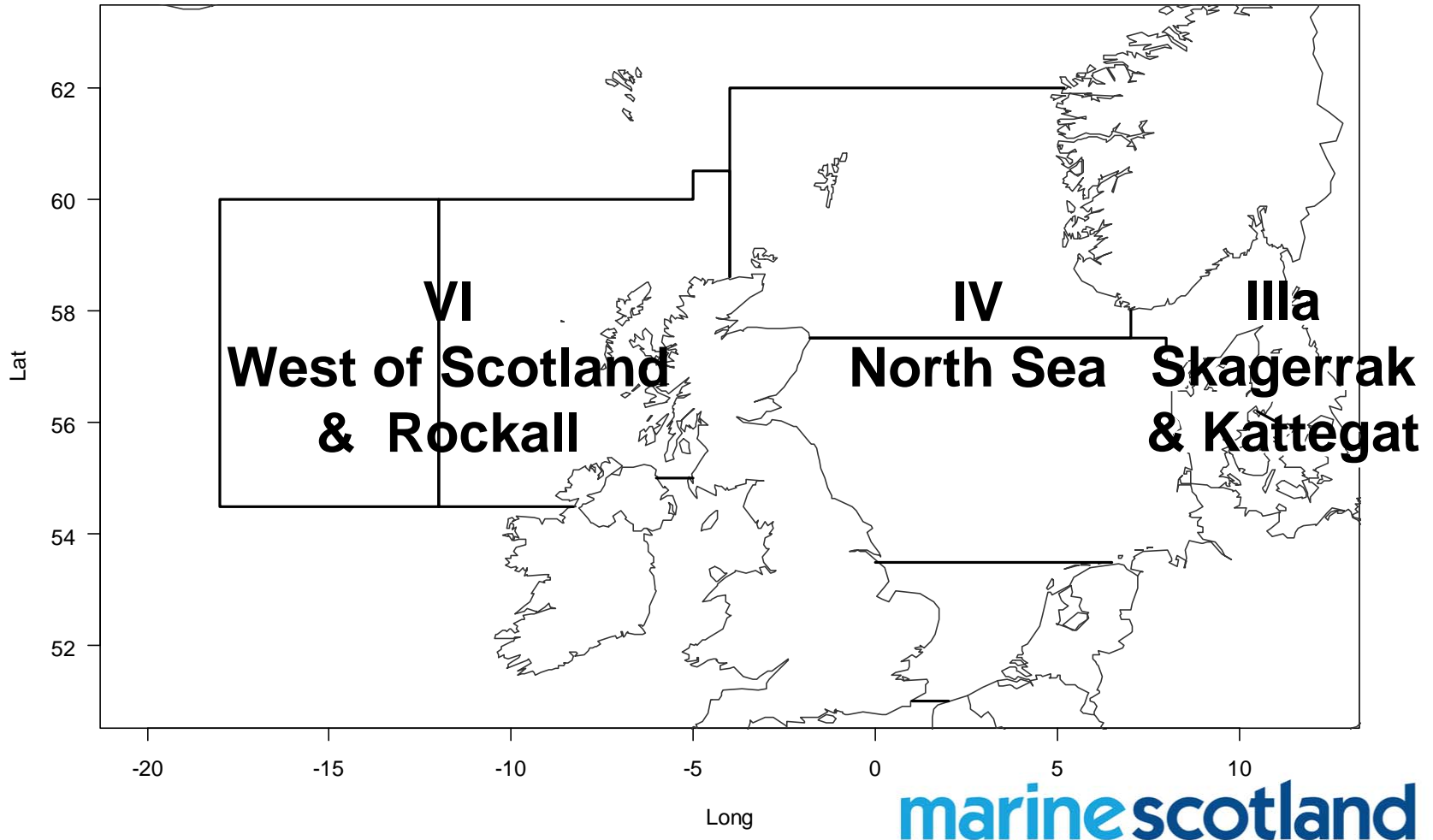
- *L. piscatorius* & *L. budegassa*
- ~ 6% *budegassa*



Anglerfish on the northern shelf

Anglerfish = monkfish = *Lophius spp.*

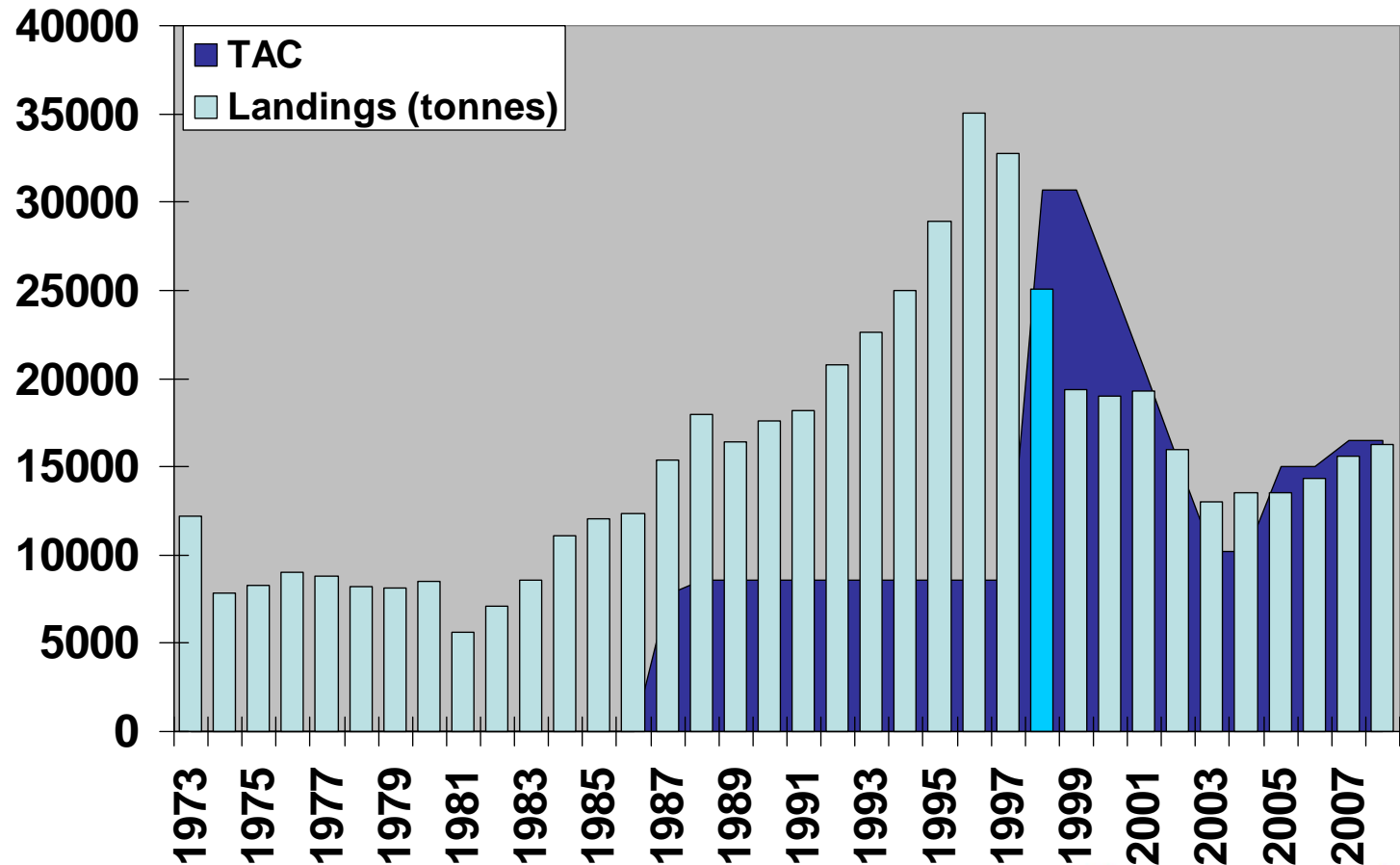
Northern shelf



Anglerfish on the northern shelf

Anglerfish = monkfish = *Lophius spp.*

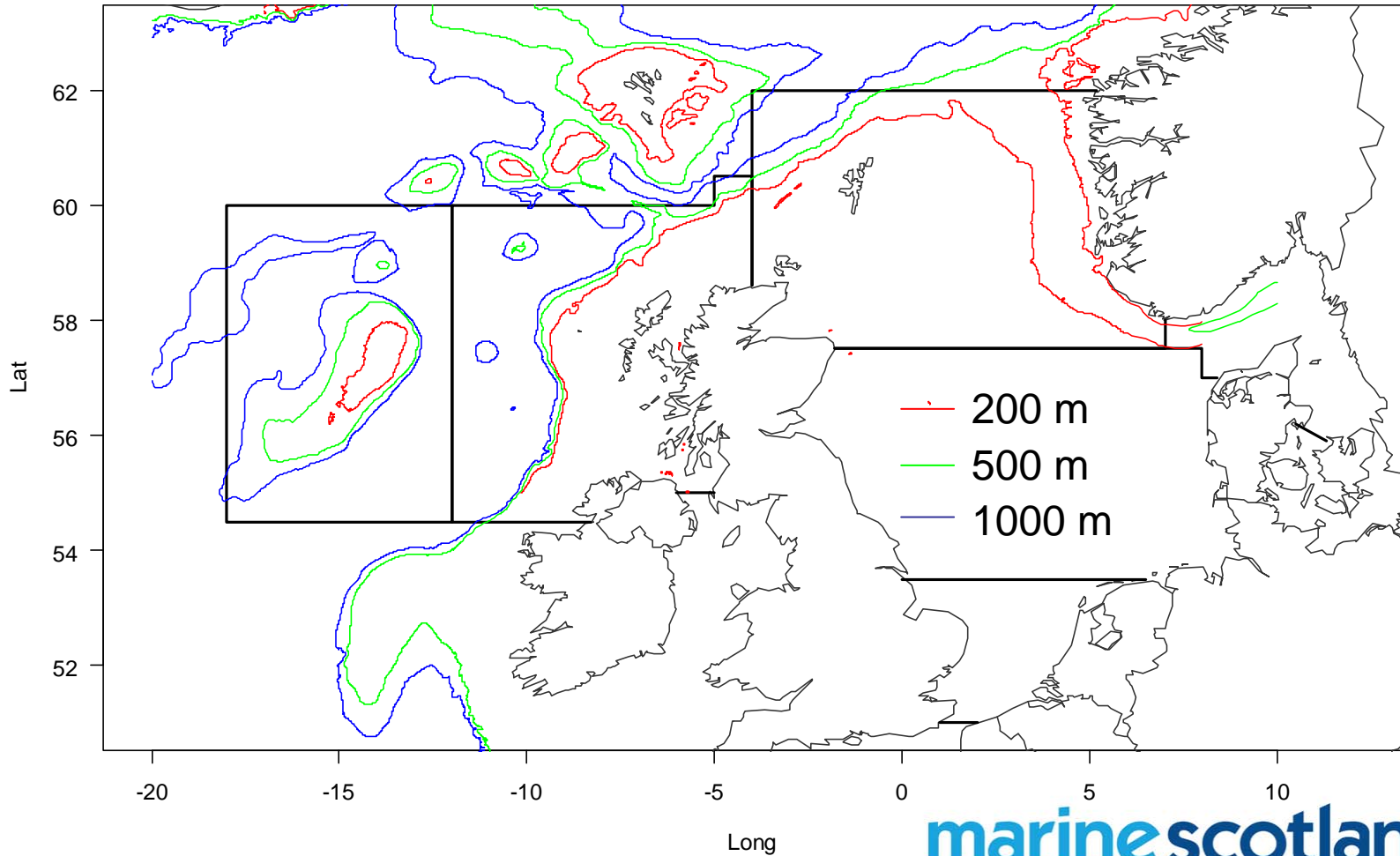
Northern shelf landings



Anglerfish on the northern shelf

Anglerfish = monkfish = *Lophius spp.*

Northern shelf bathymetry



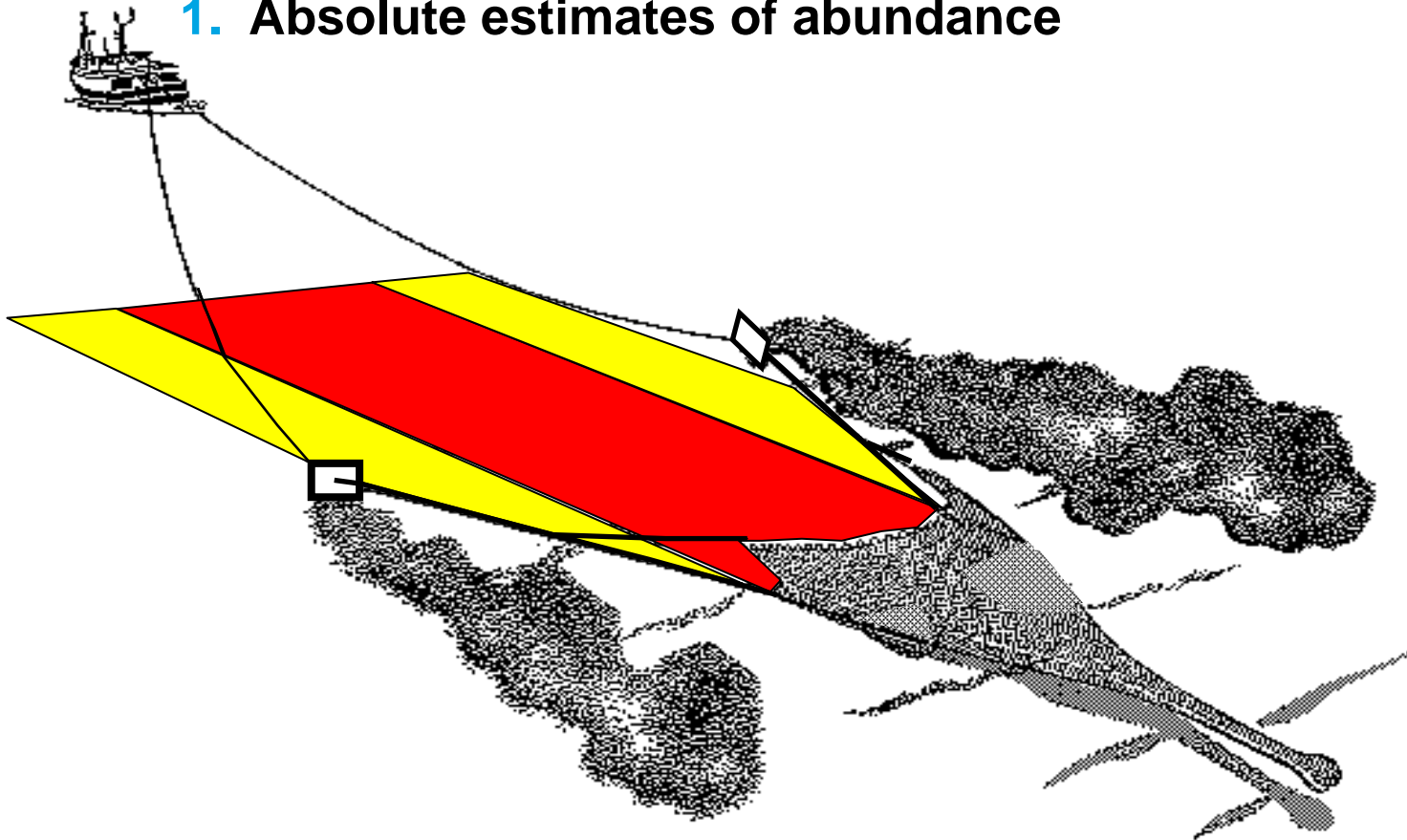
Industry / science surveys

Scottish government funded research project

– April 2005 - April 2008 (continues...)

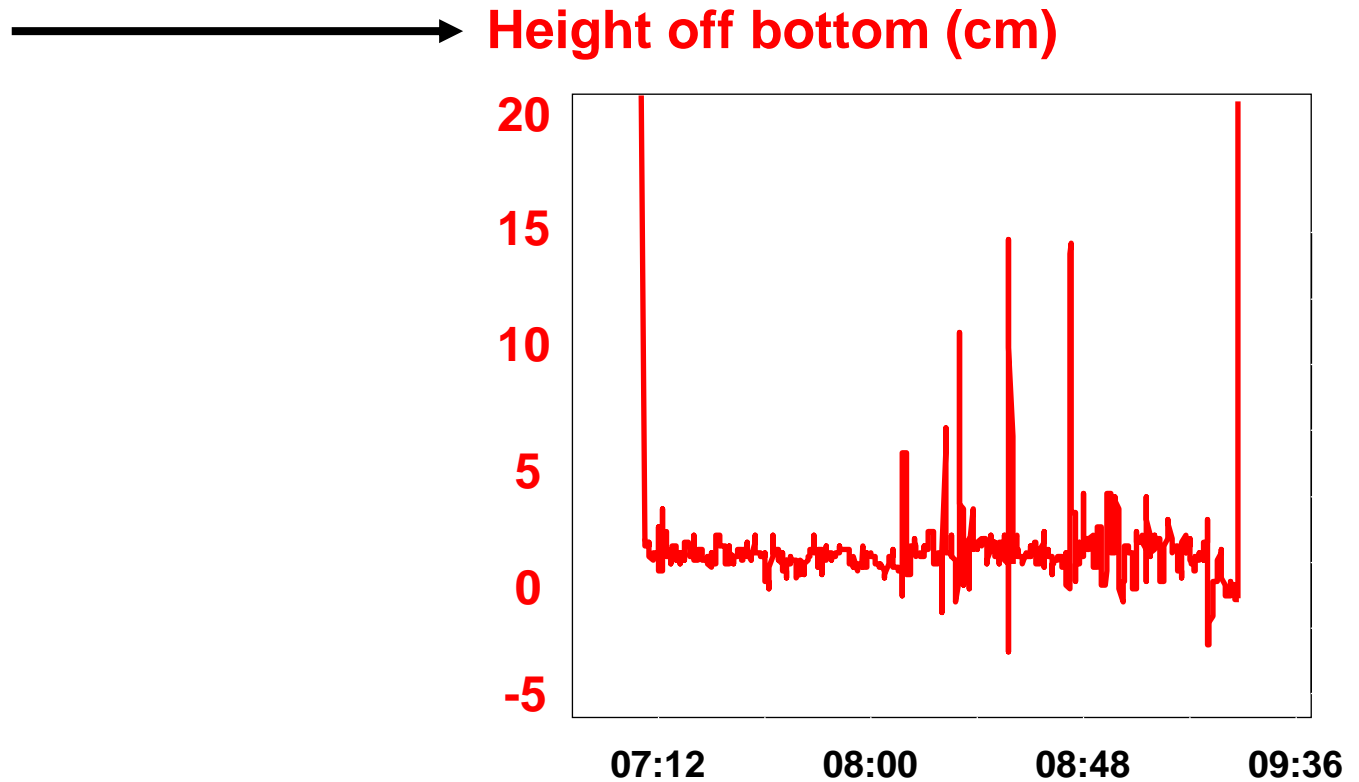
Objectives:

