

Red-throated divers wintering around Great Britain

Estimating numbers and distribution at two spatial scales



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Structure of presentation

- Methods for collecting data on numbers and distribution of red-throated divers (RTDs) wintering around Great Britain (GB)
- Analysis at scale of GB → wintering population estimate
- Analysis at scale of Greater Thames Estuary → RTD density surface



1. Data collection is difficult!

- Breed at high latitudes, winter further south incl. around GB coast
- Winter over shallow sandy bays
- Problematic to estimate numbers and distribution as:
 - Highly mobile over short timescales
 - Mostly too far (>2km) from coast for land-based counts
 - Sensitive to disturbance so hard to survey from boats
 - Require expensive aerial surveys that depend on good weather
 - rare around GB in winter!

1. Data collection: aerial surveys



Line transects from aircraft

Highly trained observers



1. Data collection: land-based counts

- Where no aerial survey use land-based counts
- Types of land-based counts in UK:
 - Systematic counts along stretch of coast
 - Opportunistic seawatching
 - Wetland Bird Survey (WeBS)



1. Data collection: boat-based survey

- RTD sensitive to boat disturbance
- Fly/dive up to 2km ahead of boat
- Will underestimate numbers of RTD
- Least useful of three methods for wintering RTDs



2. GB wintering population estimate

- Why is a wintering population estimate needed?
 - Sensitive to disturbance from OWF
 - On Annex I to Birds Directive
 - Statutory obligation to show no significant effects on RTD populations from OWF developments
- So we need to know where they are and how many there are



2. GB wintering population estimate

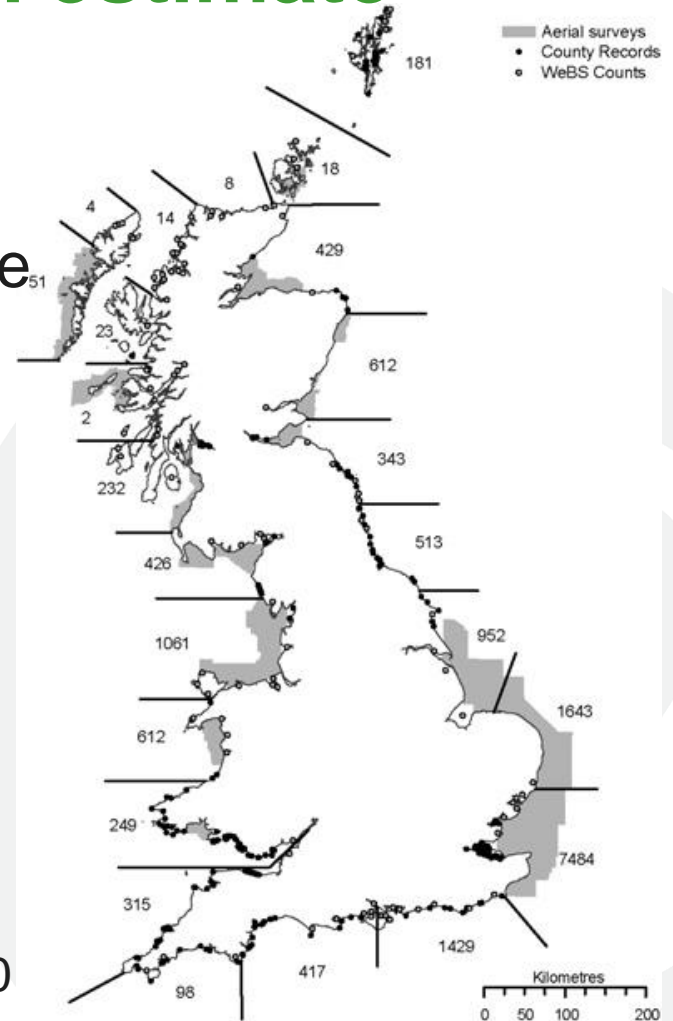
- Previous estimate of 4850 individuals (Danielsen *et al.* 1993) was known underestimate
- Used aerial survey where available, land-based counts to fill in gaps → compilation method
- January and February data only – mid winter estimate
- Used distance sampling (Thomas *et al.* 2010) where possible to estimate population in survey area

Danielsen *et al.* 1993, Proc. 7th Nordic Congress of Ornithology **1990**, 18–24

Thomas *et al.* 2010, *Journal of Applied Ecology* **47**, 5–14

2. GB wintering population estimate

- New estimate: 17,116 individuals
- Approx 7500 individuals (44%) in the Greater Thames
- Probably still an underestimate
- Real increase in numbers or better data?

