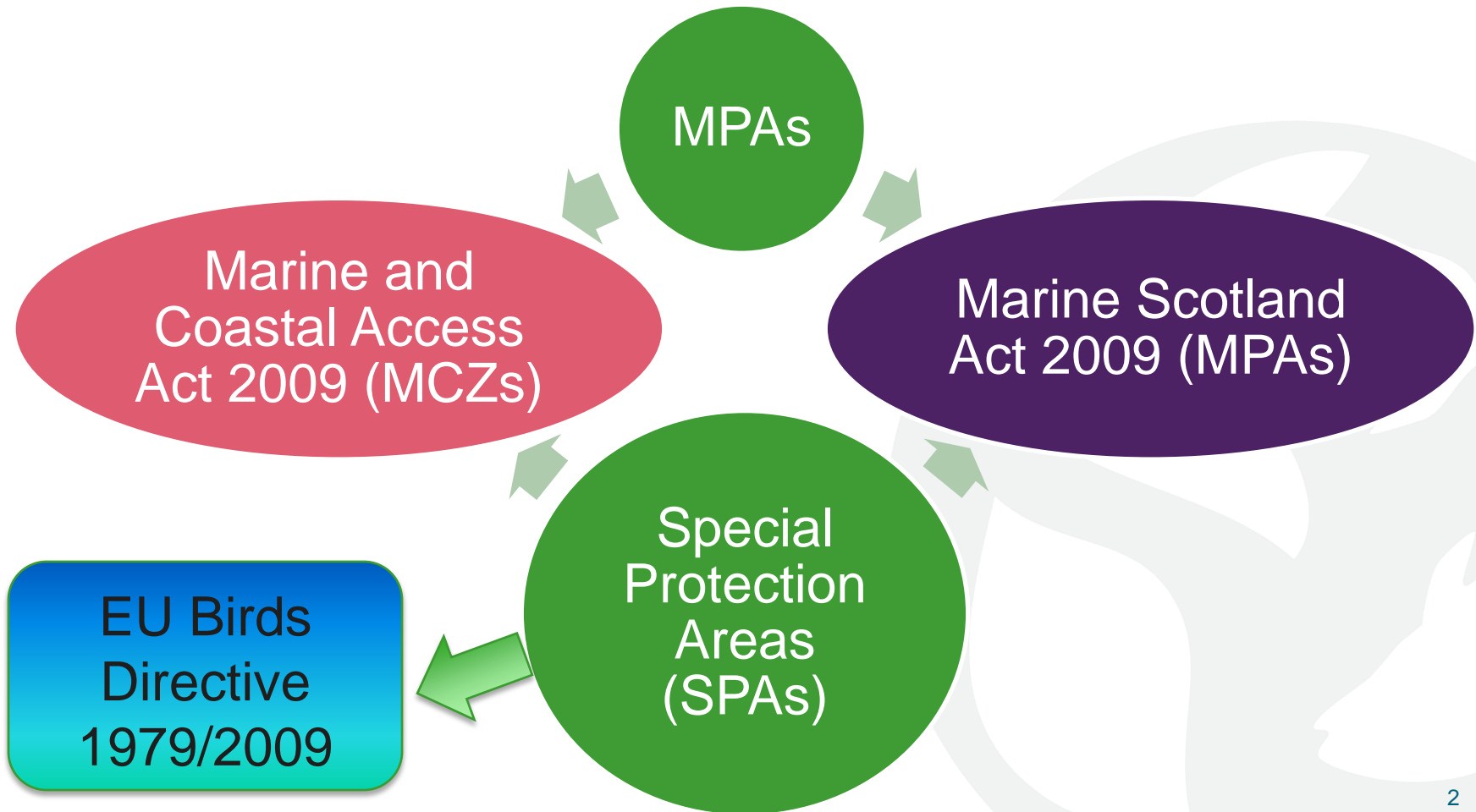


Using the spatial distribution of inshore marine birds to identify sites for MPAs around the United Kingdom