1. Absolute estimates of abundance



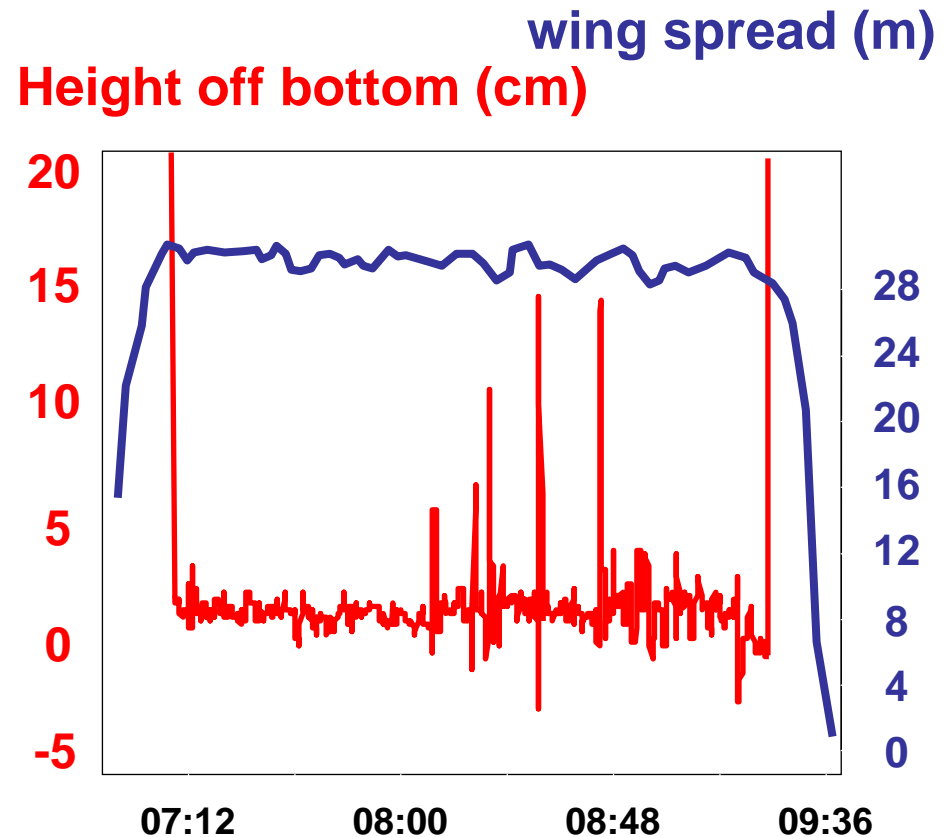
Industry / science surveys: methods

- Bottom contact
 - Angle



Industry / science surveys: methods

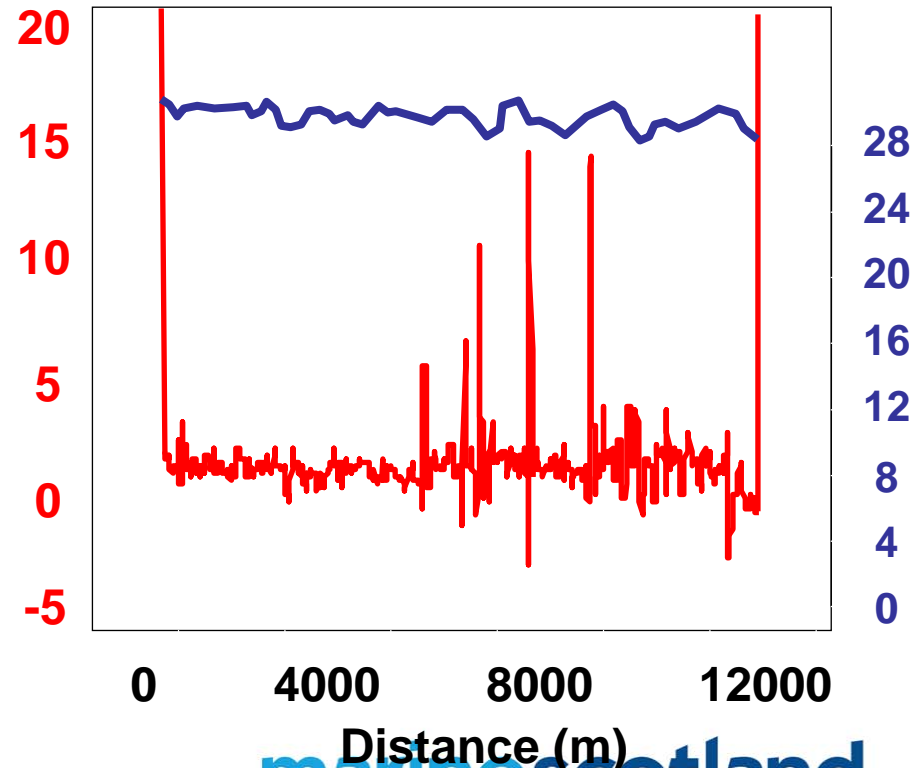
- Bottom contact
- Wing spread
- Door spread
 - Acoustic distance



Industry / science surveys: methods

- Bottom contact
- Wing spread
- Door spread

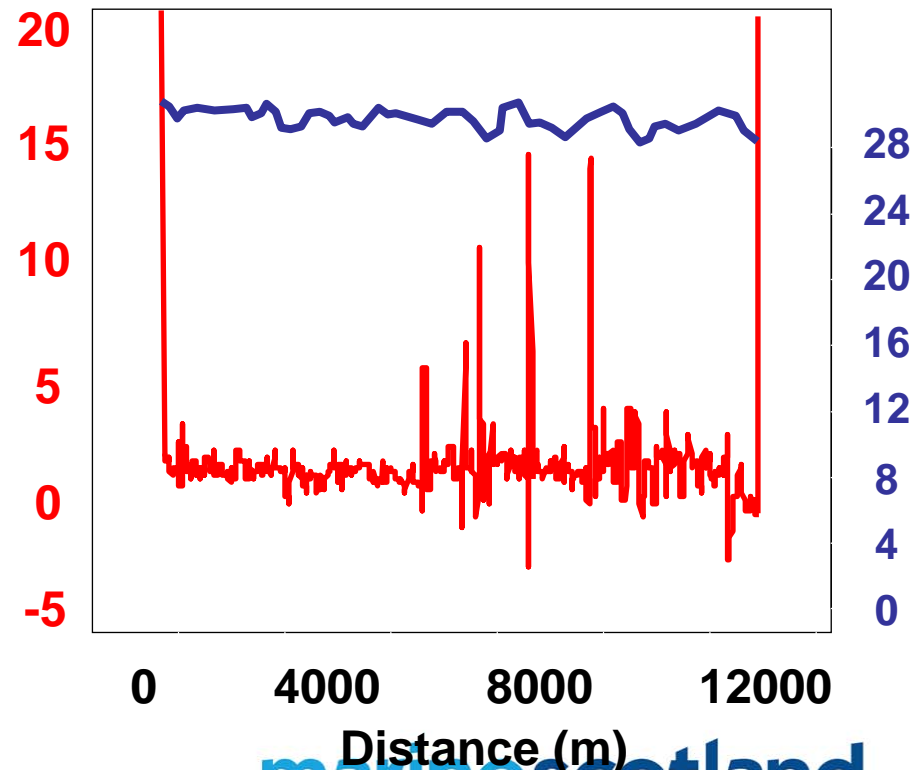
Truncated wing spread (m)
Height off bottom (cm)



Industry / science surveys: methods

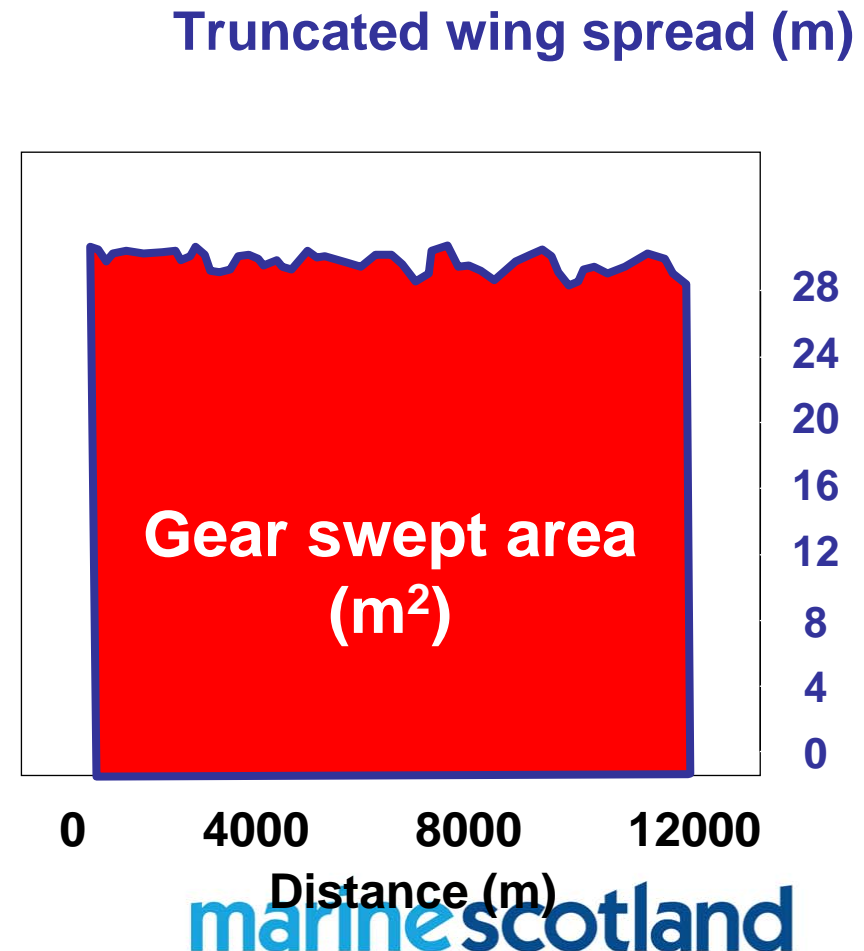
- Bottom contact
- Wing spread
- Door spread
- GPS
 - Along track distance

Truncated wing spread (m)
Height off bottom (cm)



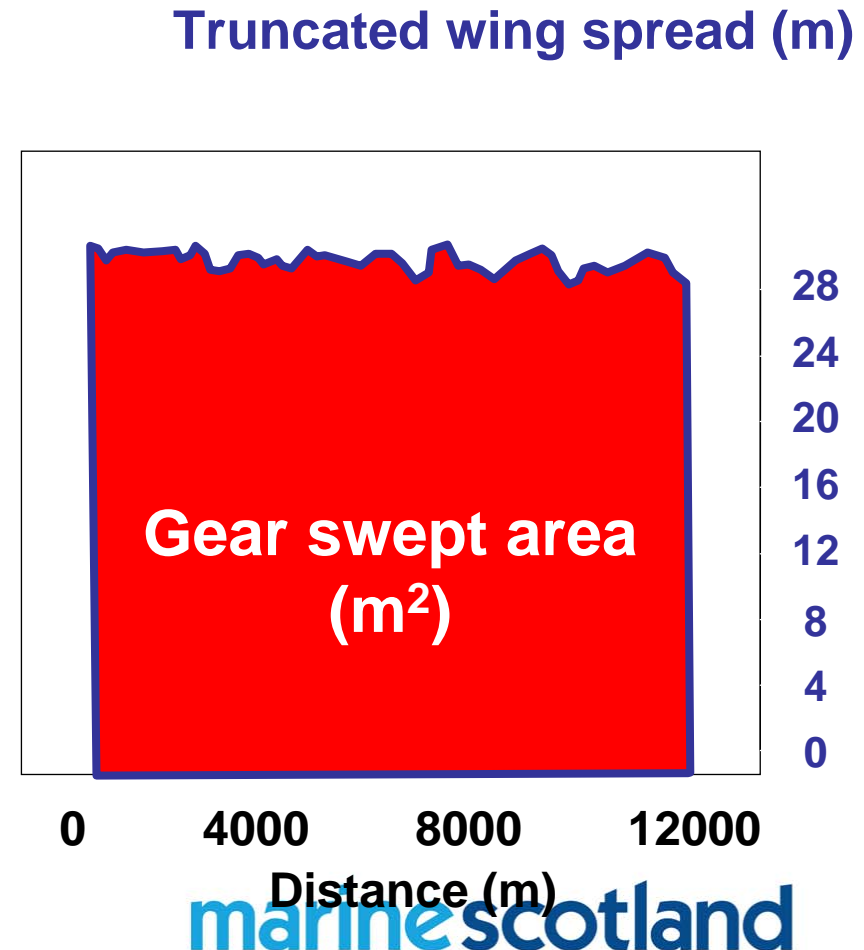
Industry / science surveys: methods

- Bottom contact
- Wing spread
- Door spread
- GPS
- Swept area
 - Gear (wing)



Industry / science surveys: methods

- Bottom contact
- Wing spread
- Door spread
- GPS
- Swept area
- ALL anglerfish
 - Length
 - Weight
 - Age
- Fish density calculated
 - Numbers per square km
 - Weight per square km



Industry / science surveys

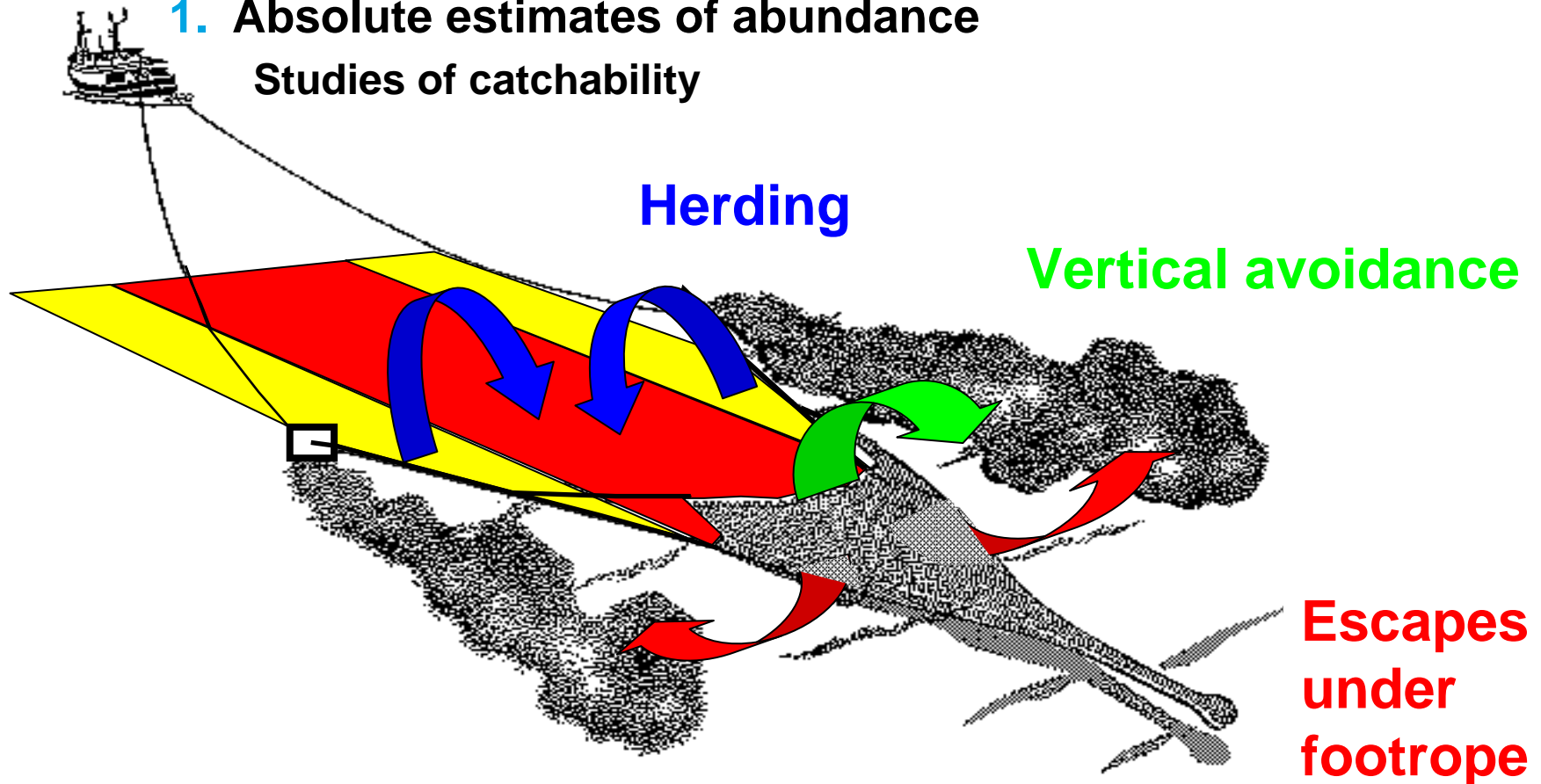
Scottish government funded research project

– April 2005 - April 2008 (continues...)

Objectives:

1. Absolute estimates of abundance

Studies of catchability



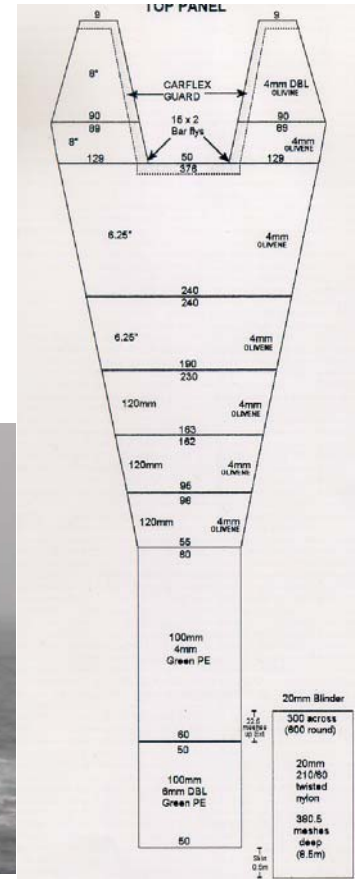
Industry / science surveys

Scottish government funded research project

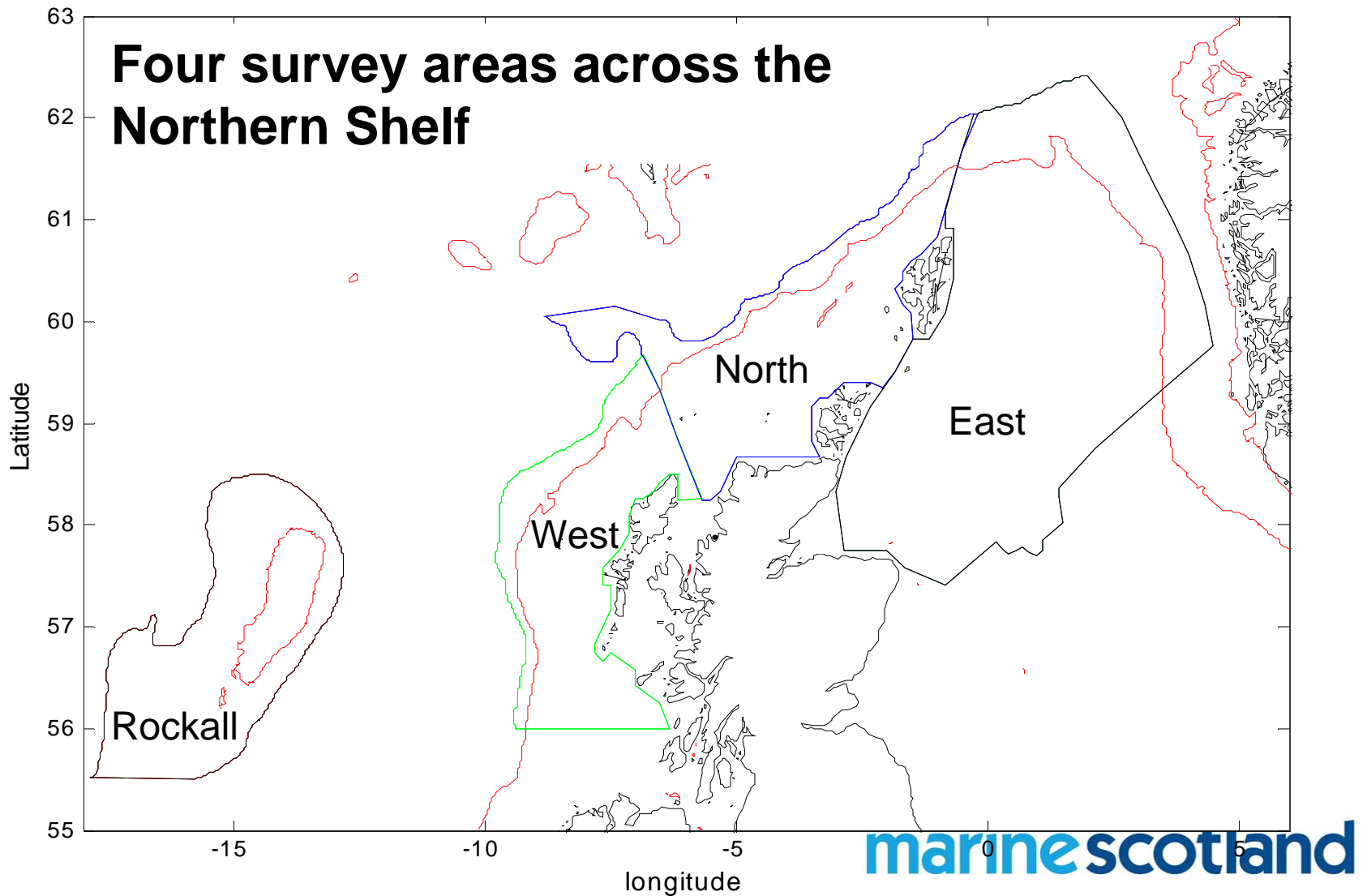
– April 2005 - April 2008 (continues...)