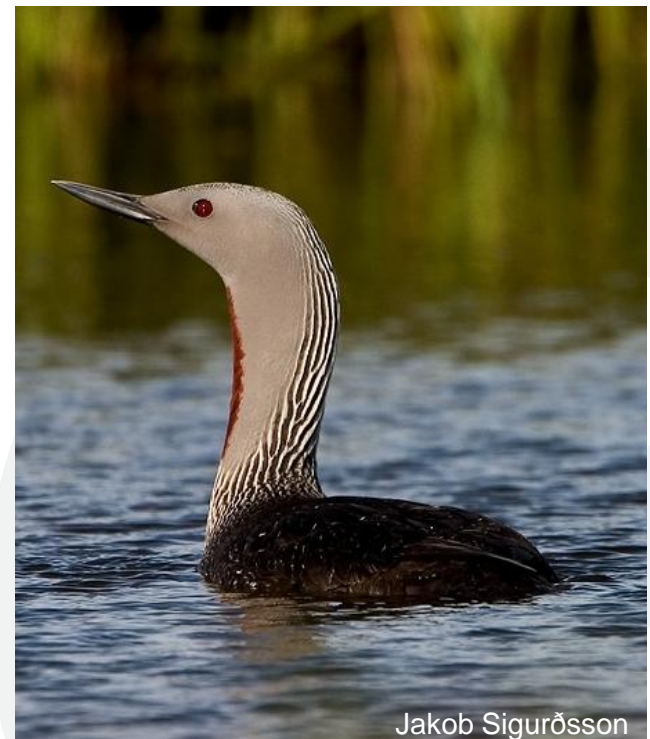


O'Brien *et al.* 2008, *Bird Study* **55**, 152–160

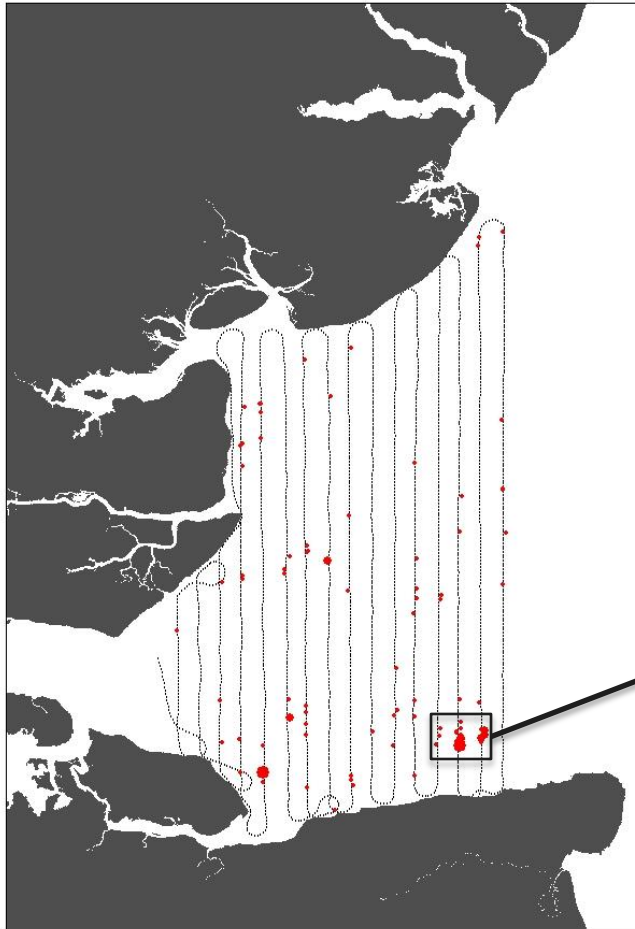
3. RTD density surface in Greater Thames

Why create a map of density for red-throated divers?