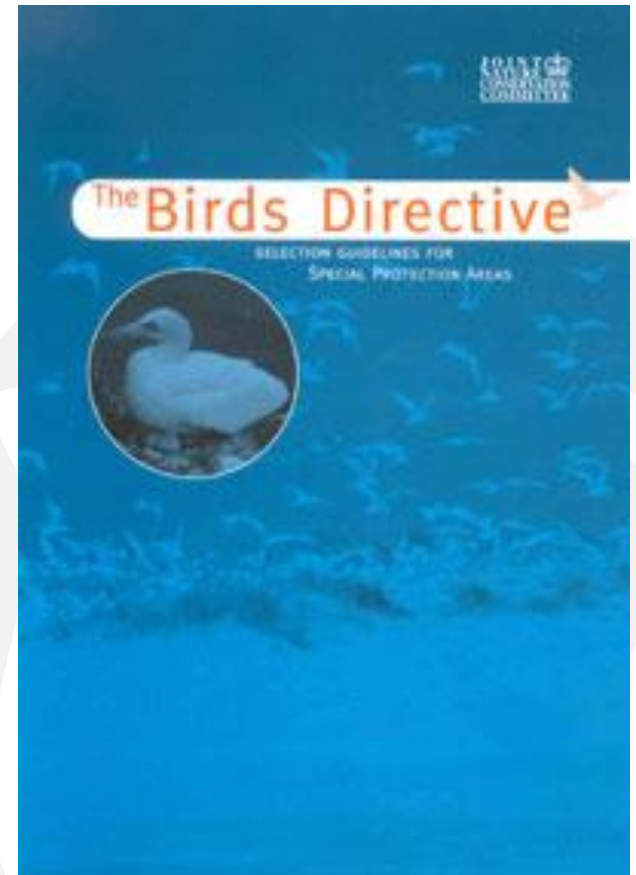
Andy Webb*, Sue O'Brien, Ilka Win, Chris Bingham,
Linda Wilson, Kerstin Kober, Julie Black, J.B Reid, Claire
Shaw, Ben Dean, Mark Lewis

Marine Protected Areas in the UK



What are Special Protection Areas?

- “EU Birds Directive”
(Council directive 79/409/EEC, 1979)
 - Applies on land and at sea
 - breeding, feeding, wintering and migrating birds
 - rare and vulnerable species (Annex 1) and migratory birds
 - UK has developed guidelines for selecting SPAs

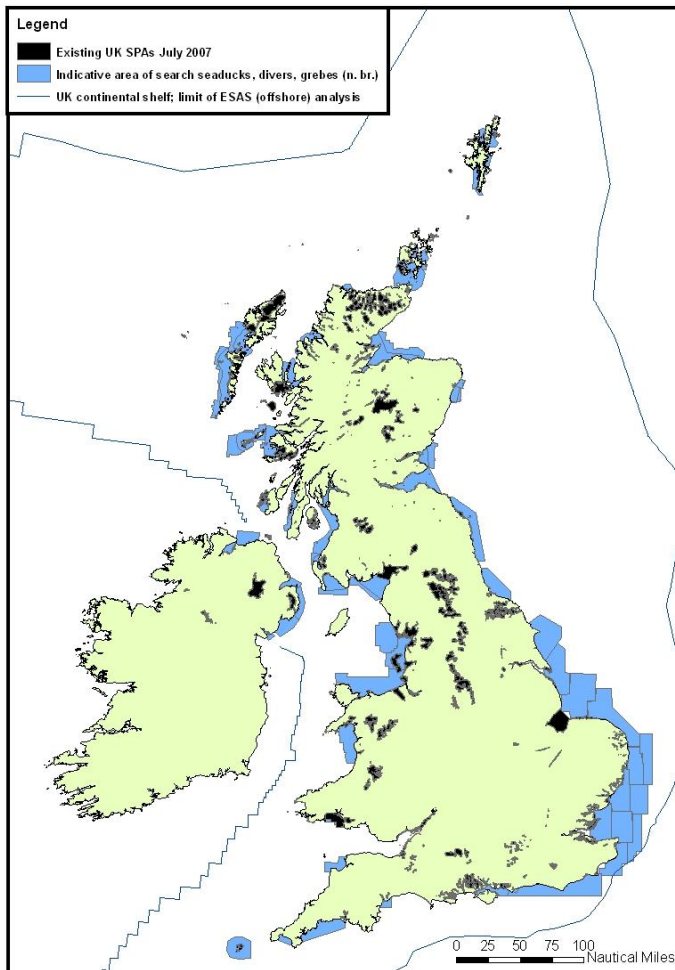


Types of marine SPA

- 1) marine extensions to existing seabird colony SPAs
- 2) inshore aggregations of non-breeding waterbirds
- 3) offshore aggregations of seabirds
- 4) other types of SPA