Objectives:

1. Absolute estimates of abundance
Studies of catchability
2. Working with the Scottish fishing industry
 - Survey design
 - Bespoke nets
 - Industry charters



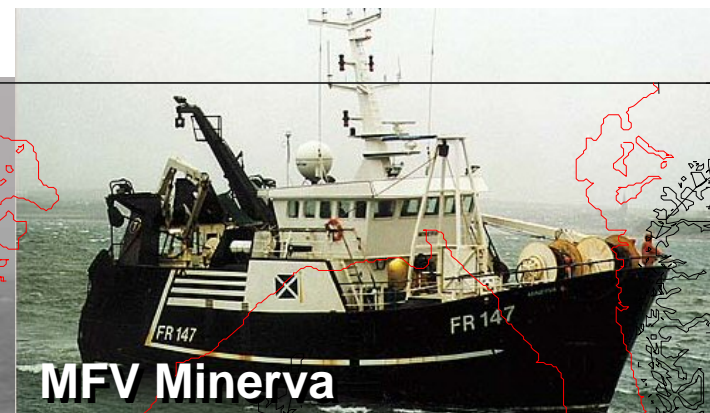
Industry / science surveys



Industry / science surveys: 2005



MFV Endeavour III



MFV Minerva



MFV Atlantic Challenge



FRV Scotia

4-14 November 2005

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Industry / science surveys: 2006