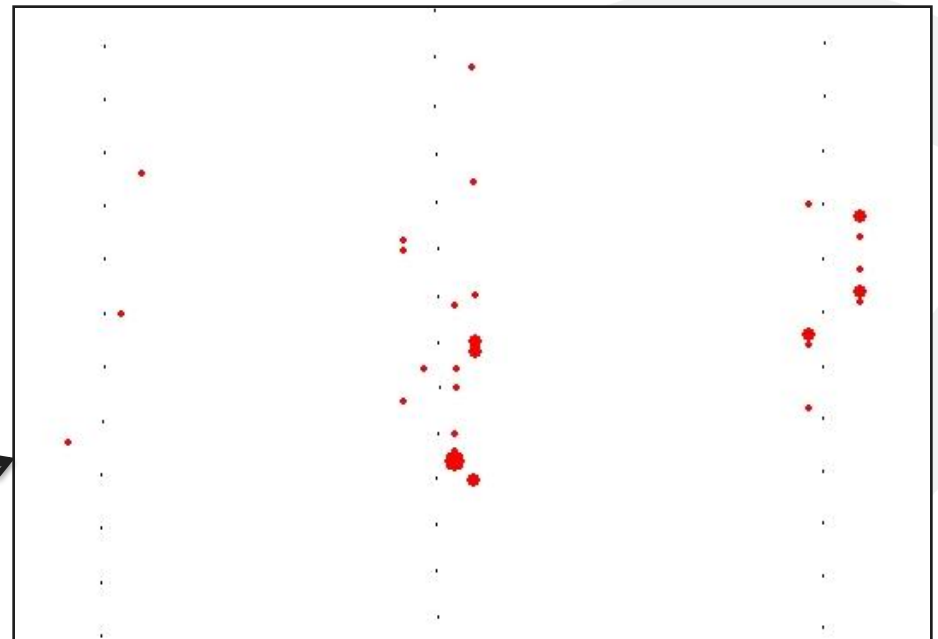
- To estimate density of divers at various places across study area
- To estimate numbers of divers within an area
- To assess large-scale displacement
- To draw a Special Protection Area boundary around important concentrations of divers



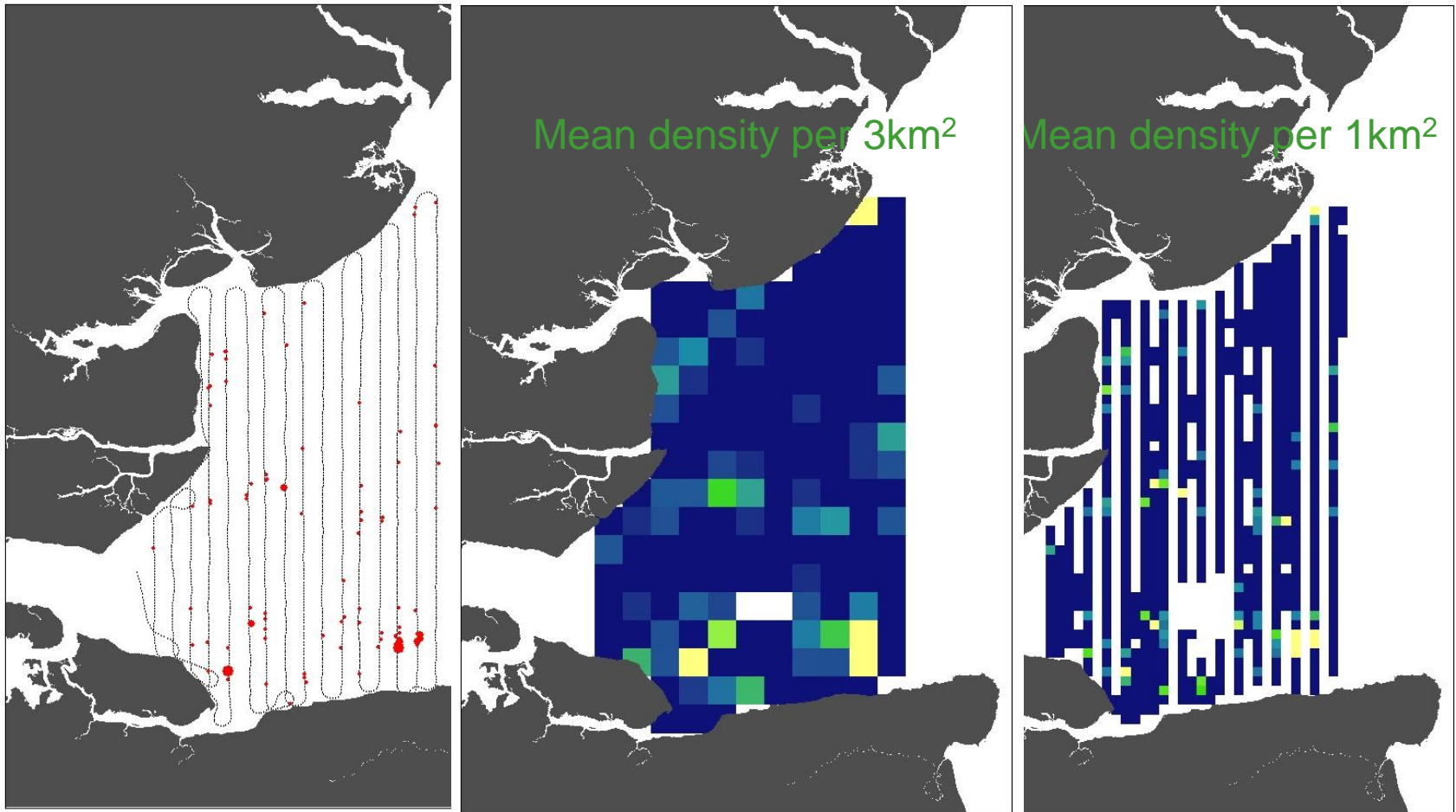
3. RTD density surface in Greater Thames