SPAs for inshore waterbirds



- 49 'Areas of Search'
- Wanted a strategic approach to identifying most suitable sites and their boundaries
- Under considerable time pressure (renewables developments)
- First step – estimate inshore waterbird numbers in search areas

Getting data on inshore waterbirds

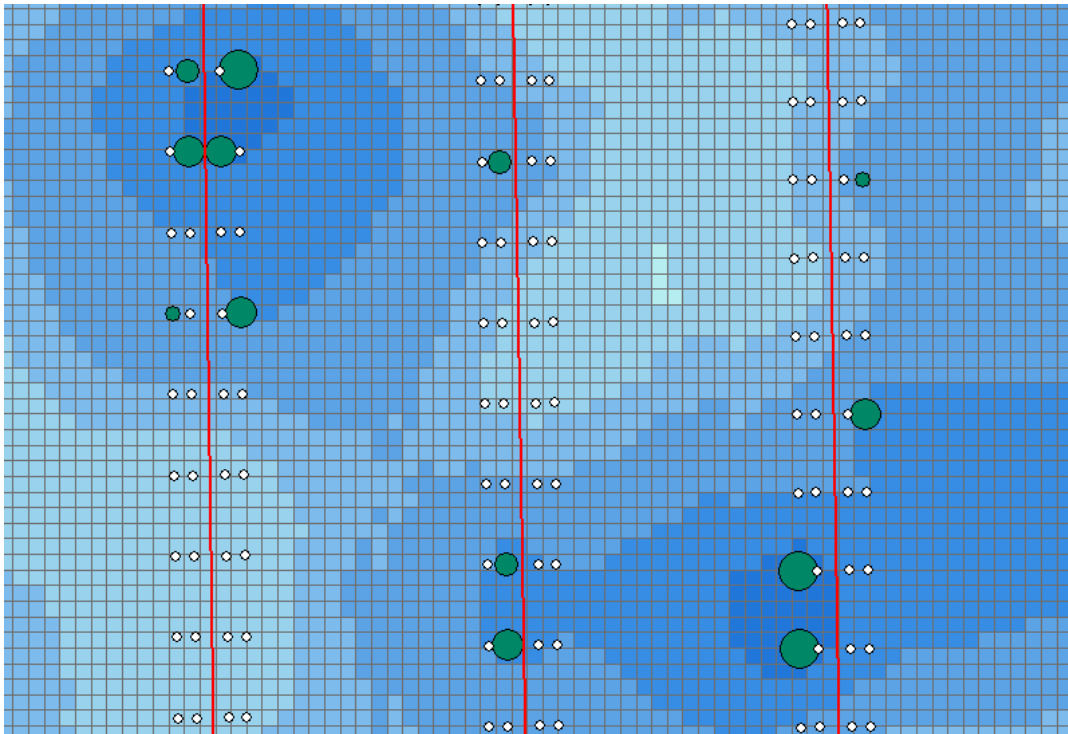


Standardised survey methods,
with distance estimation