Seagull

Caspian

Marigold

FRV Scotia

2 - 12 November

Industry / science surveys: 2007

Genesis



Marigold

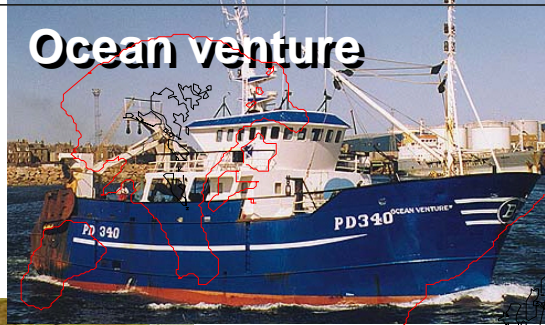


FRV Scotia

31 October -9 November

Industry / science surveys: 2008

Ocean venture



Seagull



Genesis

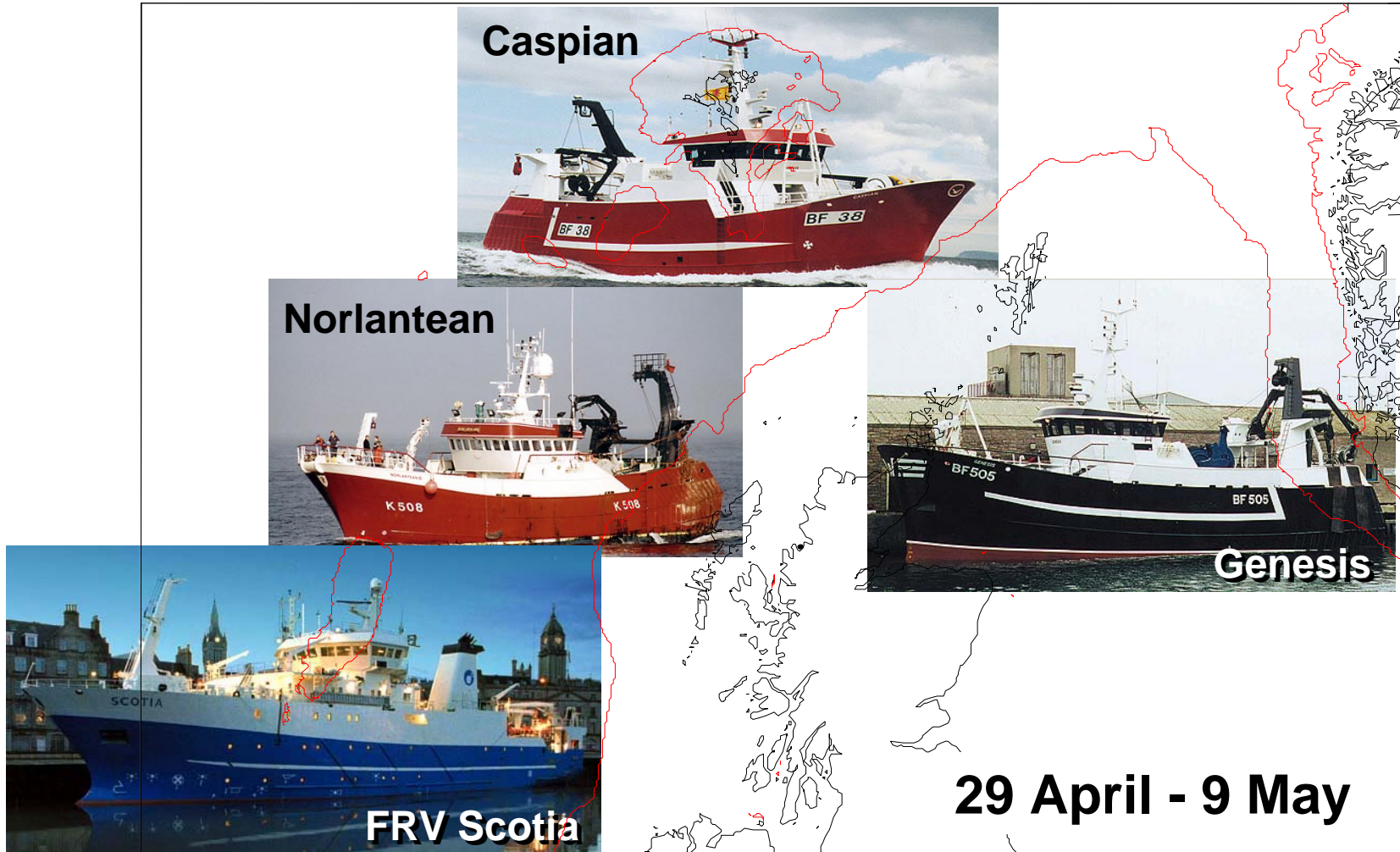


FRV Scotia

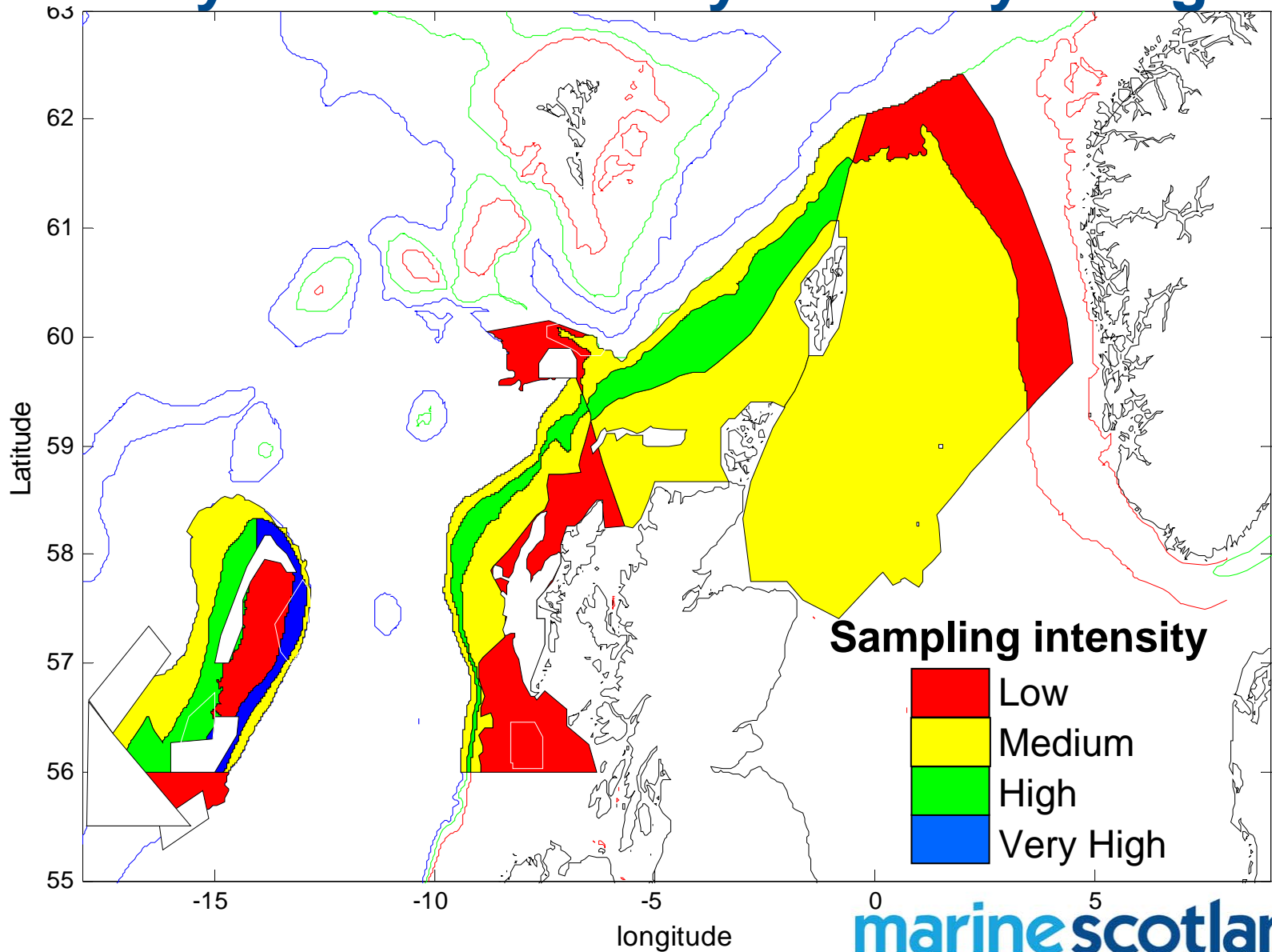


15 - 25 April

Industry / science surveys: 2009

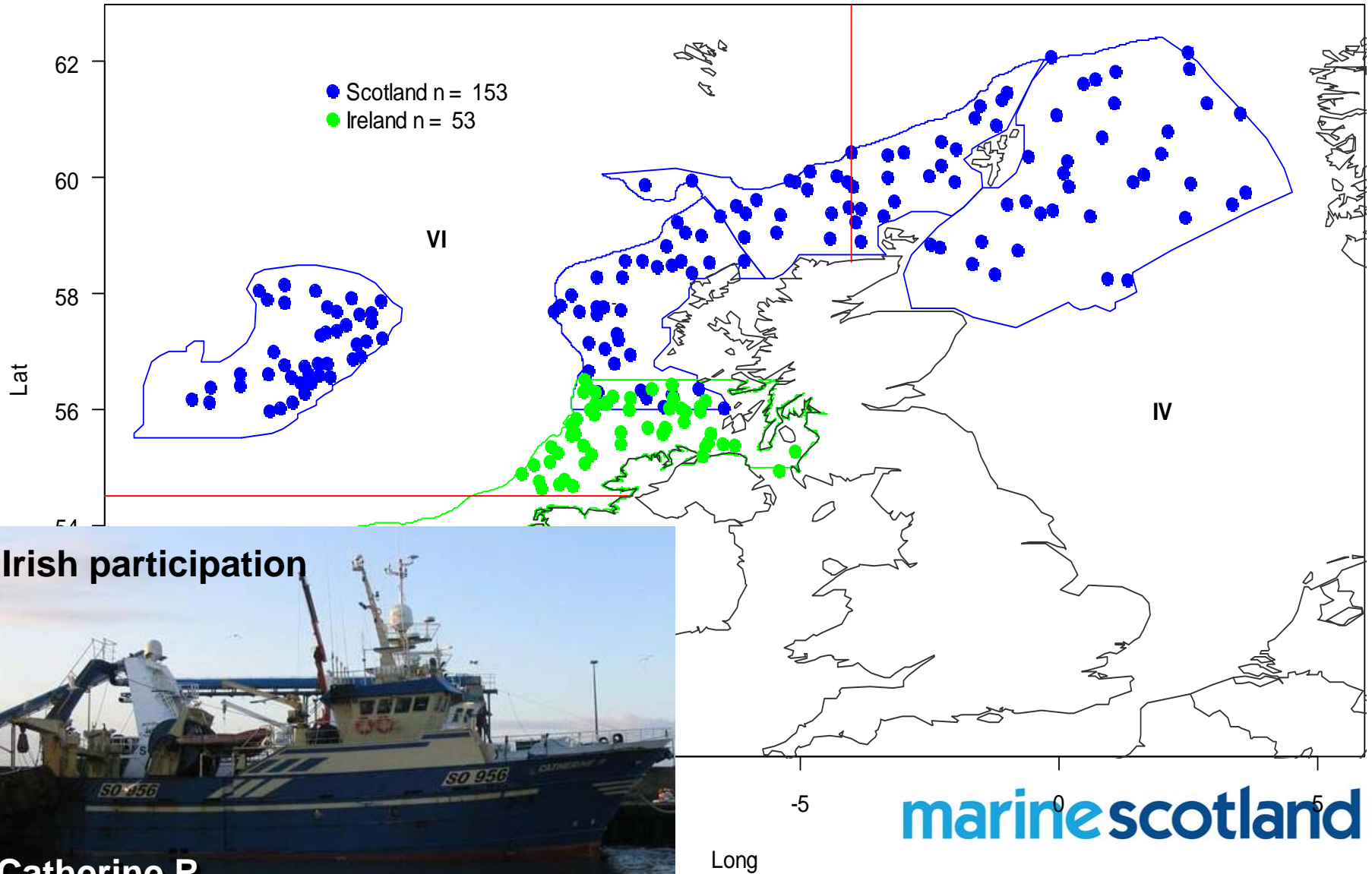


Industry / science surveys: survey design



Industry / science surveys: survey design

2009 Trawl stations



Irish participation

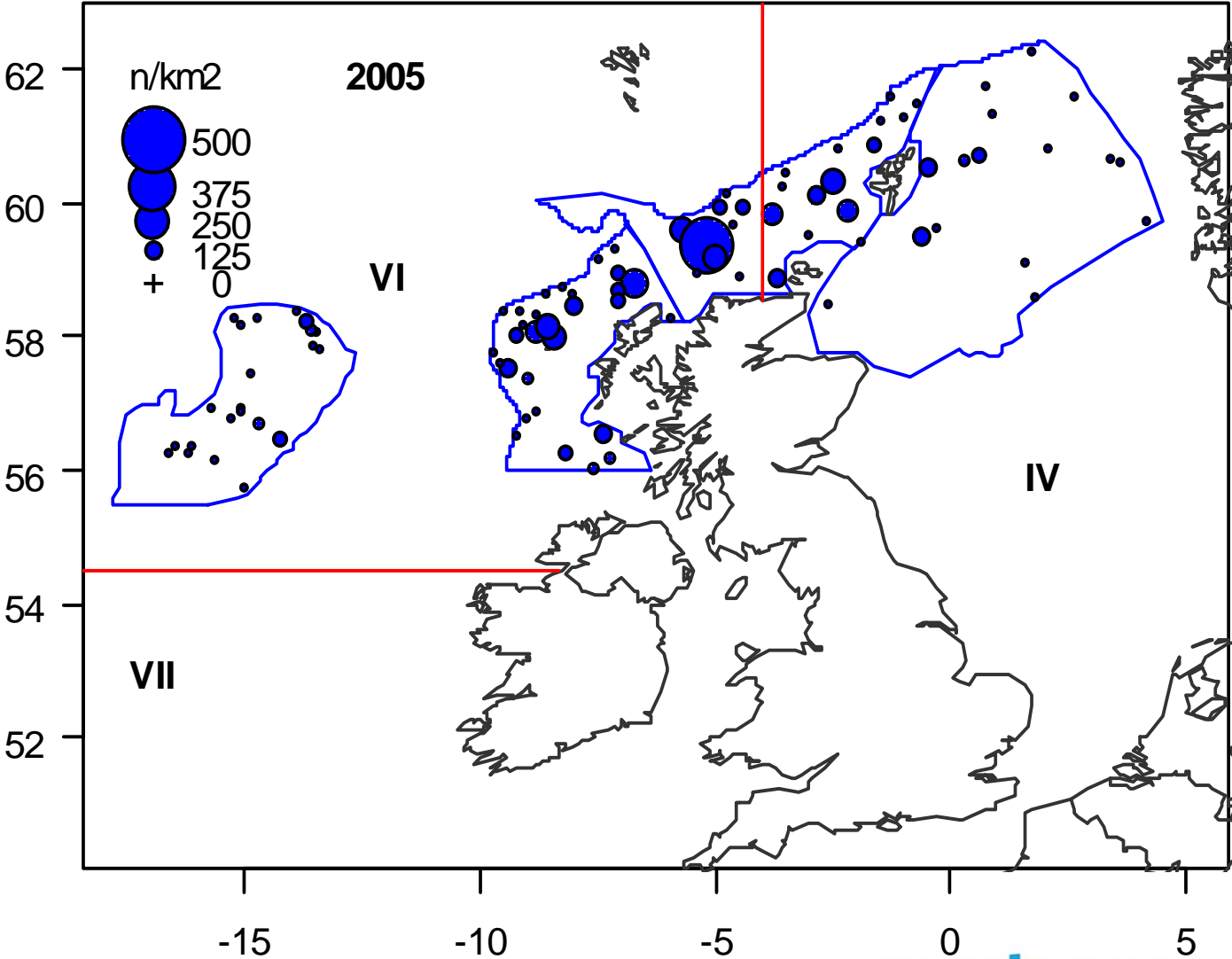


Catherine R

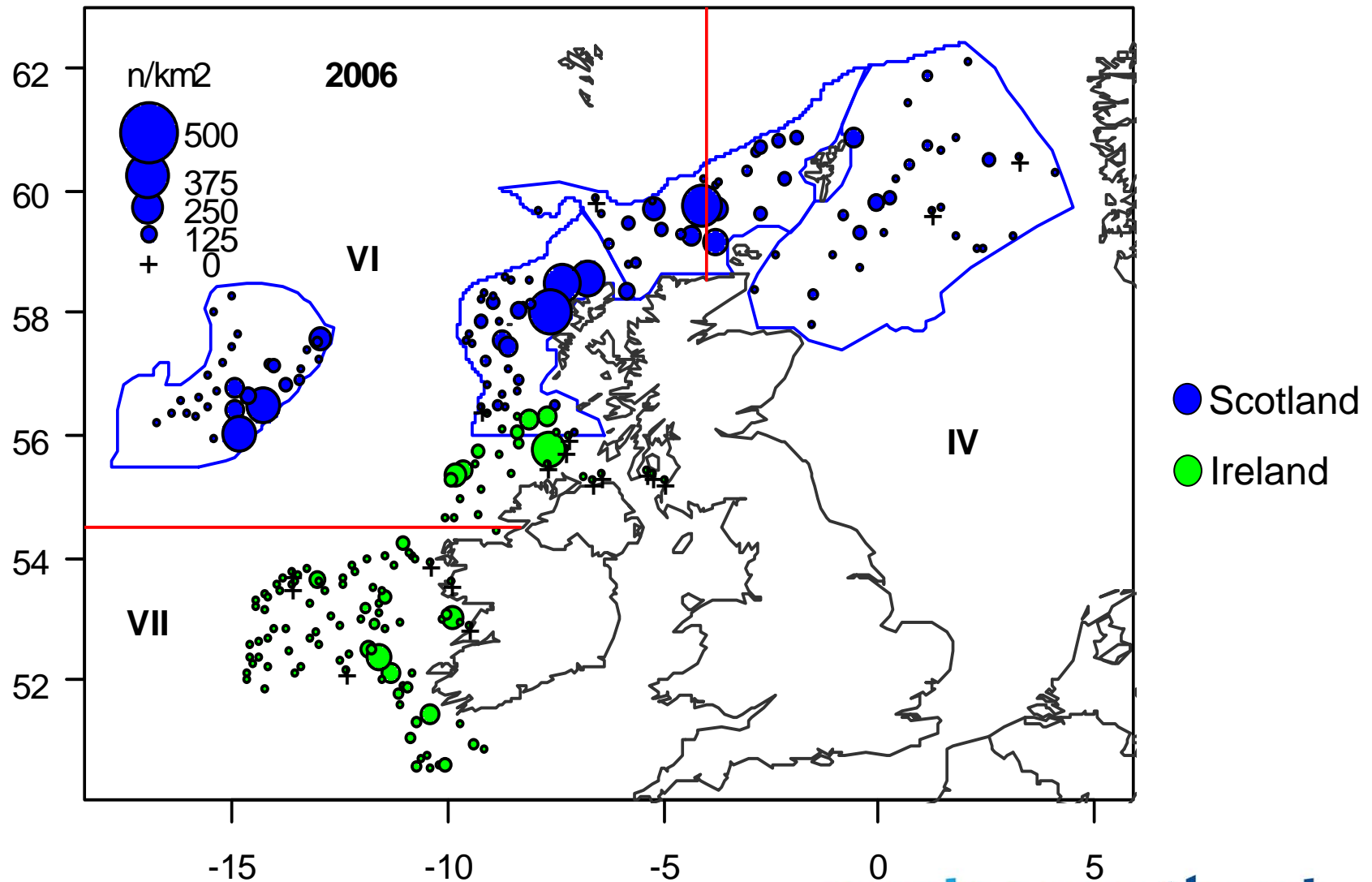
marinescotland

Long

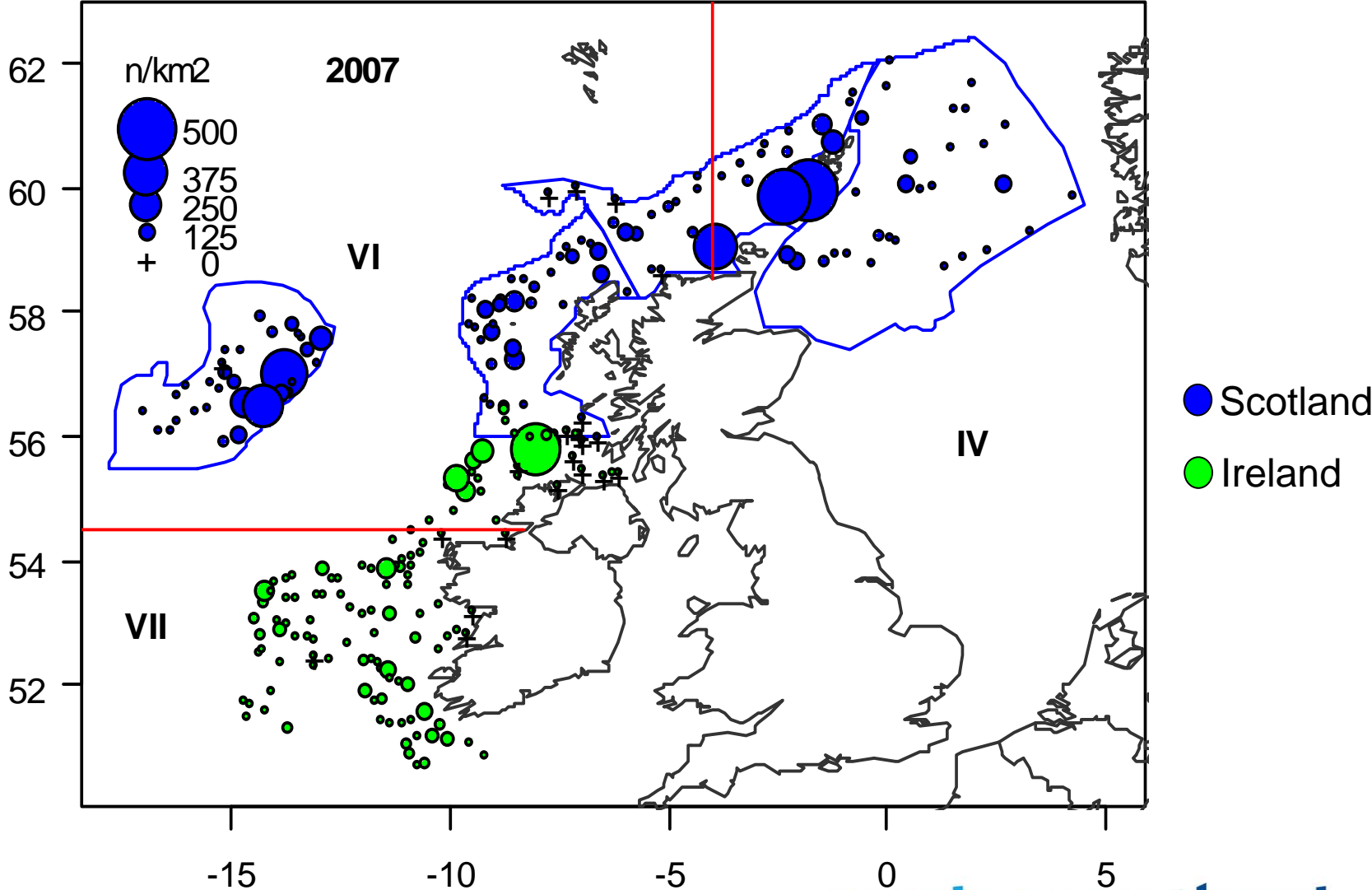
Results: Number density time series



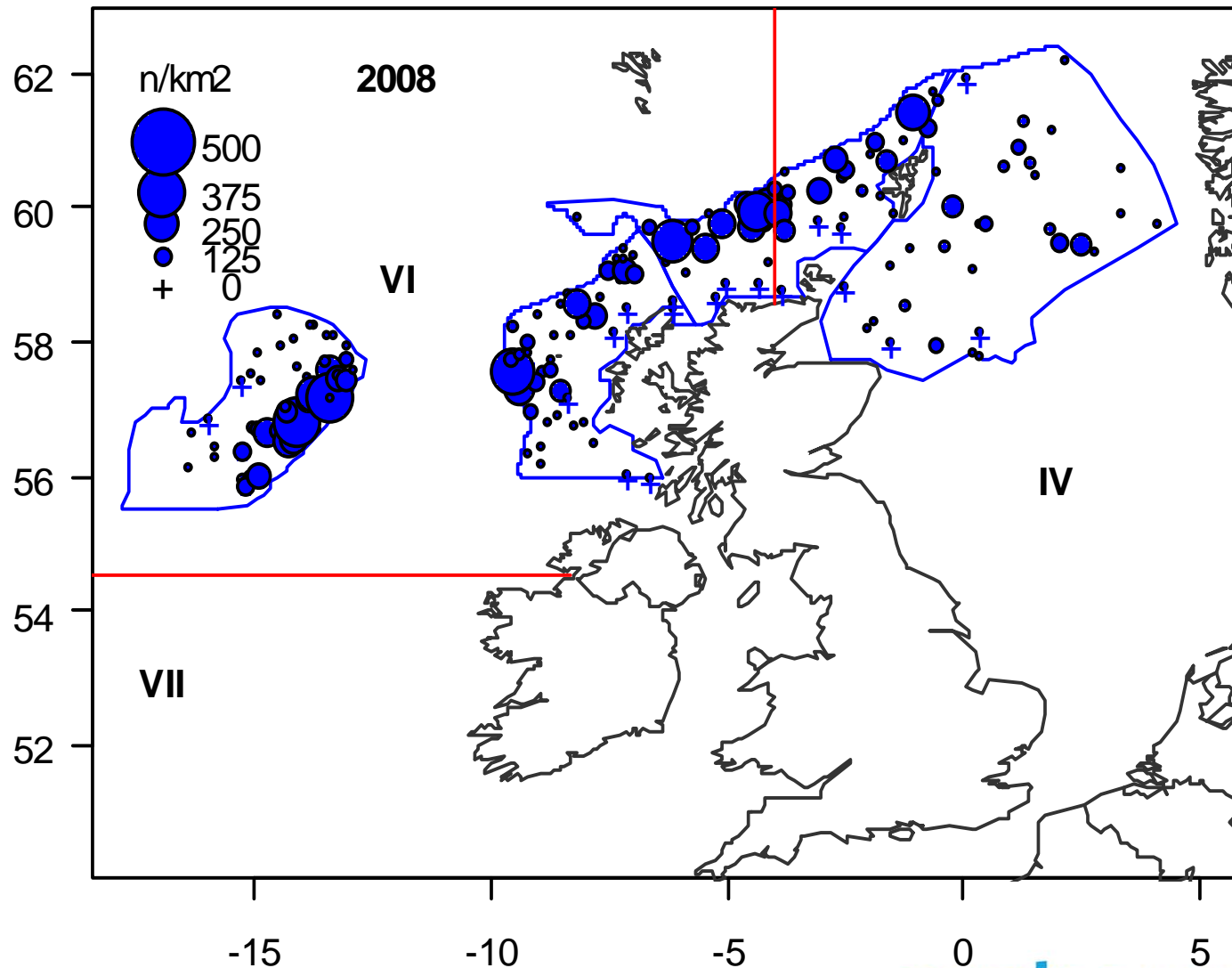
Results: Number density time series



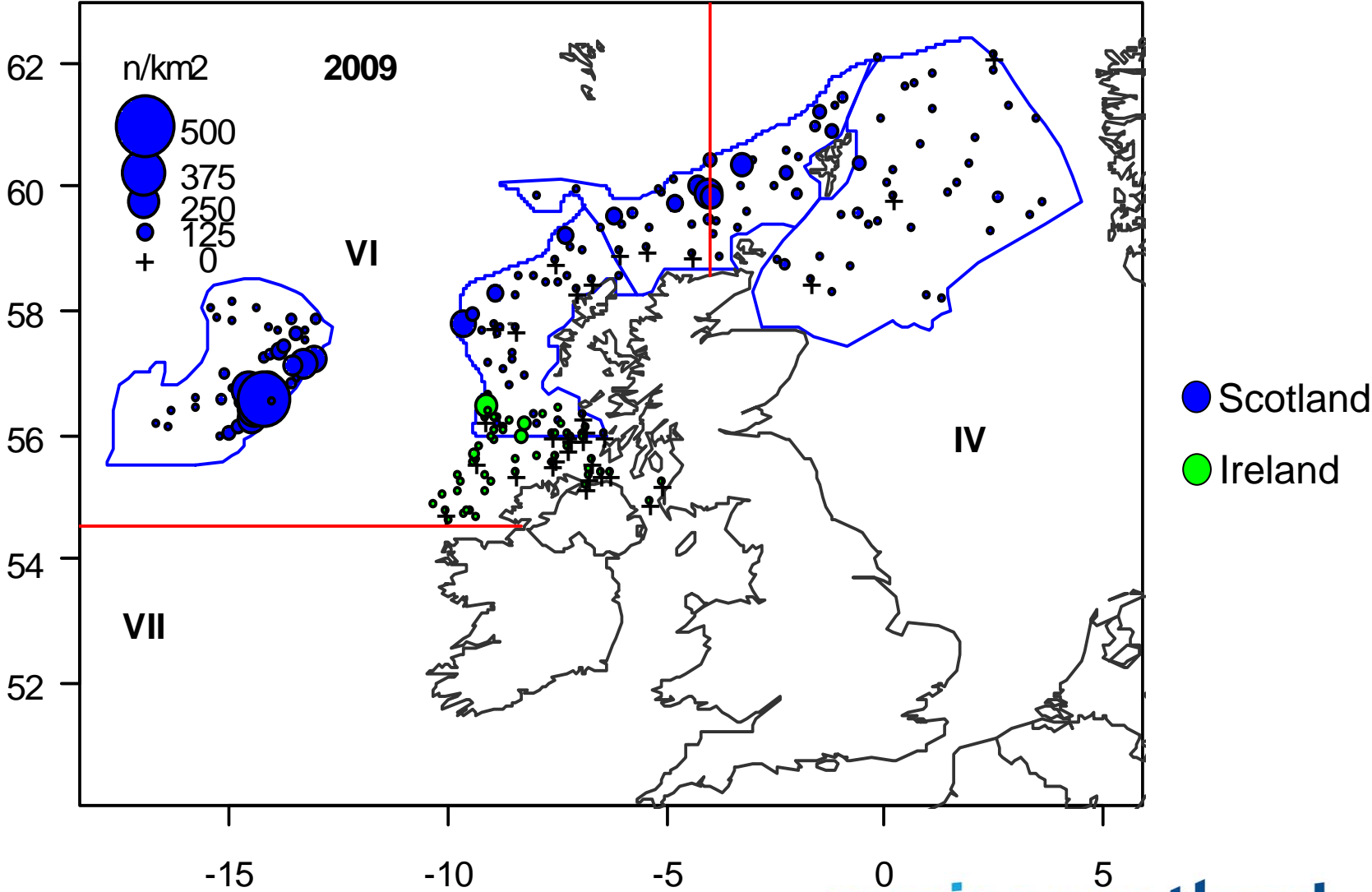