Aerial survey data collected by
WWT, February 2007

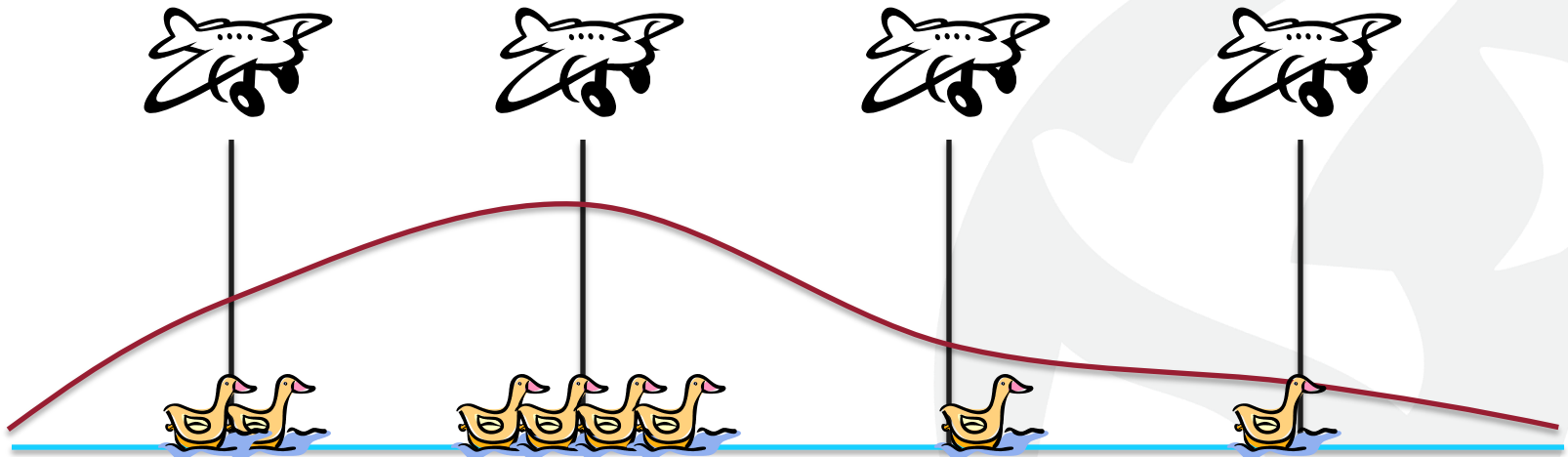


3. RTD density surface in Greater Thames

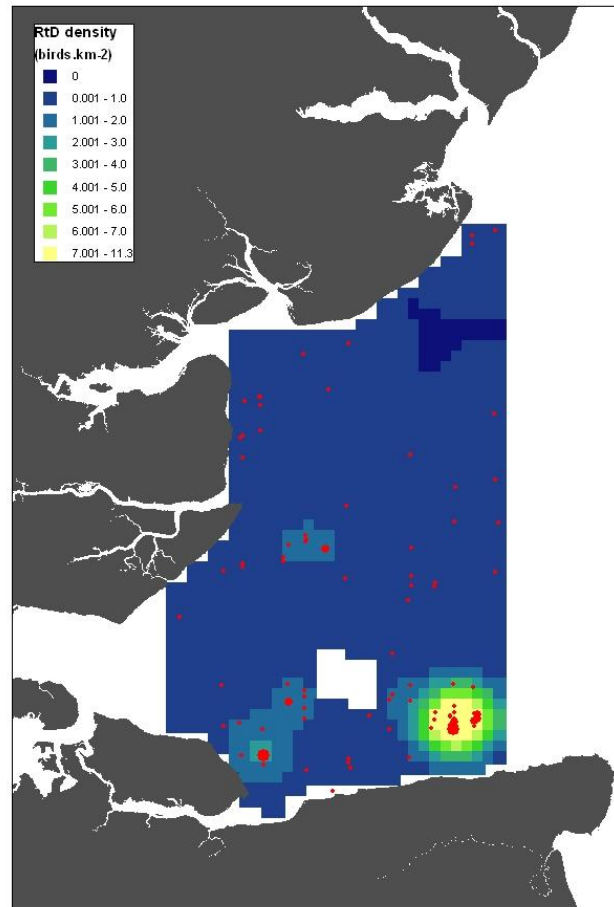


3. RTD density surface in Greater Thames

- Kernel Density Estimation (KDE) fits a Gaussian estimator over density points.

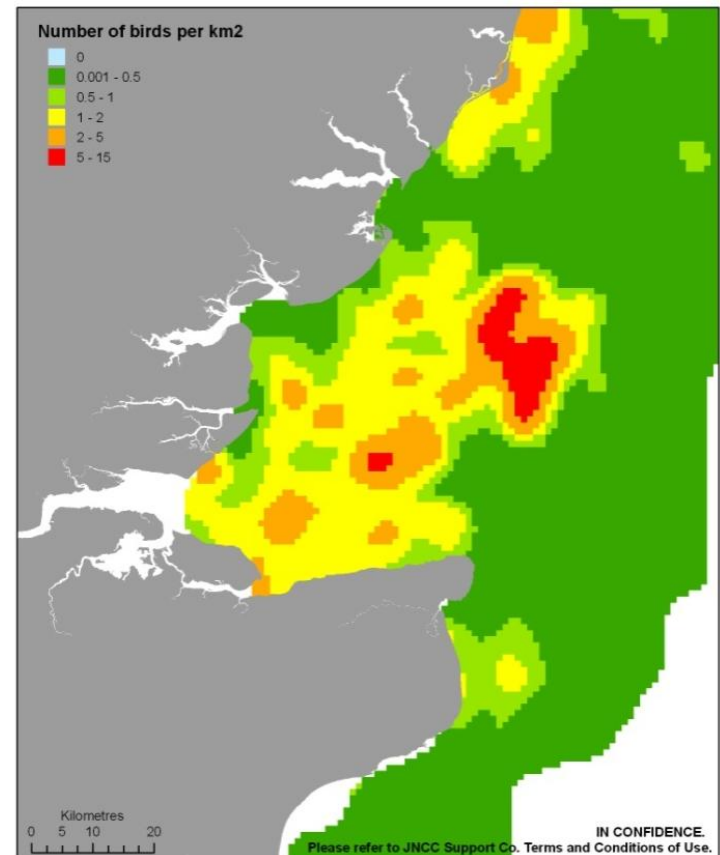


3. RTD density surface in Greater Thames



3. RTD density surface in Greater Thames

- Create KDE density surface for each survey
- Overlay all surveys and find mean density for each 1km x 1km cell
- Can also estimate 95% CI



3. RTD density surface in Greater Thames

- Benefits of KDE over other interpolation methods
 - Simple method, not ‘black box’ statistics, easy to explain to non-scientists, Government, etc.
 - Easy and quick to carry out (Hawth’s tools: <http://www.spataleecology.com/htools/index.php>)
 - Non-parametric so fewer assumptions about data
- Disadvantages of KDE
 - How smoothing parameter is chosen needs careful consideration
 - Density surface can only be used at relatively large scales



NO DIVERS