Line transects from aircraft

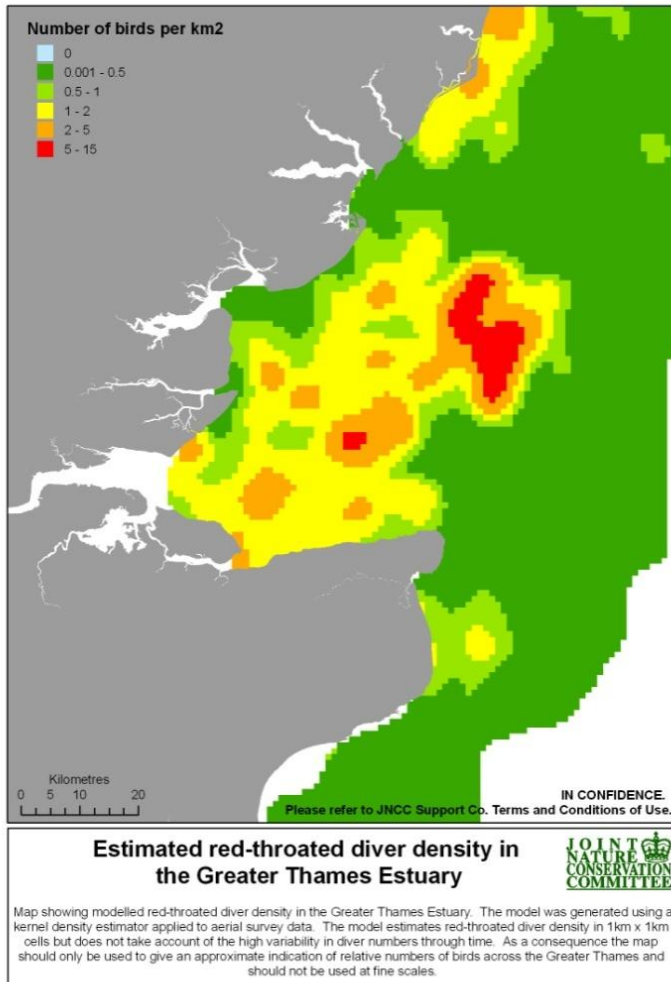


Using aerial survey data



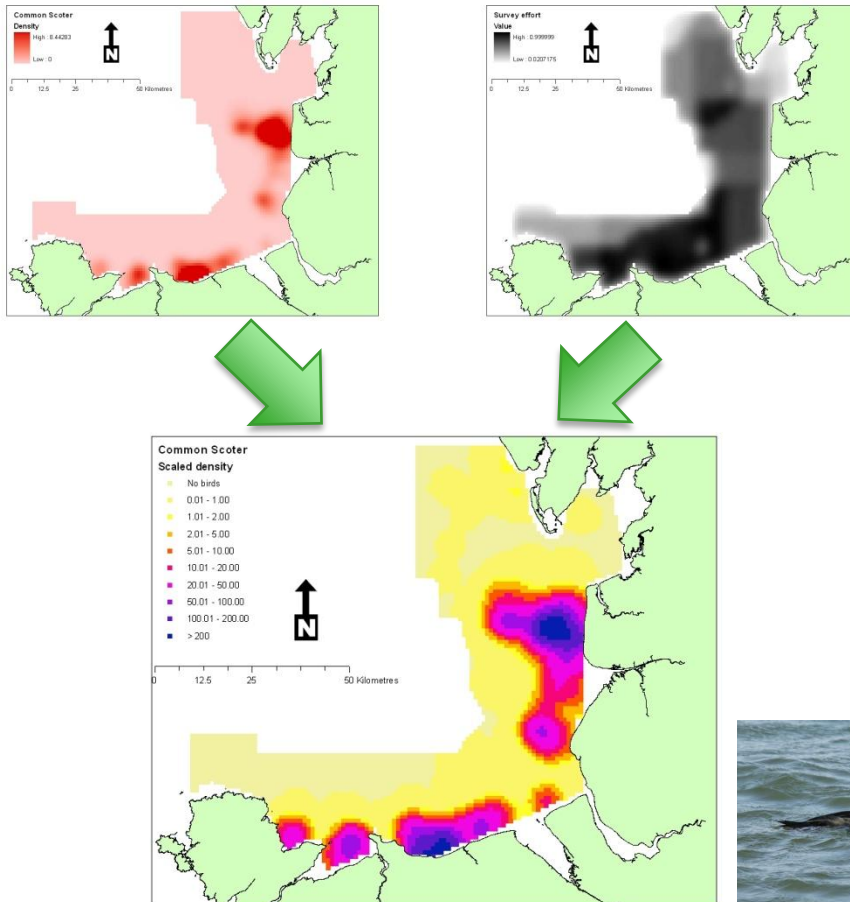
- Fit boundary around most important areas
- Density grids of bird density
- Many ways for modeling density grids....

Models of bird density



- Non-stochastic methods (e.g. density surface modelling, kriging) ideal
- Other methods do not require large sample sizes but still robust