Results: Number density time series



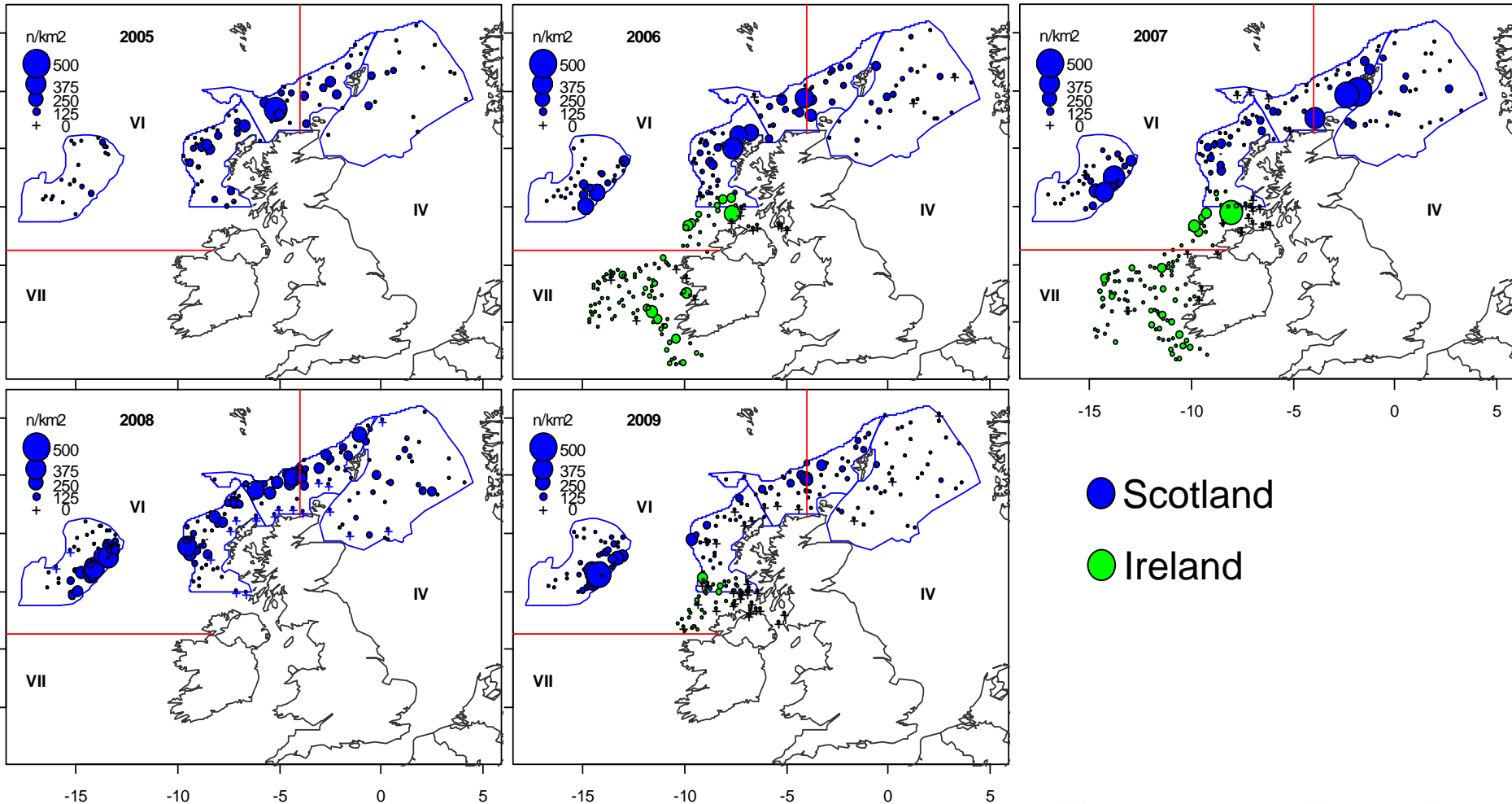
Results: Number density time series



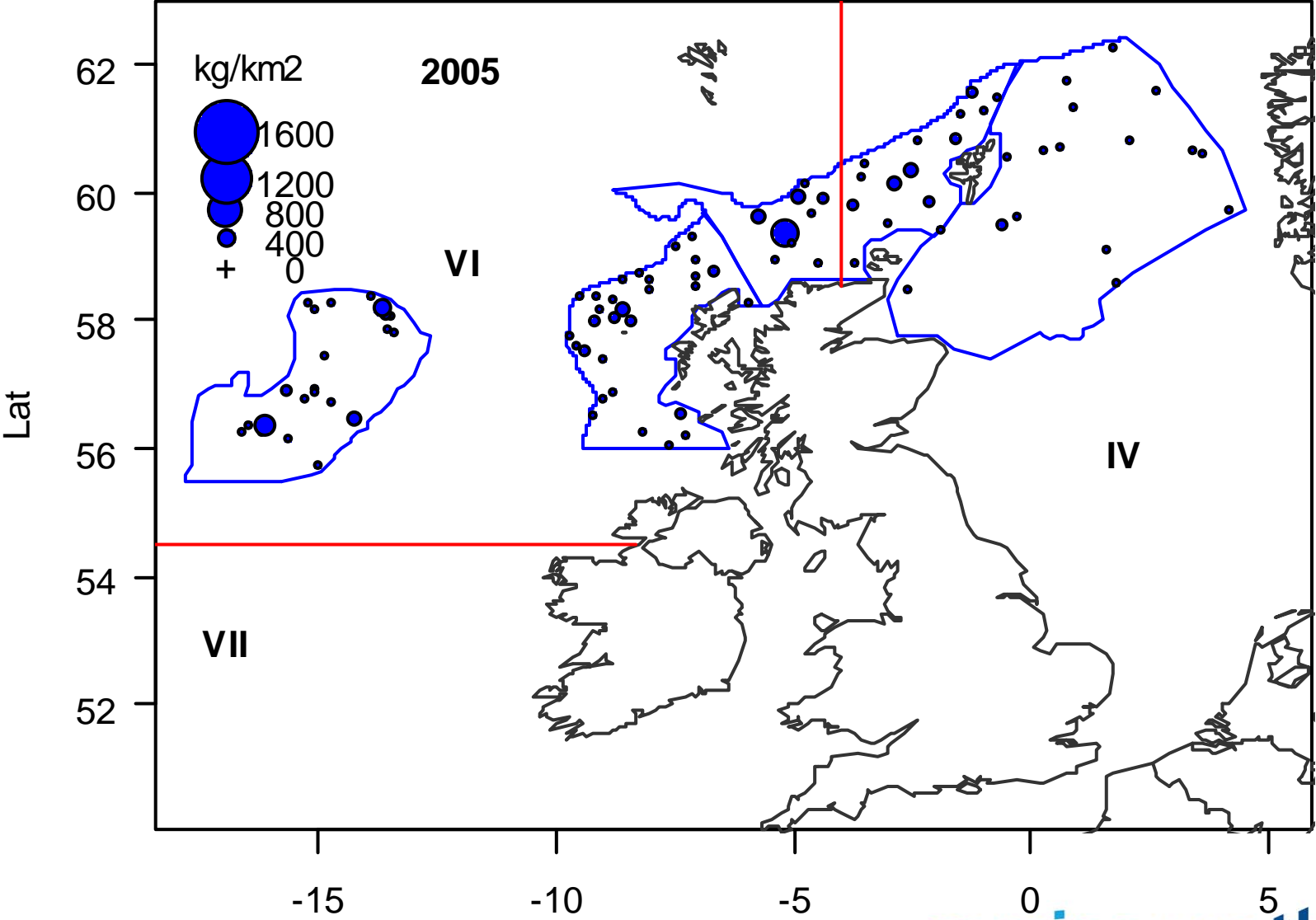
Results: Number density time series



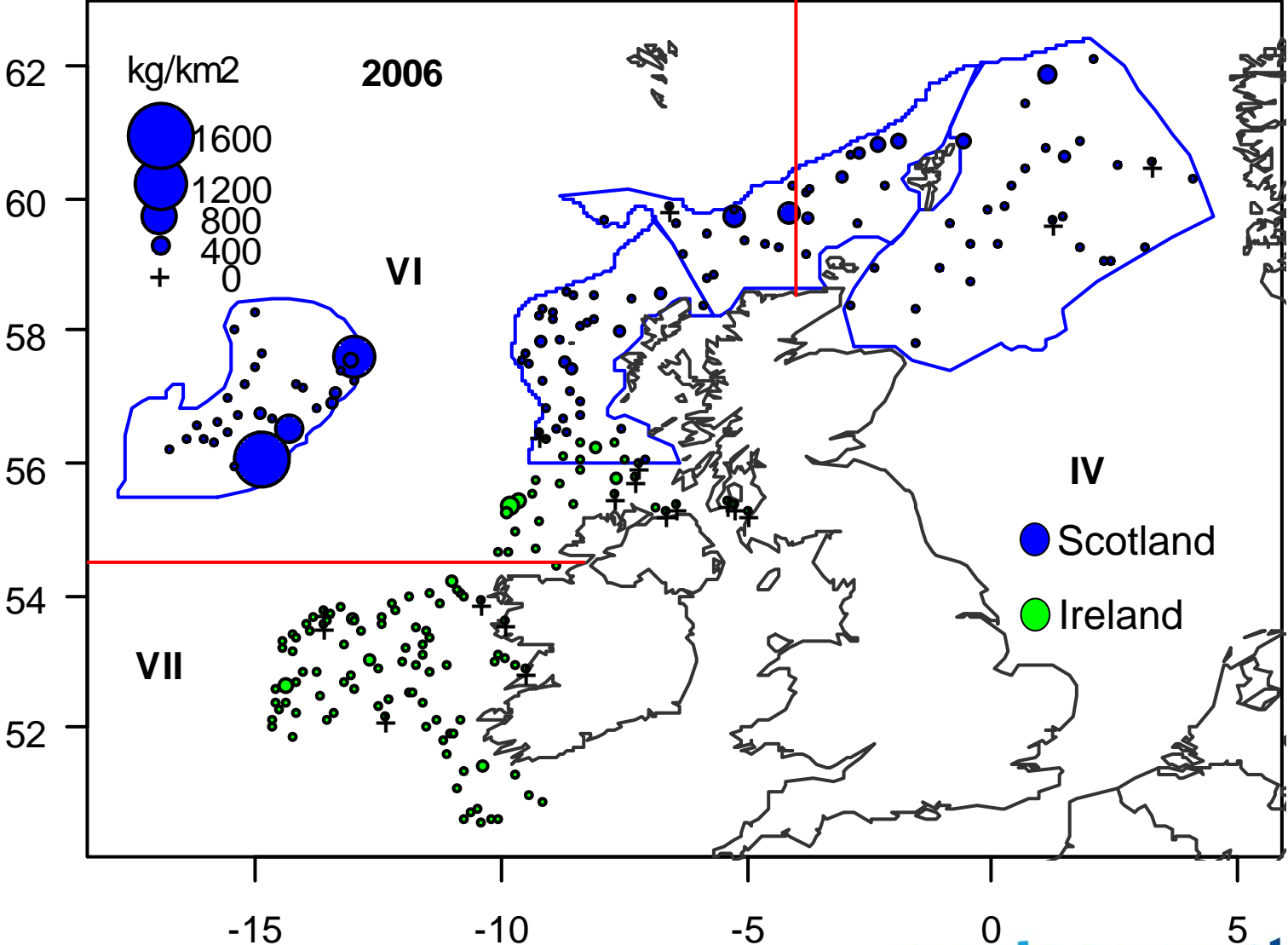
Results: Number density time series



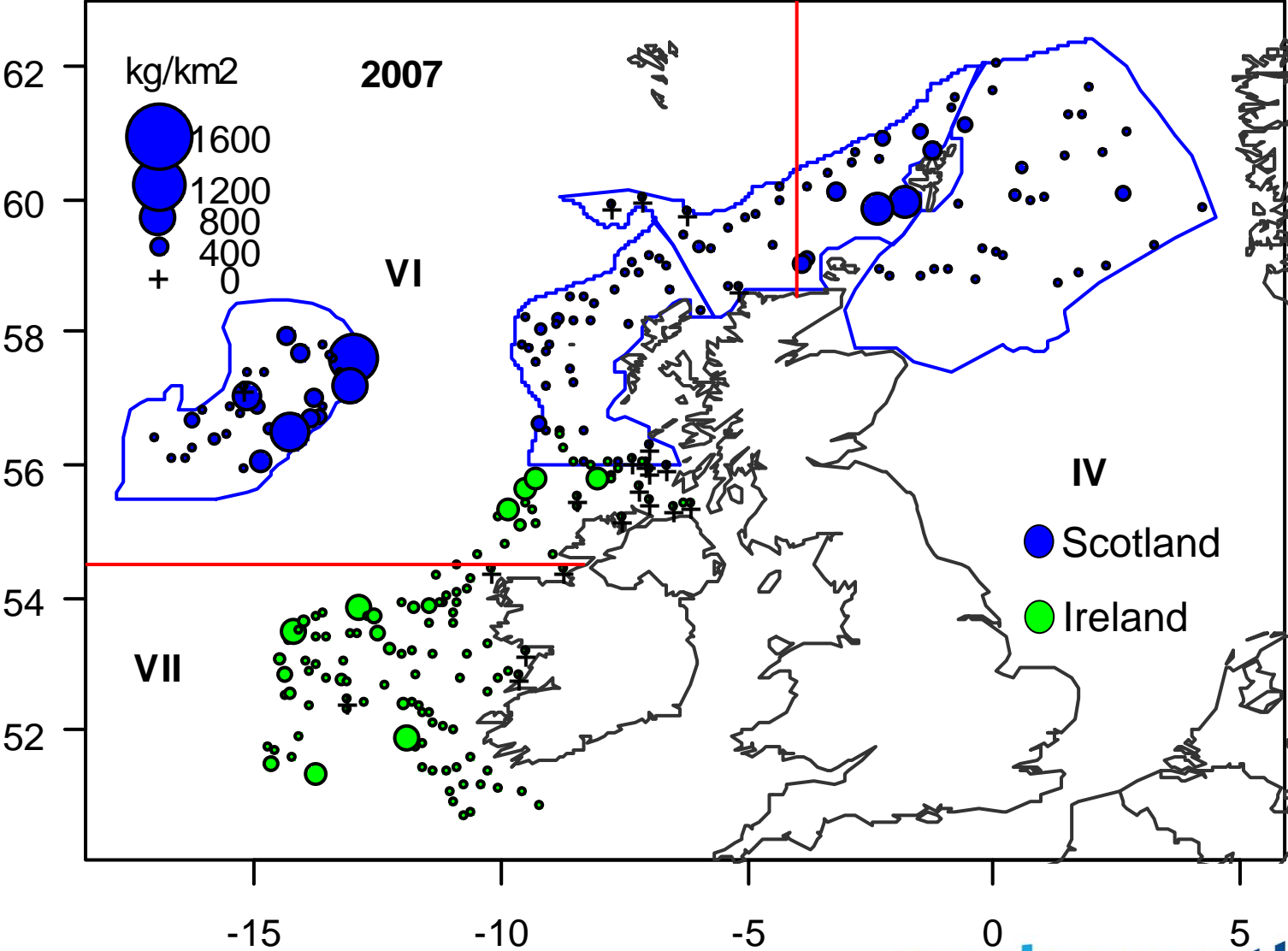
Results: Weight density time series



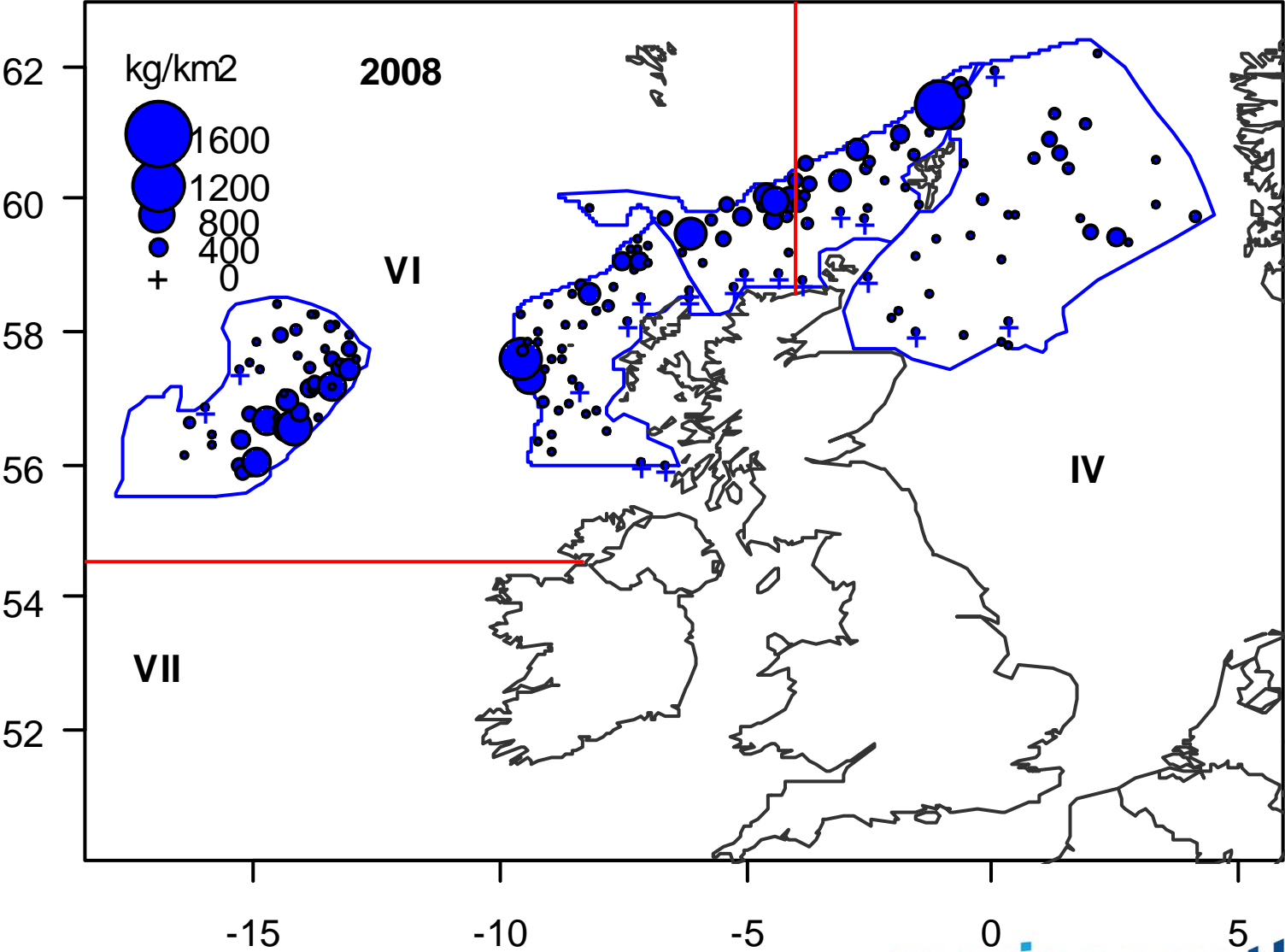
Results: Weight density time series



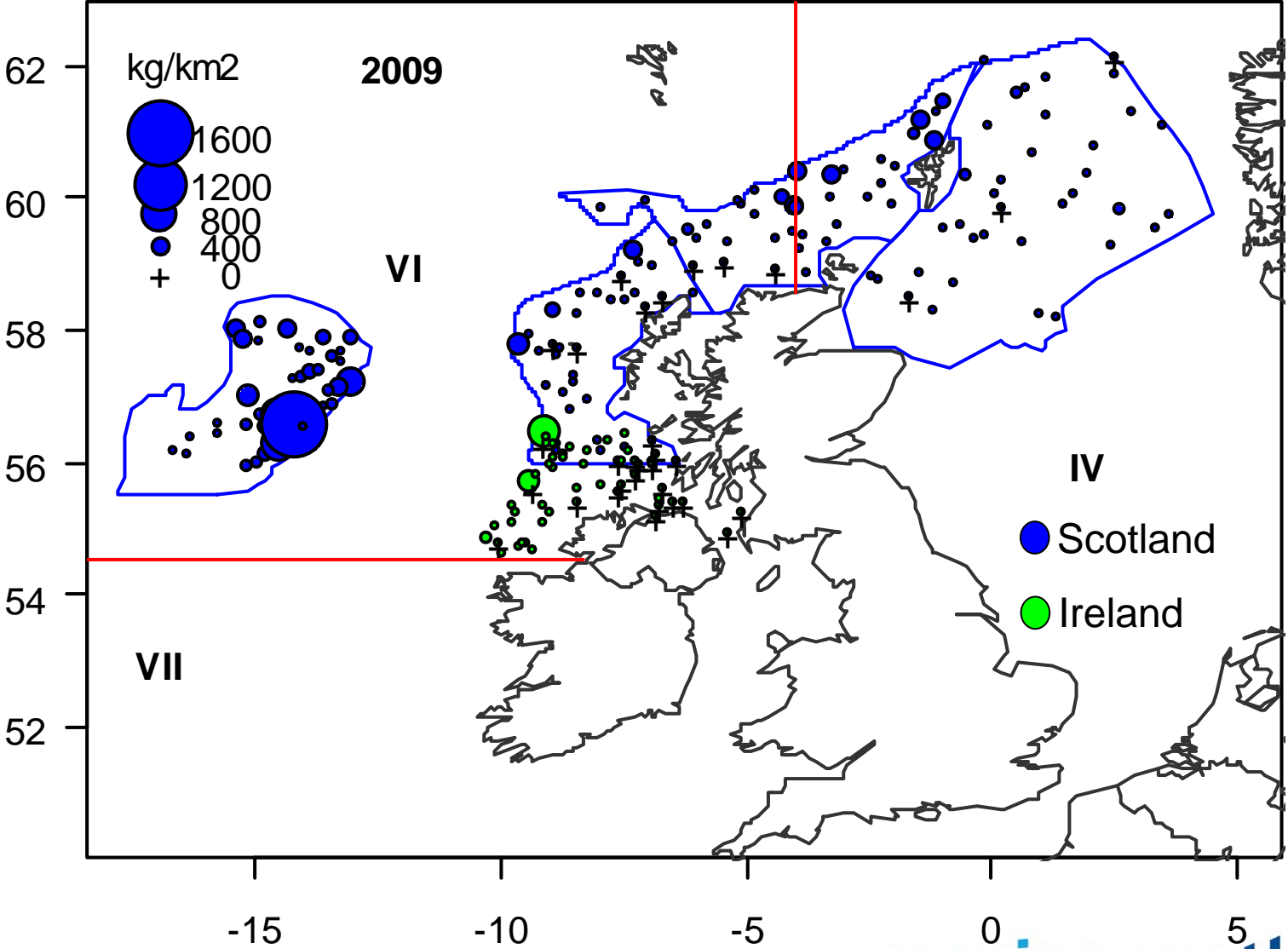
Results: Weight density time series



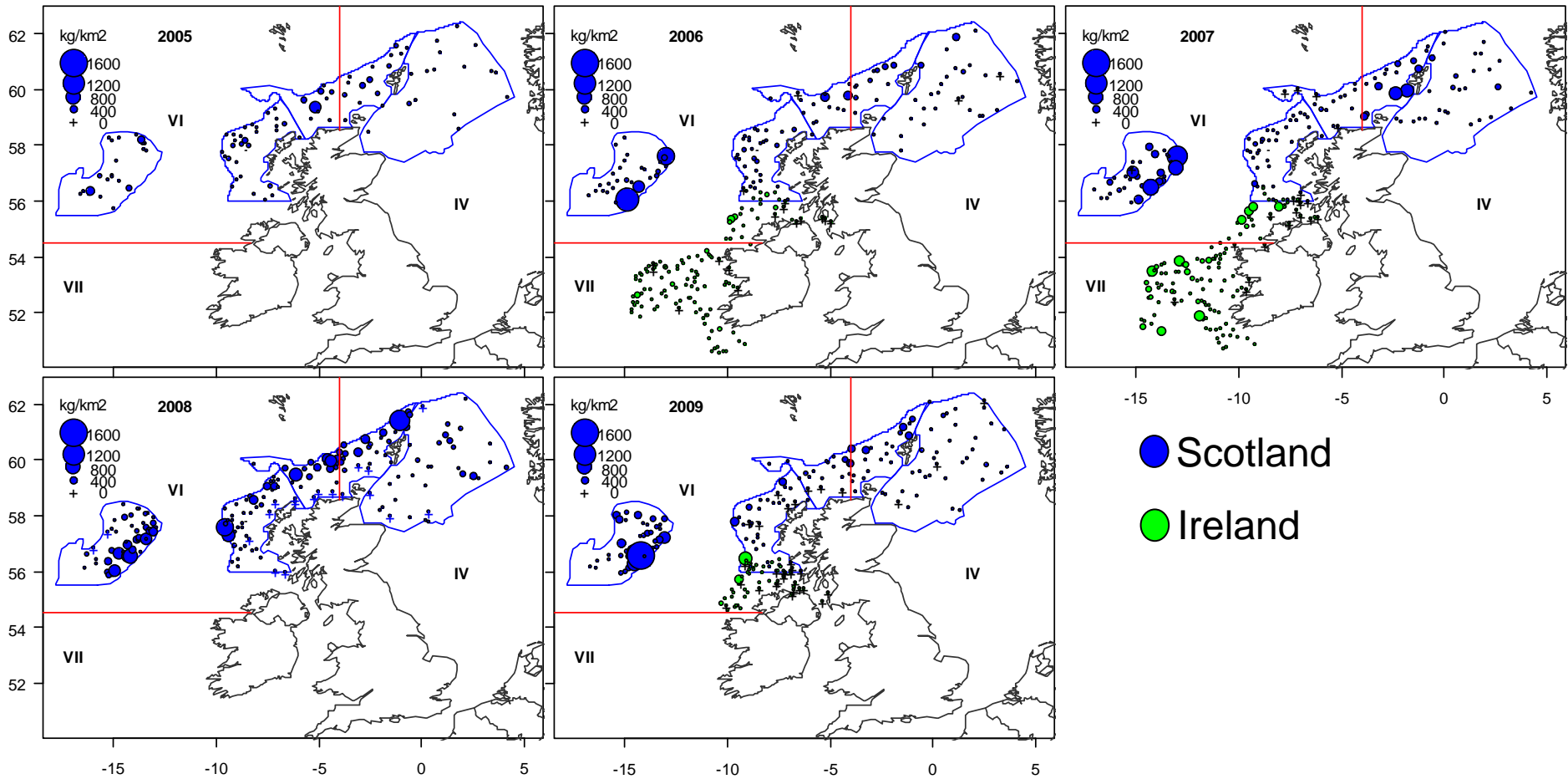
Results: Weight density time series



Results: Weight density time series

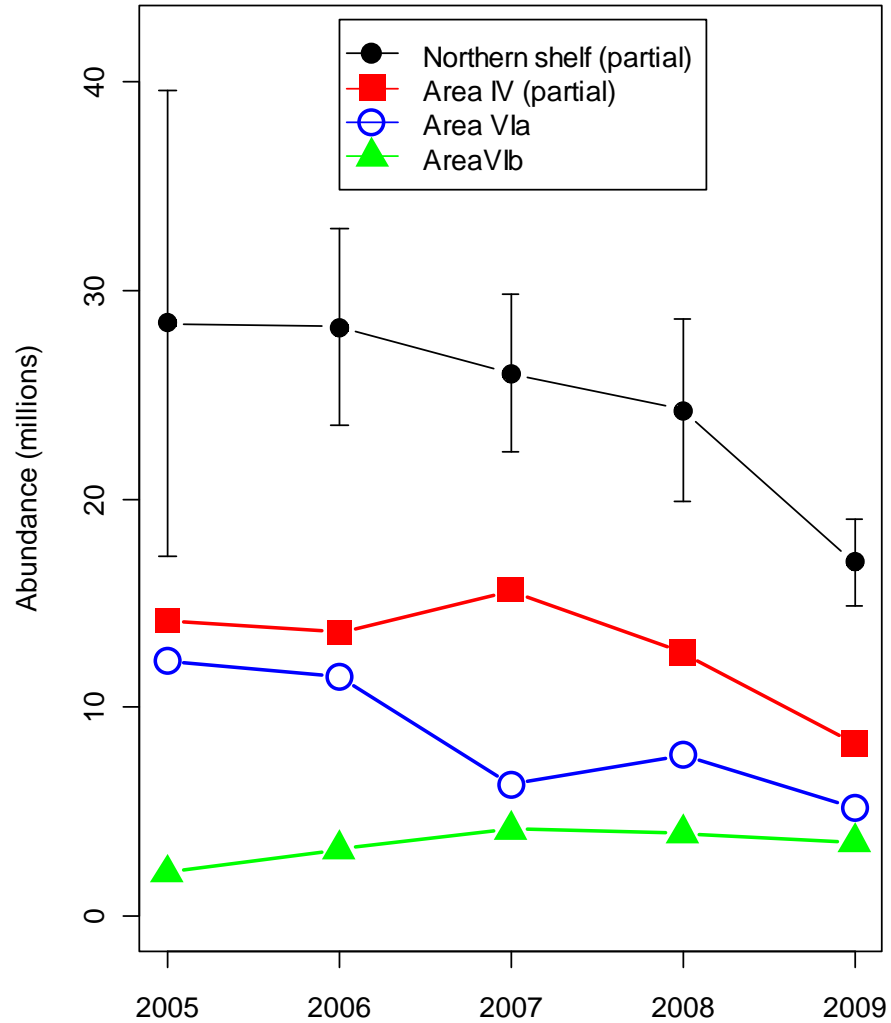


Results: Weight density time series

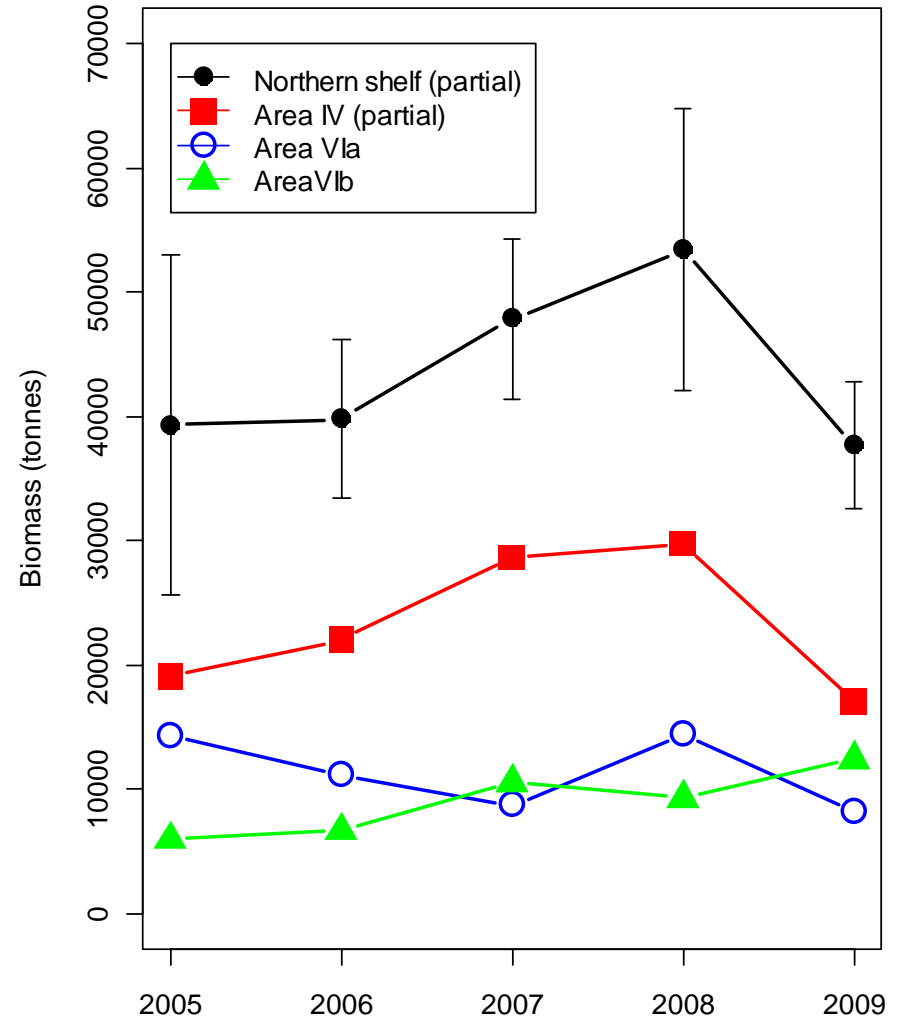


Results: Time series

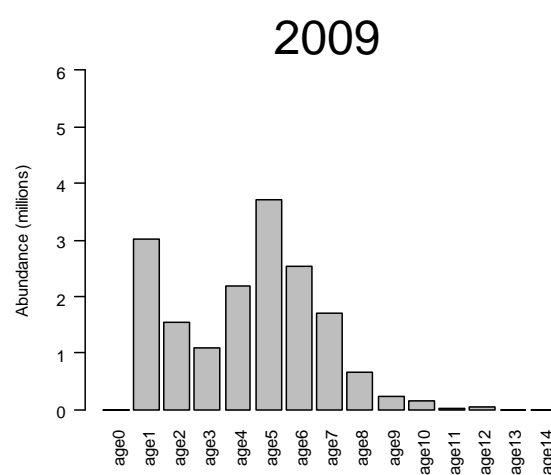
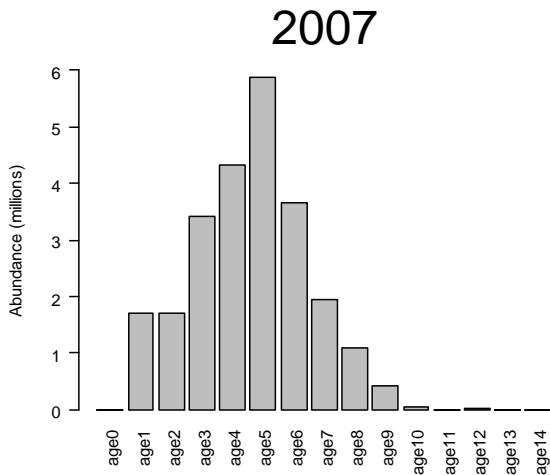