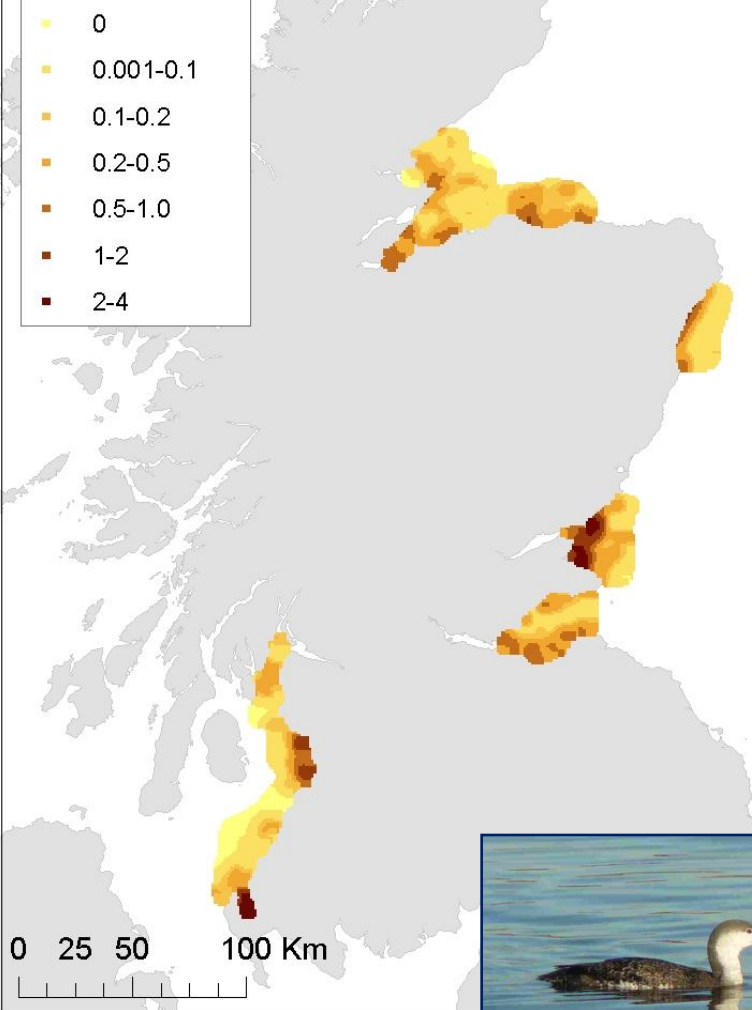
Kernel Density Estimation



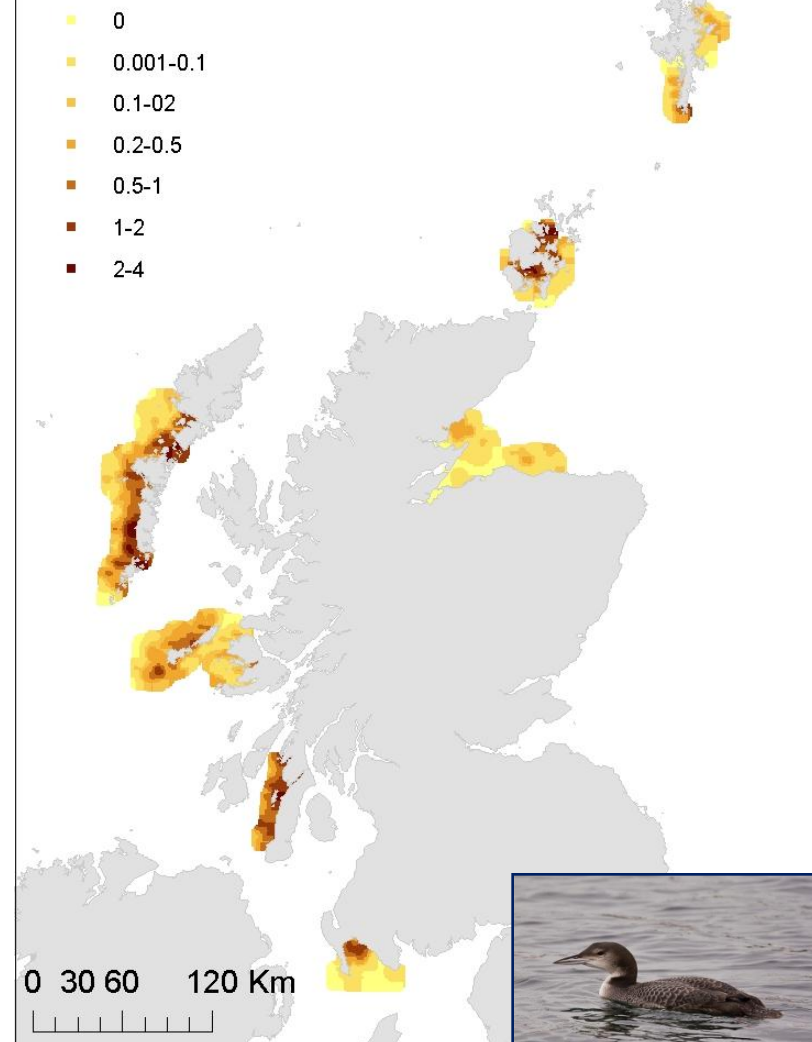
- Create grid of 1km x 1km squares for sightings and effort
- Density values scaled up to average max population for whole search area
- Smooths data between sample points (3km range)

Density maps

RTD density (birds/km²) - scaled to mean peak



GND density (birds/km²)



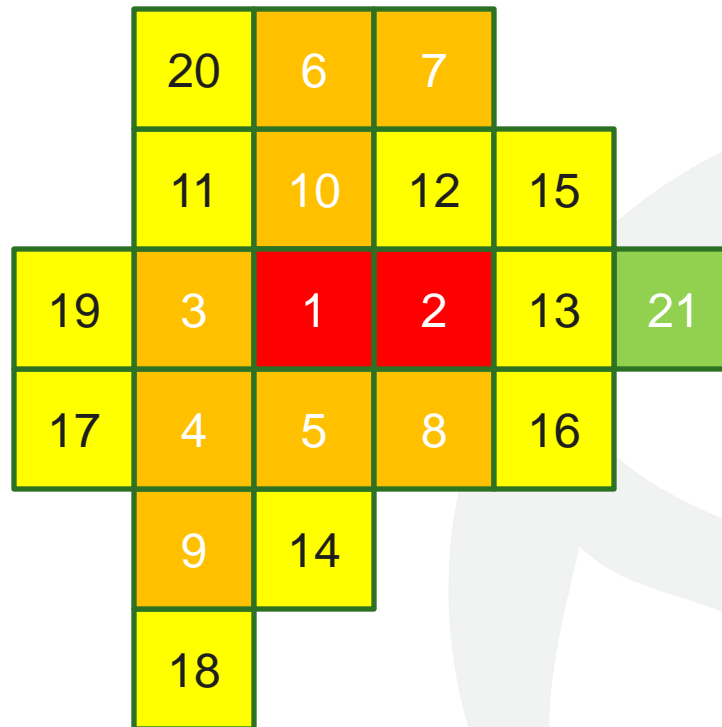
Drawing boundaries around the birds

- Characterised by density of birds not habitats
- Early attempts were over-complex or insufficiently robust
- Size matters

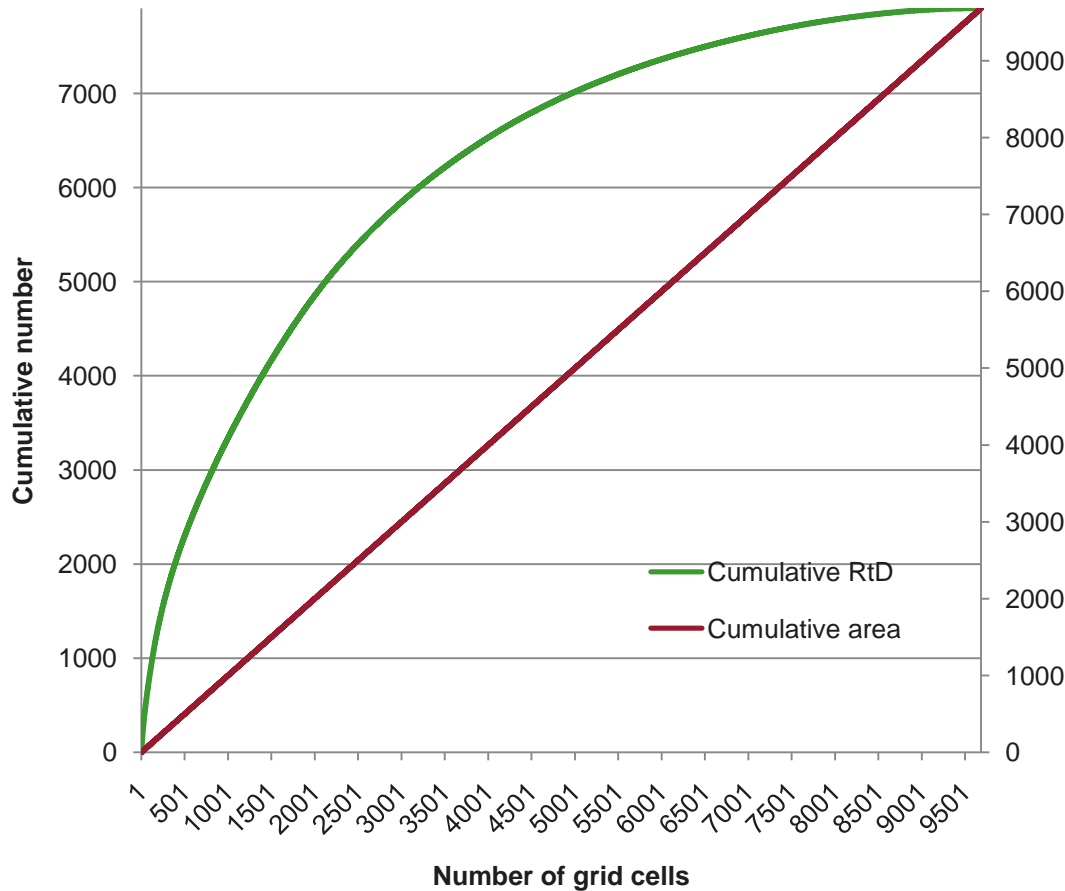
Characteristics of boundary method:

- ▶ Be robust and minimise subjective judgements
- ▶ Boundary contain the highest densities of birds
- ▶ Use trade-off between number of birds and size of area
- ▶ Should be relatively easy to understand and explain
- ▶ Should be applicable to all sites and species.

Adding grid cells from highest to lowest density



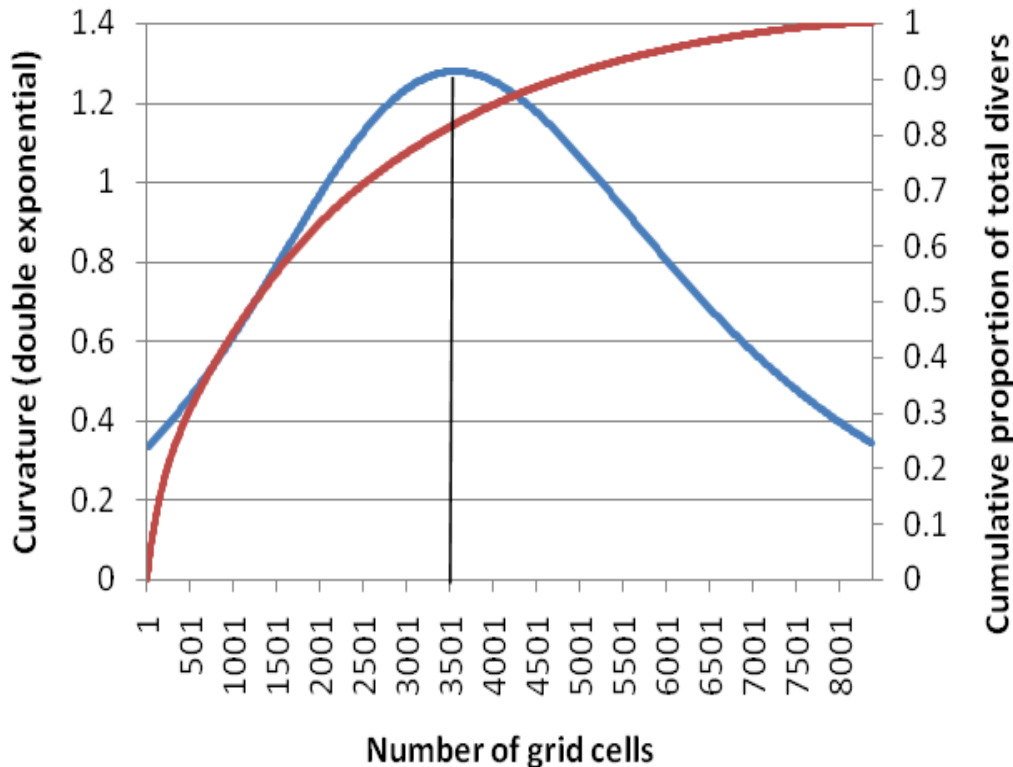
Relationship between size of site and number of birds



Optimum trade-off

- The point where the rate at which the increase in numbers becomes less than the rate at which area (size of site) increases