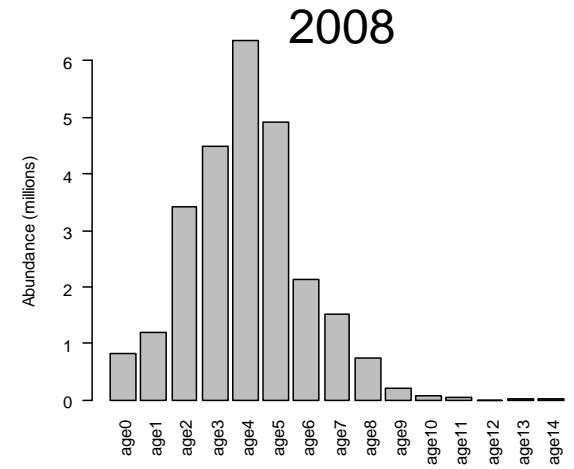
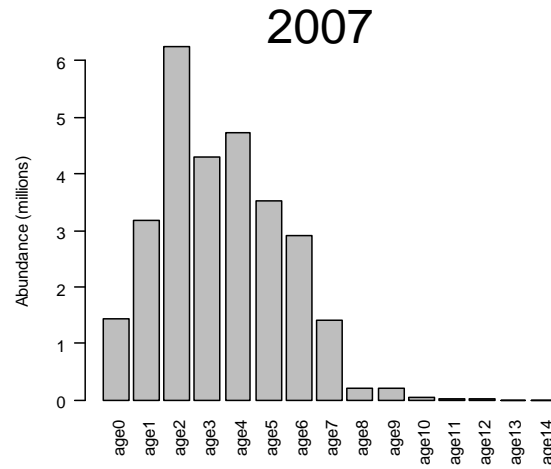
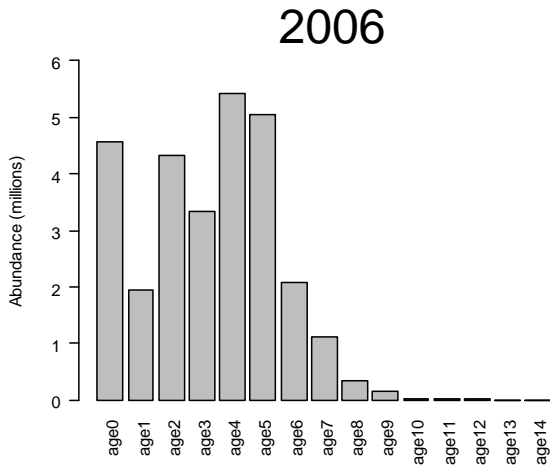
Abundance



Biomass (t)



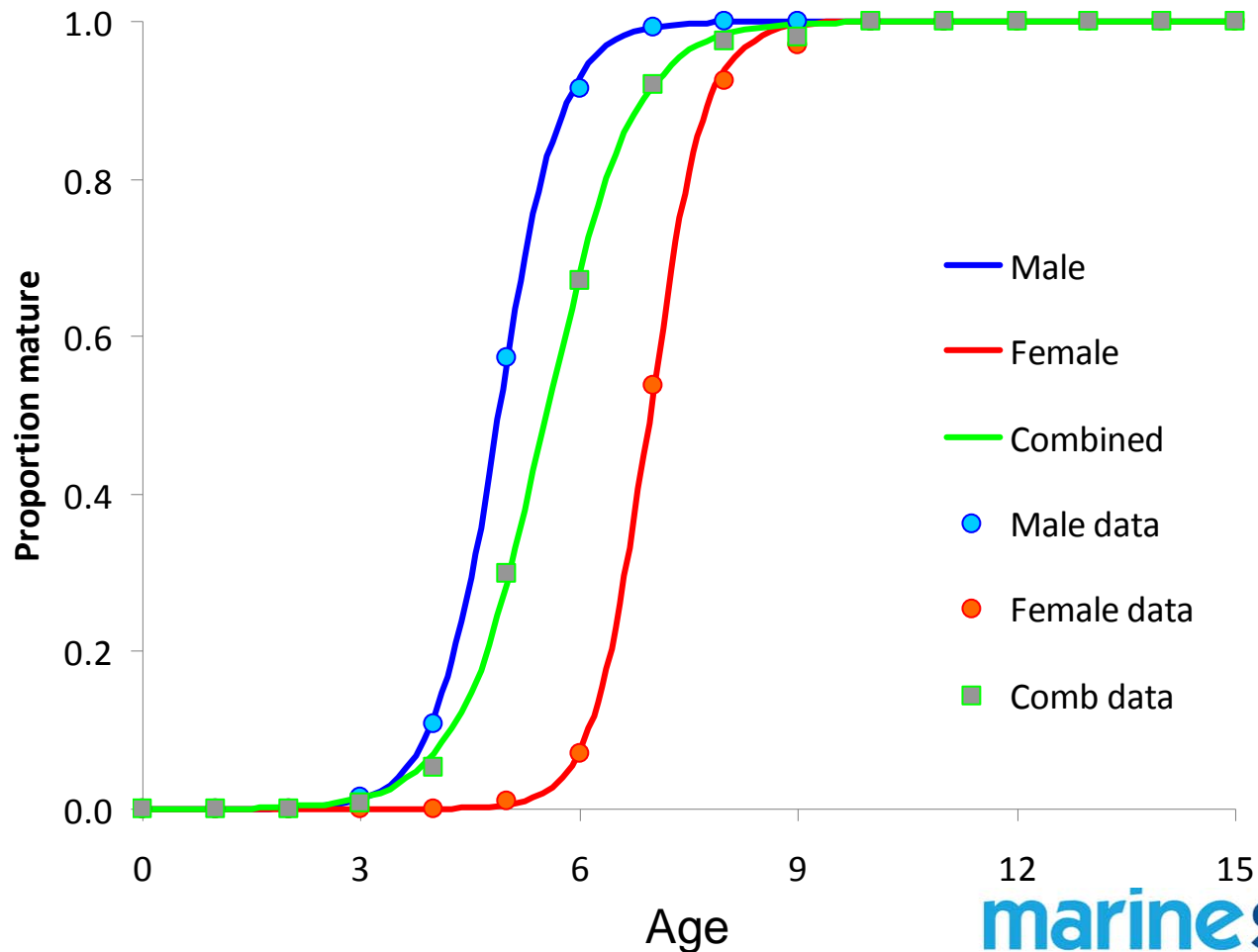
Results: Age based estimates



Next steps: Population assessment

- **Biological information**

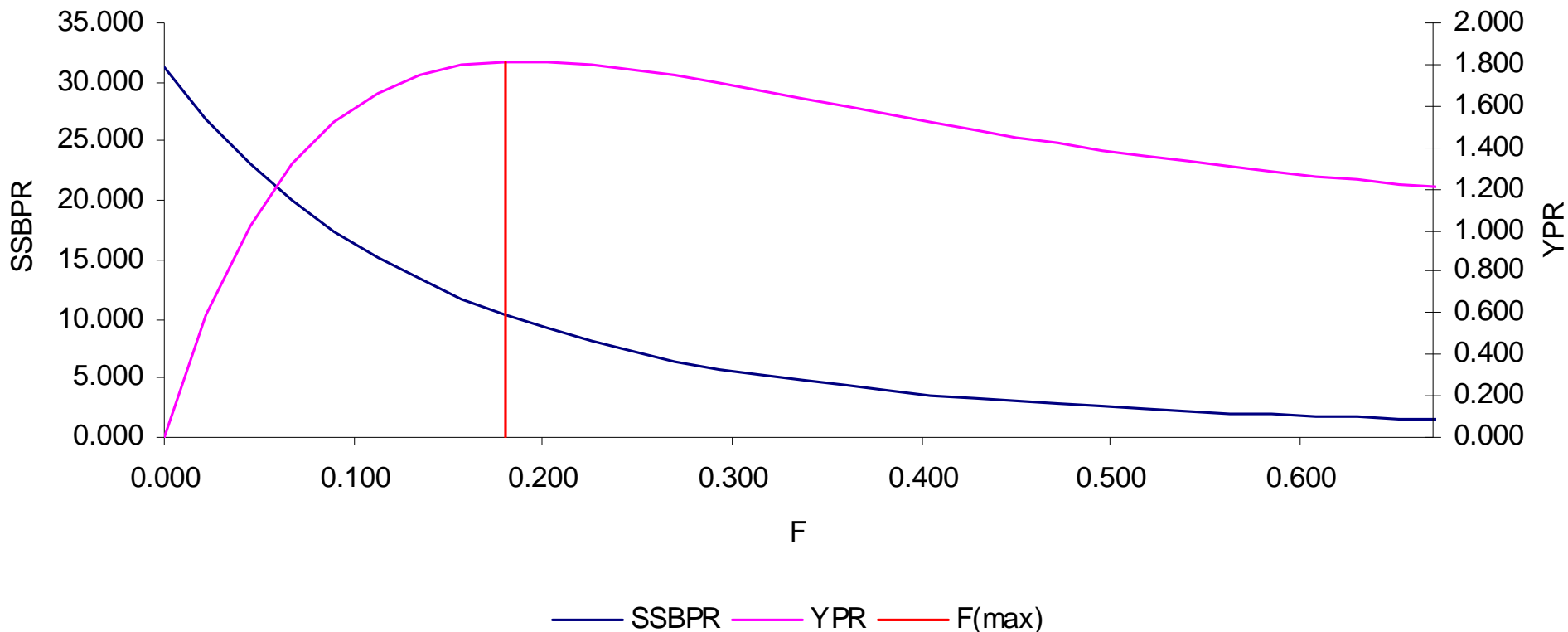
- **Maturity at age**



Next steps: Population assessment

- **Biological information**

- Fishing selection pattern required to estimate Yield per recruit

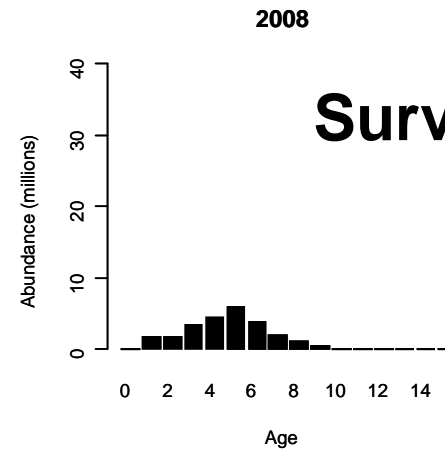
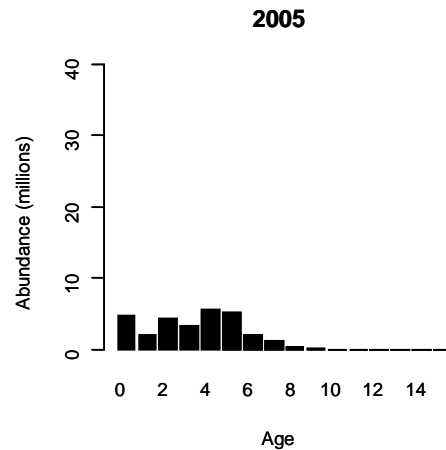


$$F_{max} \sim 0.18$$

$$F_{0.1} \sim 0.13 \quad (\text{ICES WG NSDS 2003 } F_{0.1} = 0.12)$$

Next steps: Population assessment

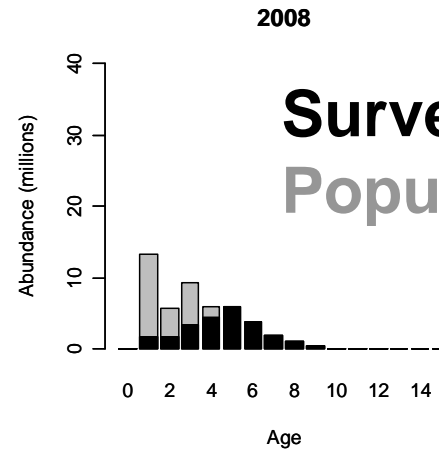
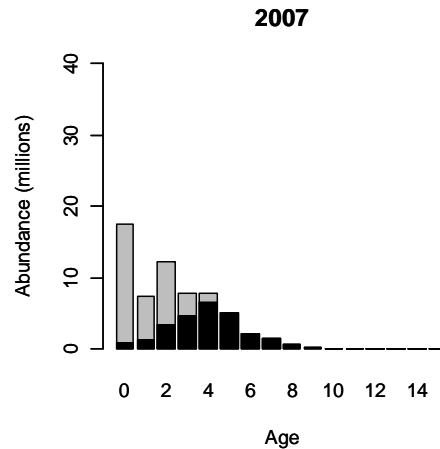
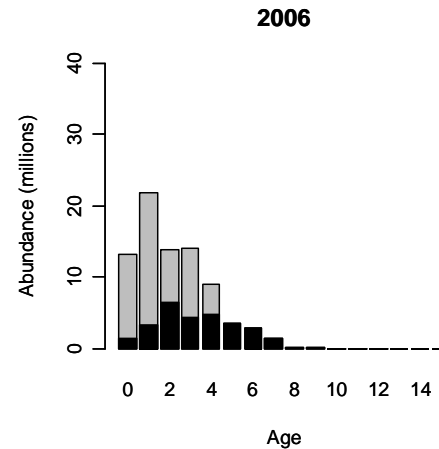
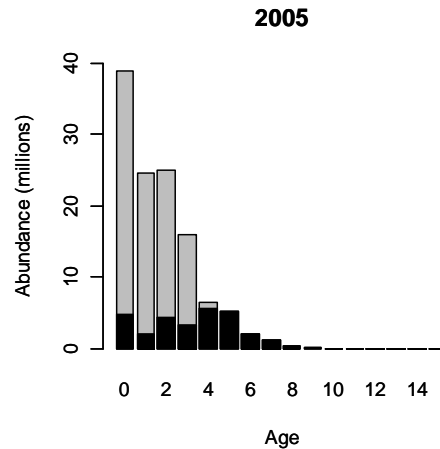
- Stock assessment model required



Survey estimates

Next steps: Population assessment

- Stock assessment model required

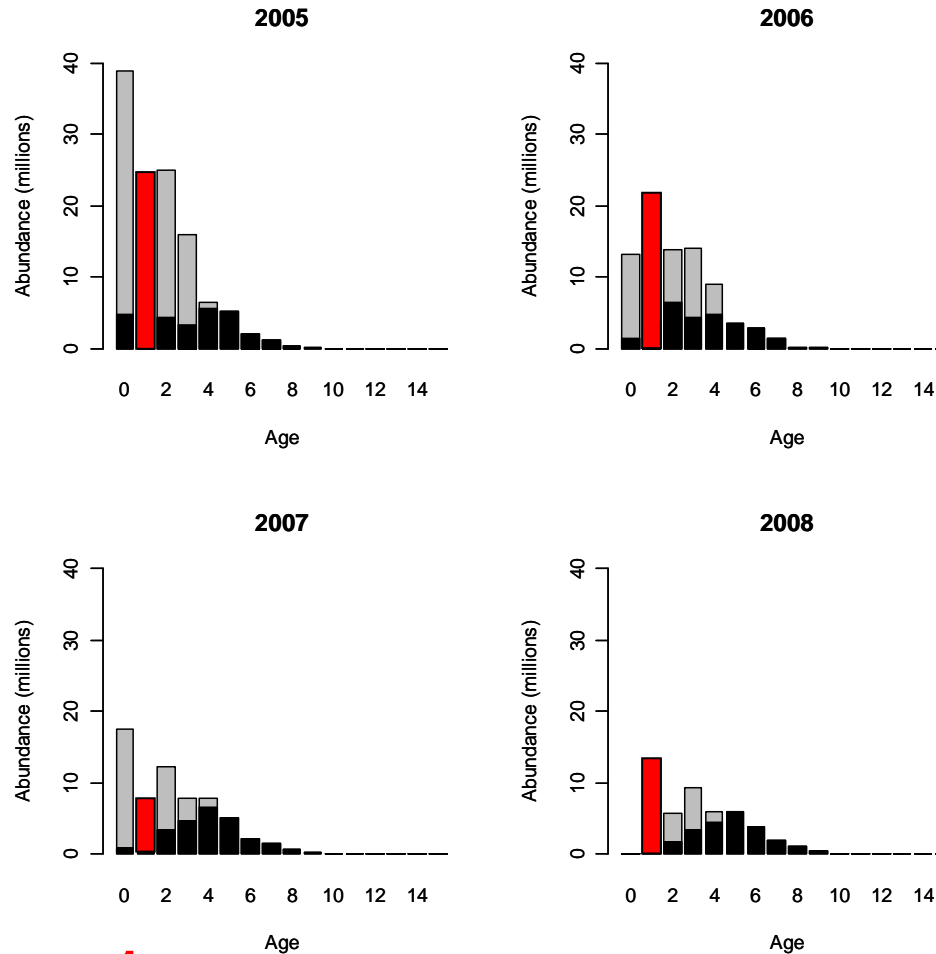


Survey estimates
Population estimates*

*example only,
not actual figures

Next steps: Population assessment

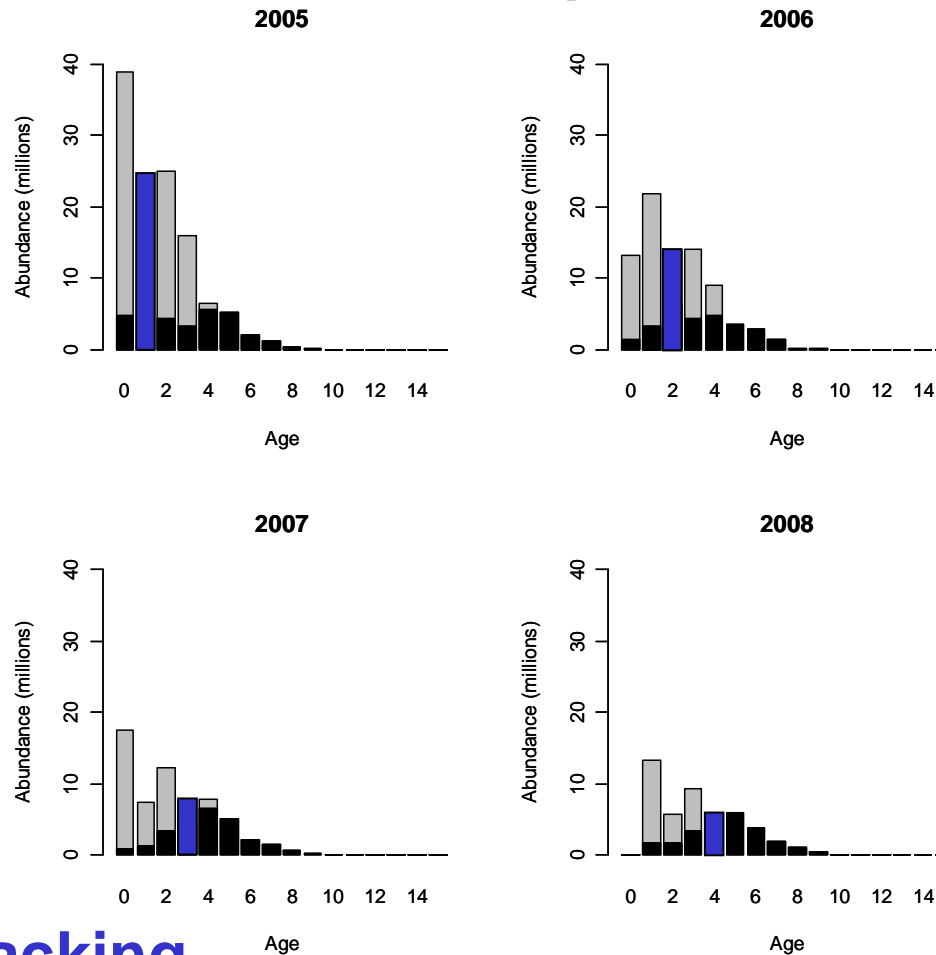
- Stock assessment model required



Recruits at age 1

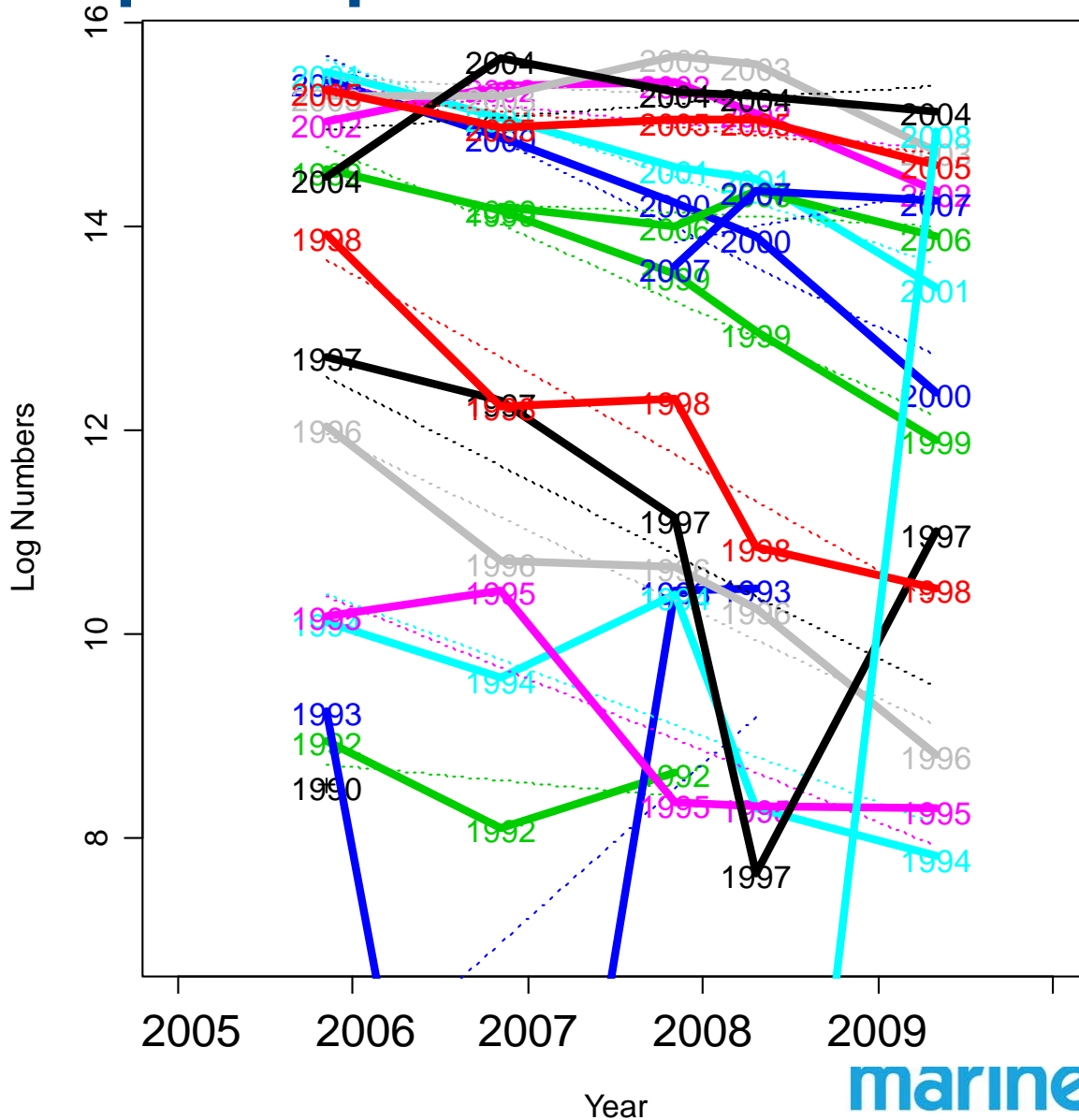
Next steps: Population assessment

- Stock assessment model required



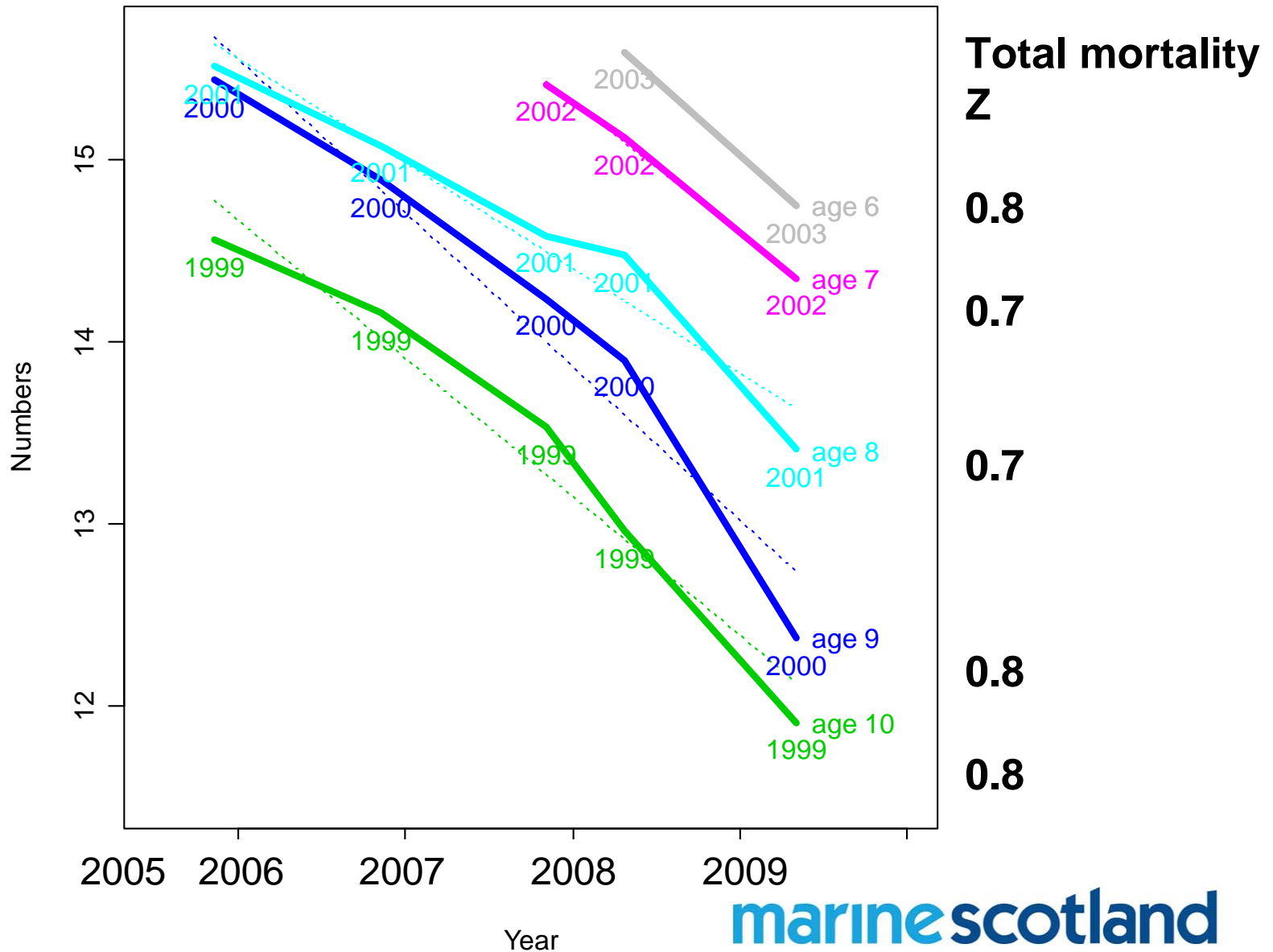
year class tracking
e.g. 2004 year class

Next steps: Population assessment

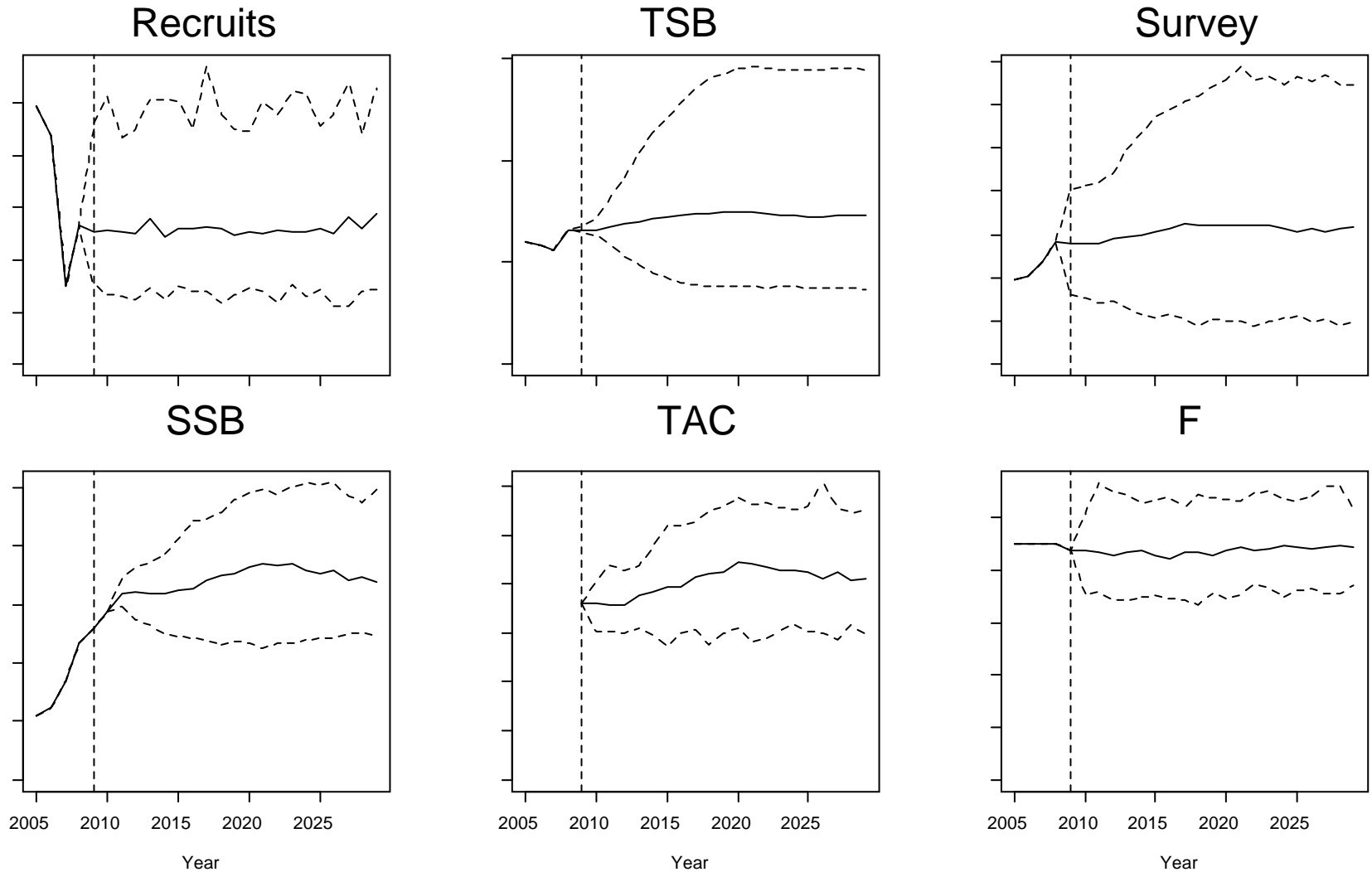


**Year class
or cohort
abundance
by year**

Next steps: Population assessment



Next steps: Management strategy evaluation*



*illustrative example only, not actual figures

Anglerfish on the northern shelf

- **Absolute biomass of anglerfish on the Northern Shelf in 2009 ~ minimum of 37,700 tonnes**
 - 20,600 tonnes - Sub-area VI (west of Scotland)
 - 17,100 tonnes - northern part of Sub-area IV (North Sea).
- **ICES approved use of surveys as indicators of relative changes in the population of anglerfish**
 - biomass increased in most areas from 2005 to 2008, but decreased in 2009.
- **Following the new rules for setting TACs, as proposed by the European Commission, implies no change to the TACs:**
 - Division VIb (Rockall) is the only area where there has been an increase in abundance and biomass over the past five years.
- **Work ongoing to determine how to manage the stock**

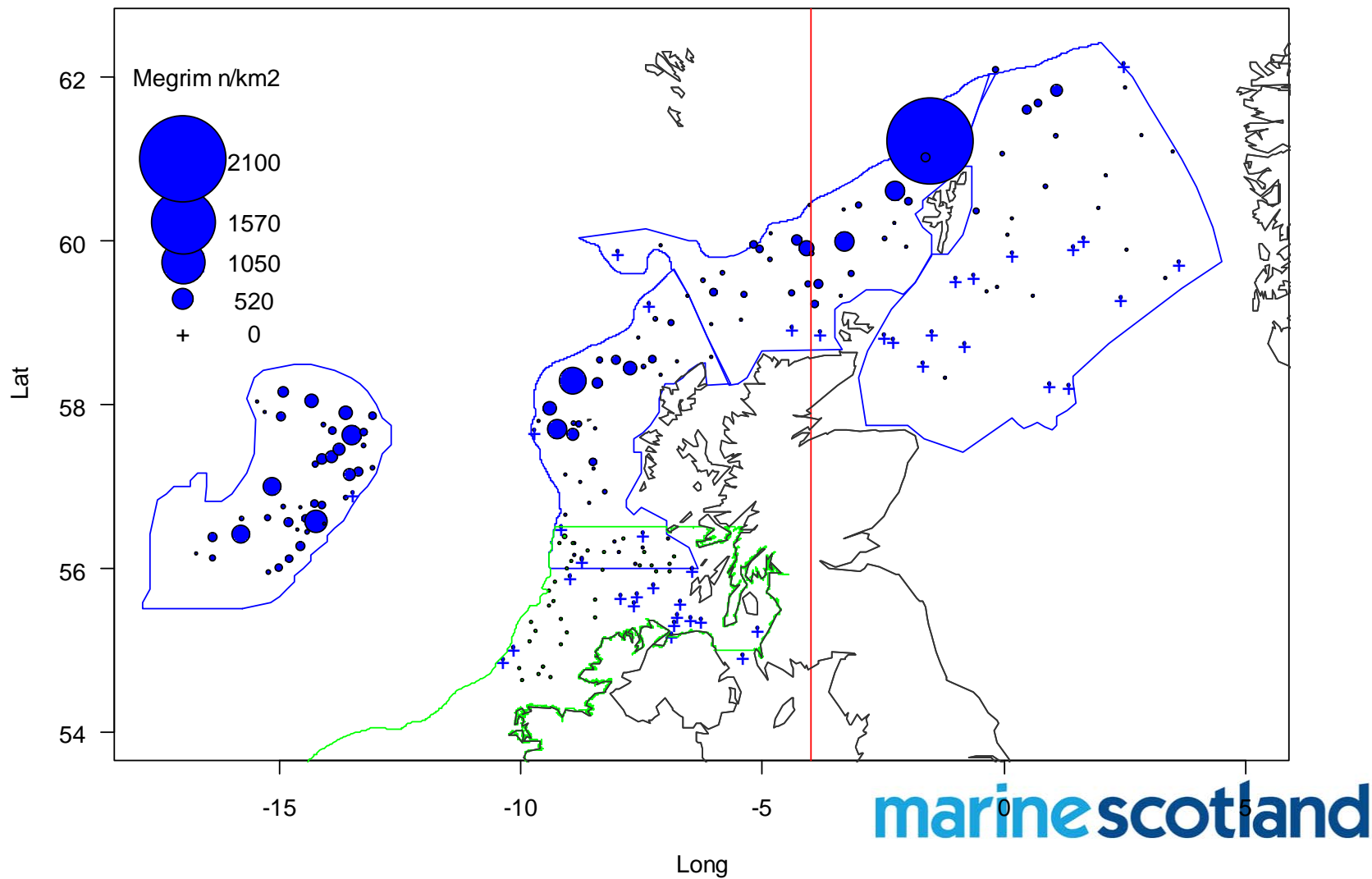
Megrim on the northern shelf

Megrim = *Lepidorhombus whiffiagonis*

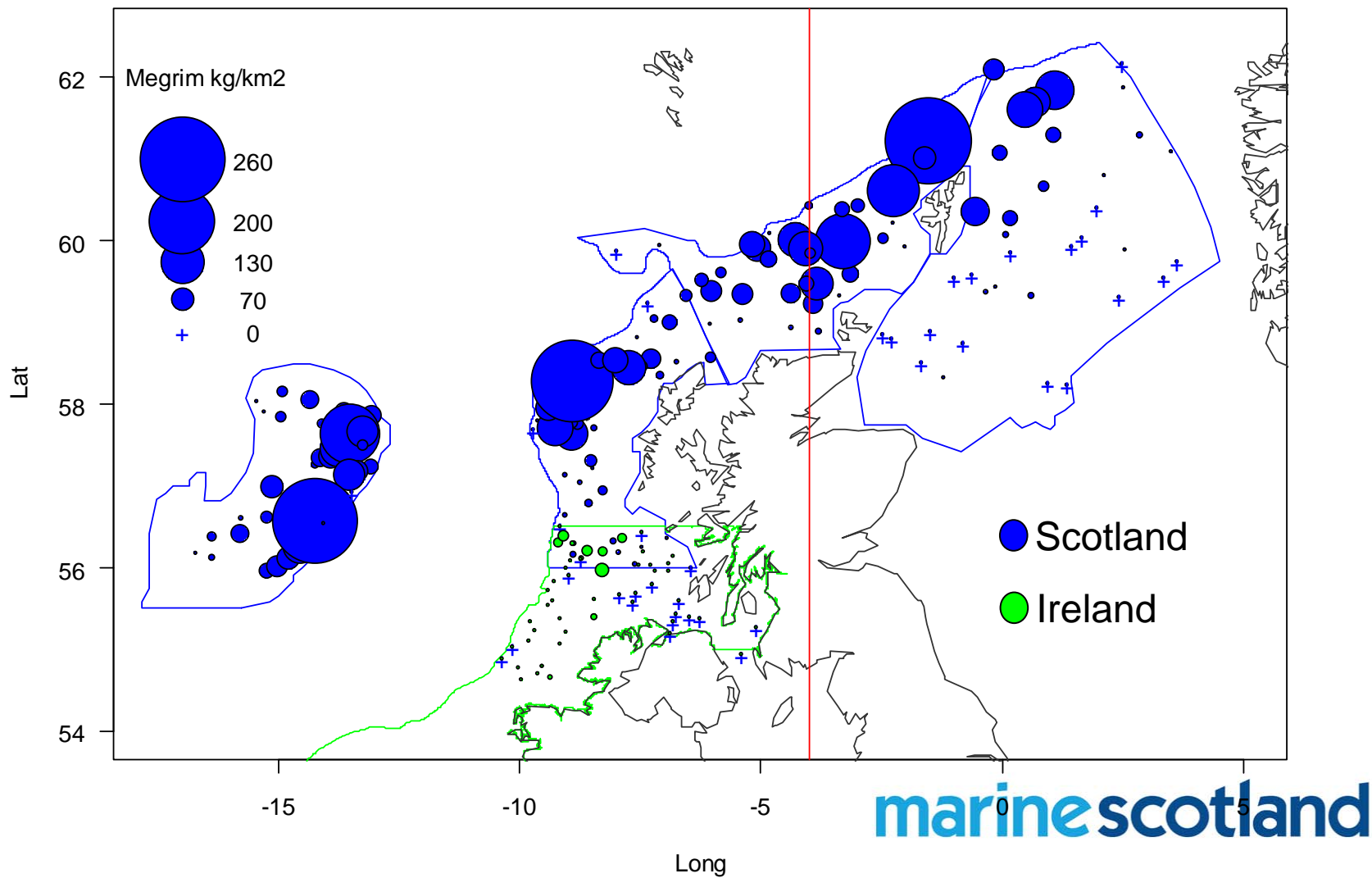
- *L. whiffiagonis* & *L. boscii* (four spotted megrim)
- ~ 1% *L. boscii*