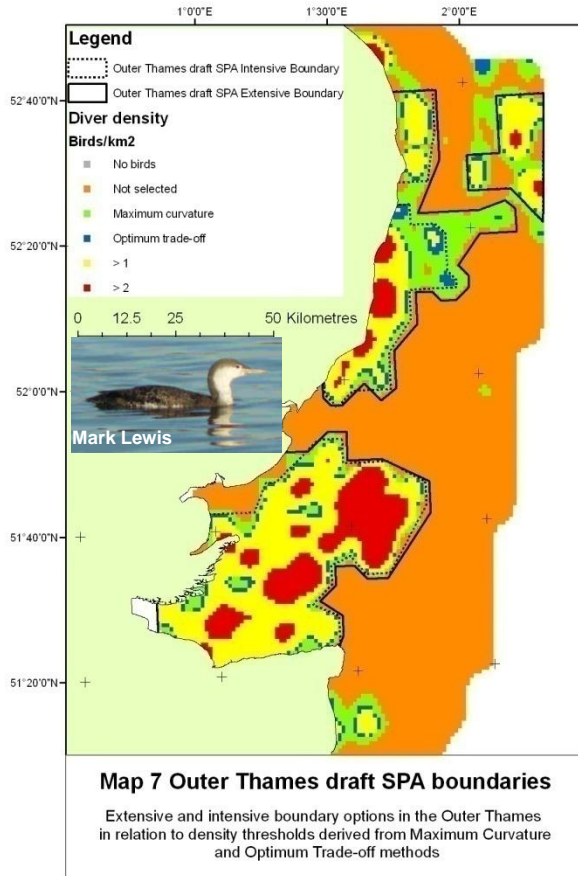
Relationship between size of site and number of birds



Maximum curvature

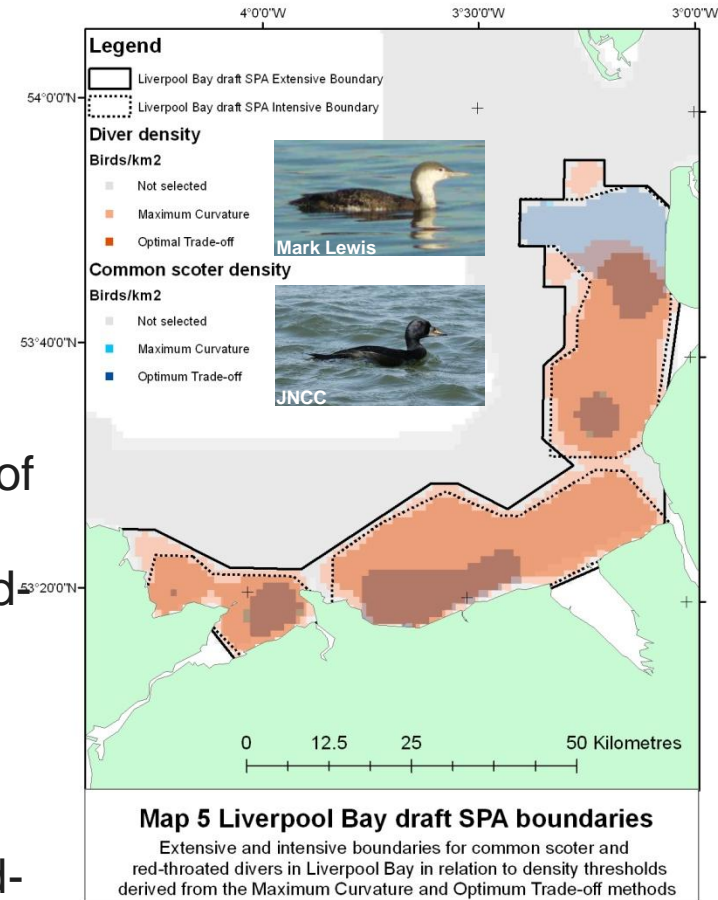
- The point along the curve where the relationship between size of site and number of birds changes most

Draft boundaries



- Outer Thames holds mean peak 6486 red-throated divers
- 38% GB wintering population

- Liverpool Bay holds mean peak of 54,675 common scoter and 922 red-throated divers
- 3.4% of NW Europe's common scoters
- 5.4% of GB's red-throated divers



Outer Thames dSPA

Liverpool Bay dSPA

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- You for listening



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- Many contractors and volunteers