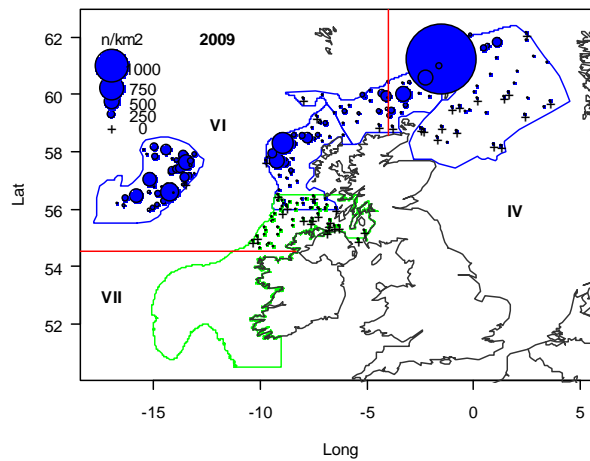
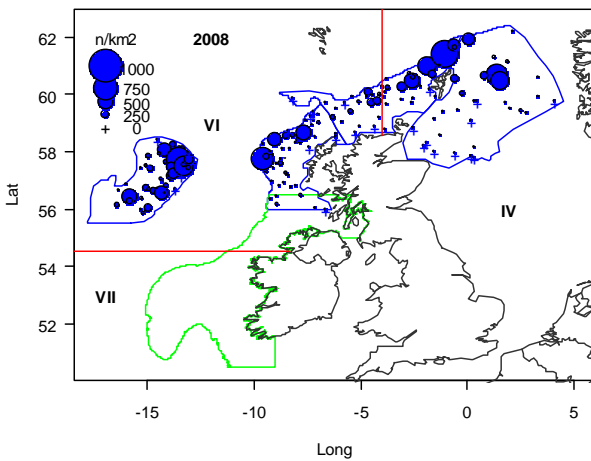
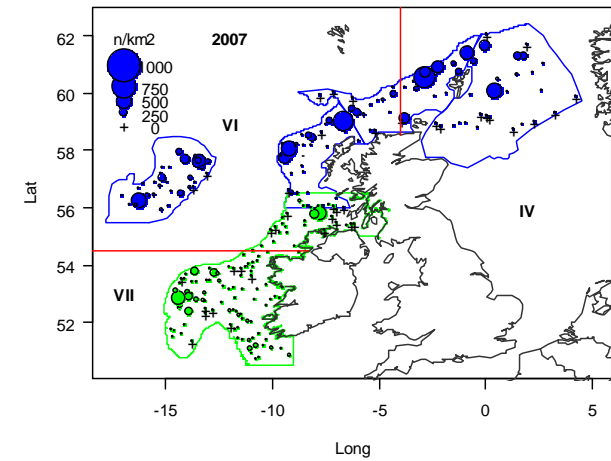
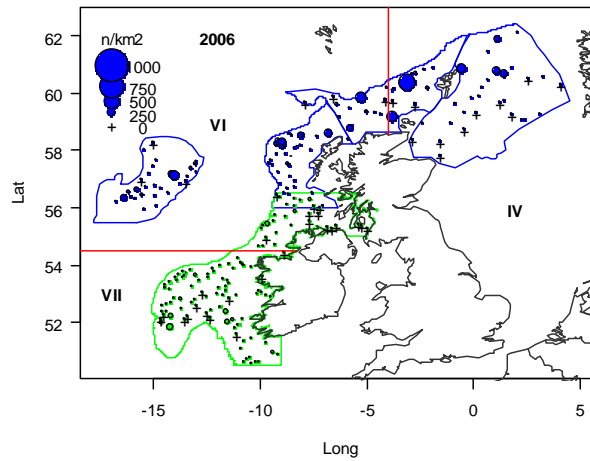
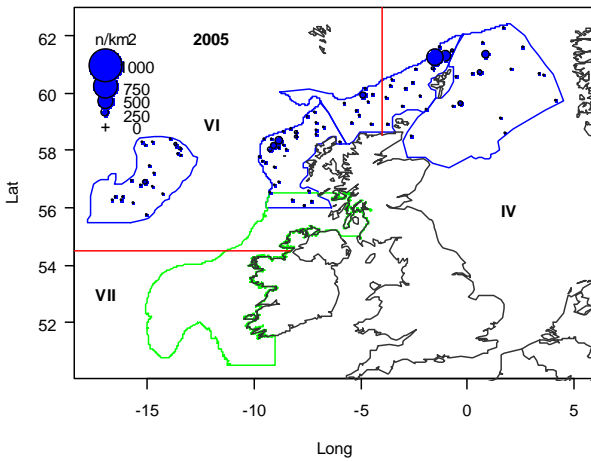
2009 Number density



2009 Weight density



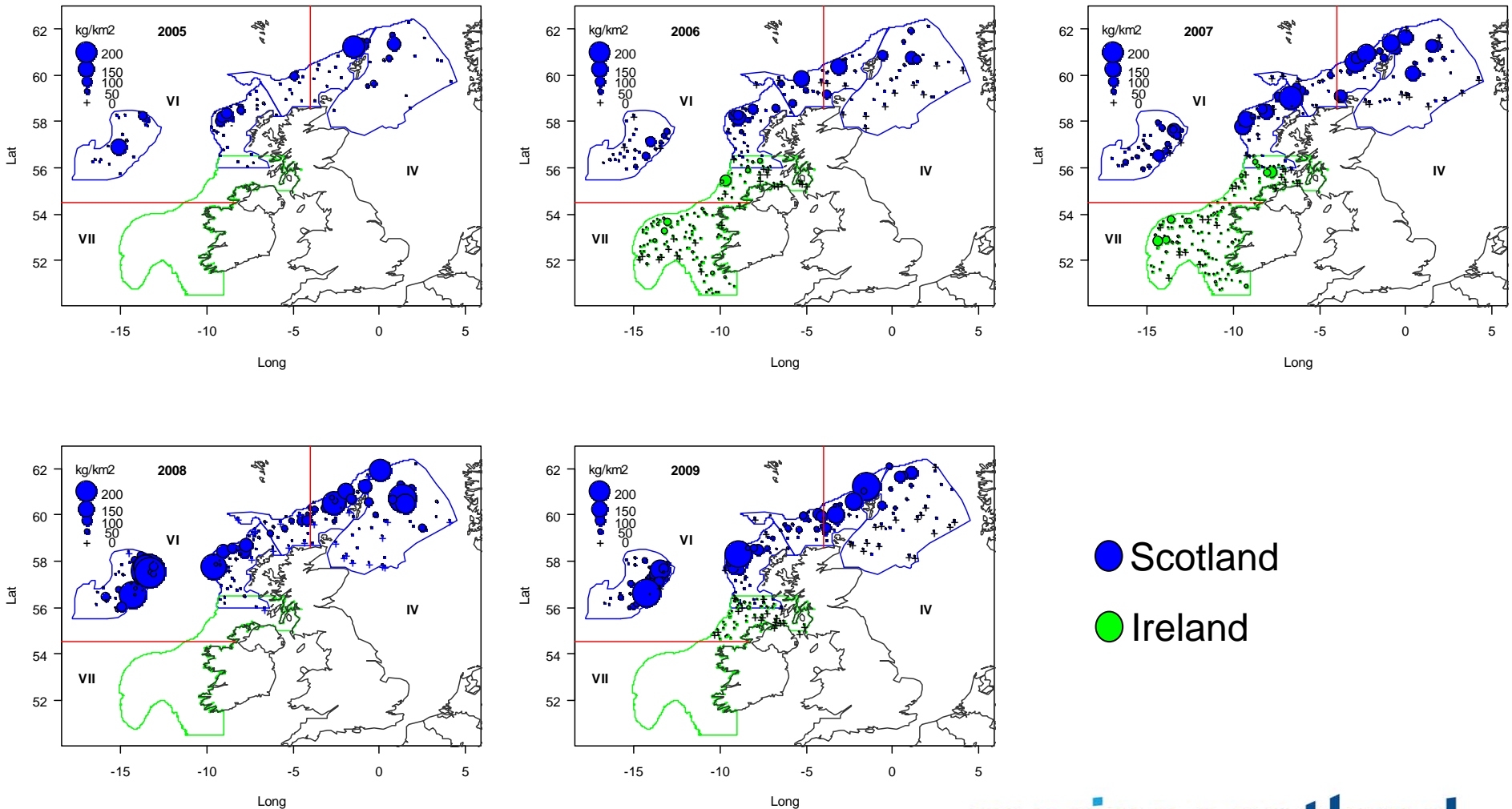
Number density time series



● Scotland

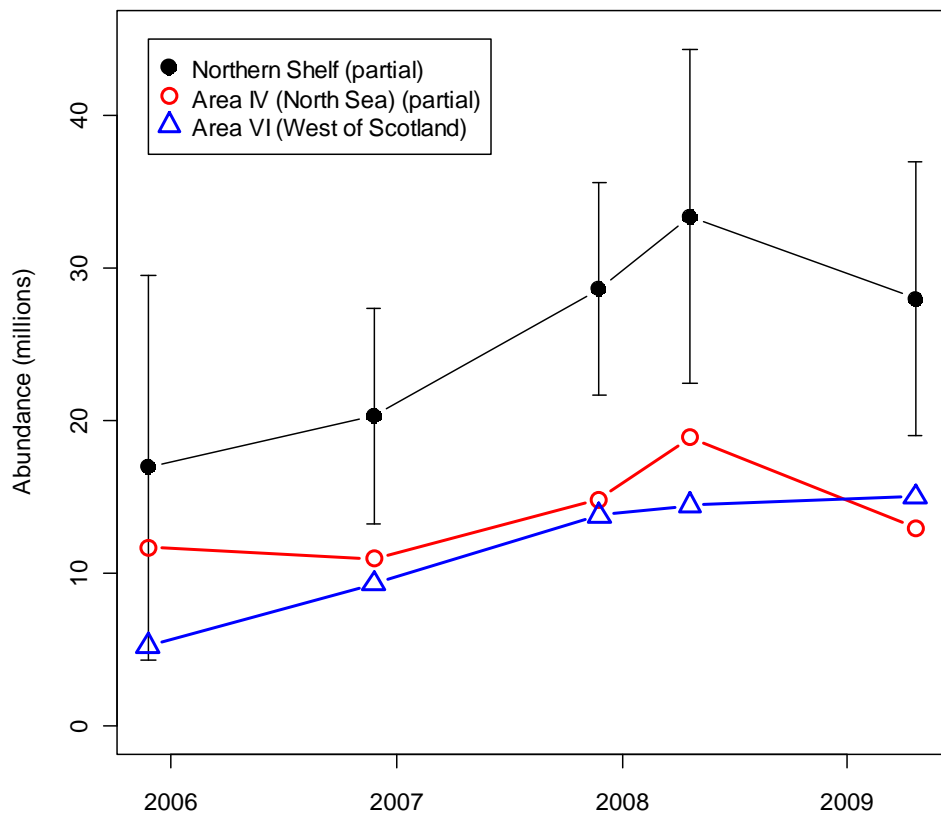
● Ireland

Weight density time series

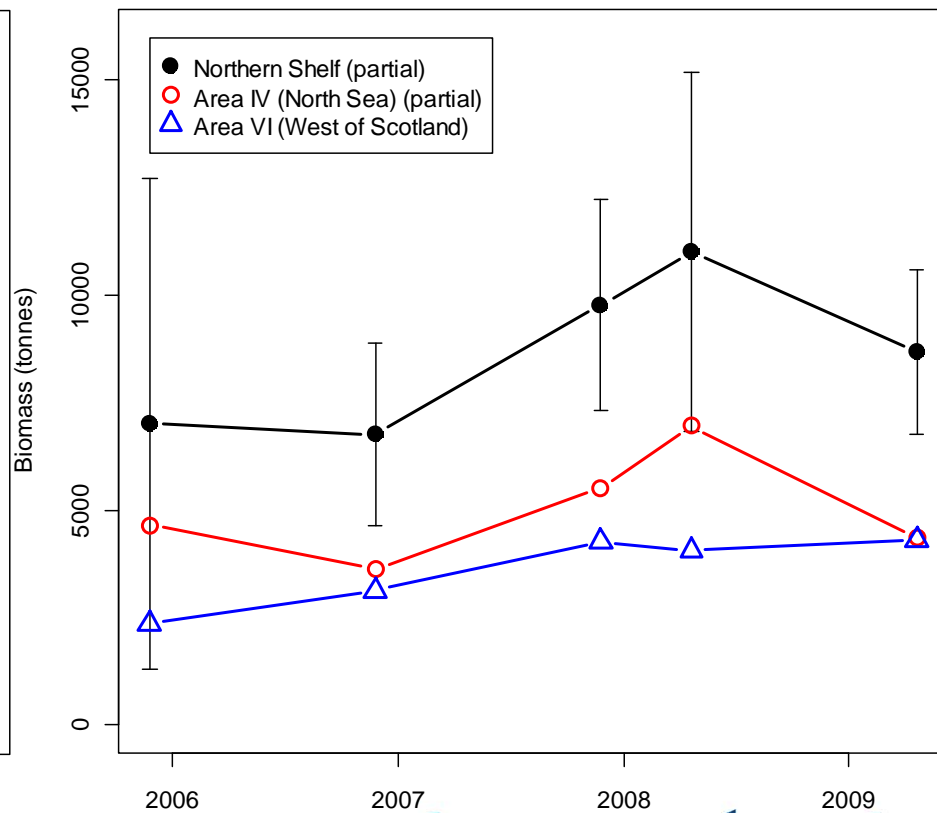


Time series

Abundance



Biomass (t)

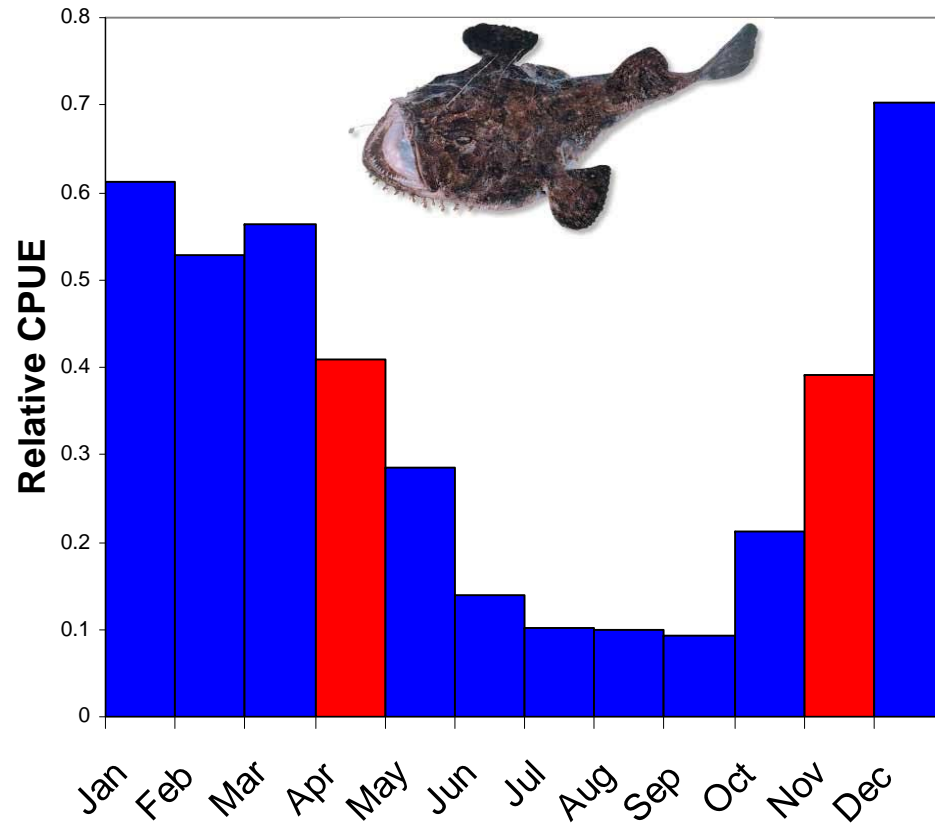


Megrim on the northern shelf

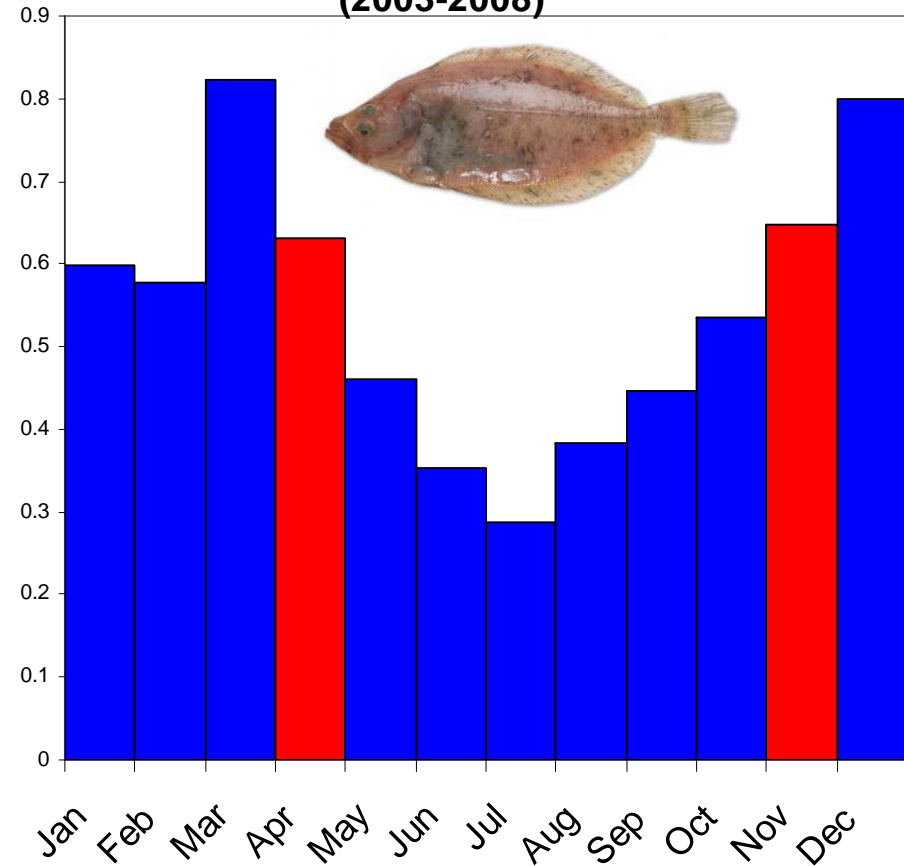
- ***Biomass index in 2009 = 8,673 tonnes:***
 - *4,312 tonnes - Sub-area VI (west of Scotland)*
 - *4,361 tonnes - northern part of Sub-area IV (North Sea).*
- ***ICES approved use of these surveys as indicators of relative changes in the population of megrim: abundance and biomass have increased in recent years.***
- ***Following the new rules for setting TACs, as proposed by the European Commission, implies increases of 15% for the 2010 TACs in both ICES Sub-areas IV and VI, relative to those in 2009.***

Survey timing: Nov (2005-2007) – April (2008-2009)

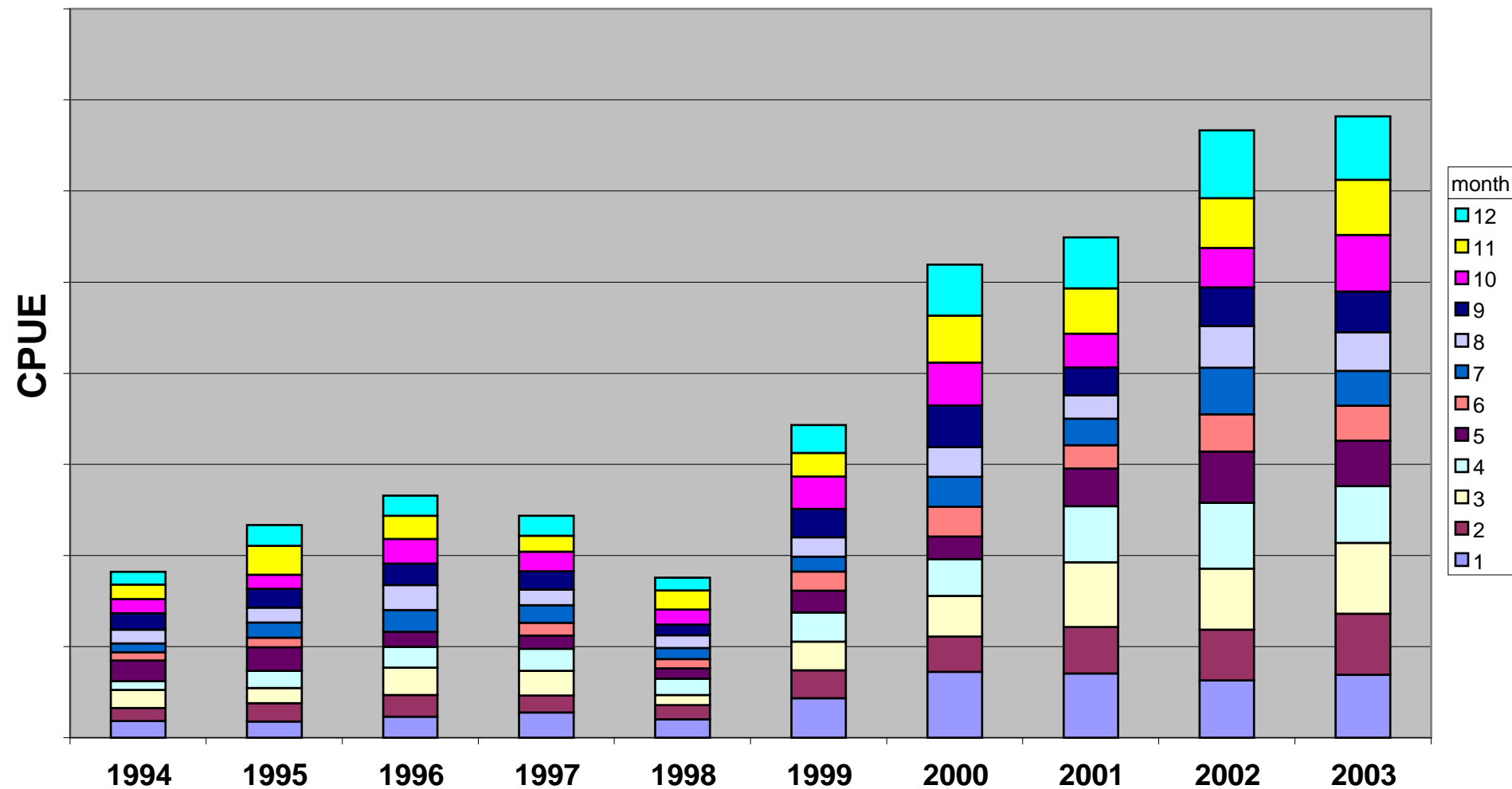
Anglerfish average relative CPUE
(2003-2008)



Megrim average relative CPUE
(2003-2008)



Catch rates from fishermen's diaries 1994 - 2003



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