

# Loon & Divers Workshop TVÄRMINNE

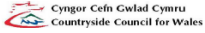

## September 2013

*An approach for monitoring  
red-throated diver numbers in the  
Liverpool Bay Special Protection Area*

Andy Webb & Gareth Bradbury

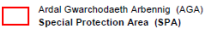


# Liverpool Bay SPA

**Liverpool Bay / Bae Lerpwl**

Map 1 o'r 1 Codi Safon y DE EC Site Code UK9020294


 Ardal Gwarchodfaeth Arbennig (AGA) Special Protection Area (SPA)

Awyrbedd cyfan 170,292.94 ha  
 Total area

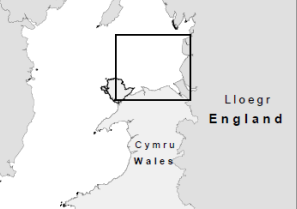
Hydred Longitude 03° 12' 34" Gorllewin West  
 Lledred Latitude 53° 36' 10" Gogledd North

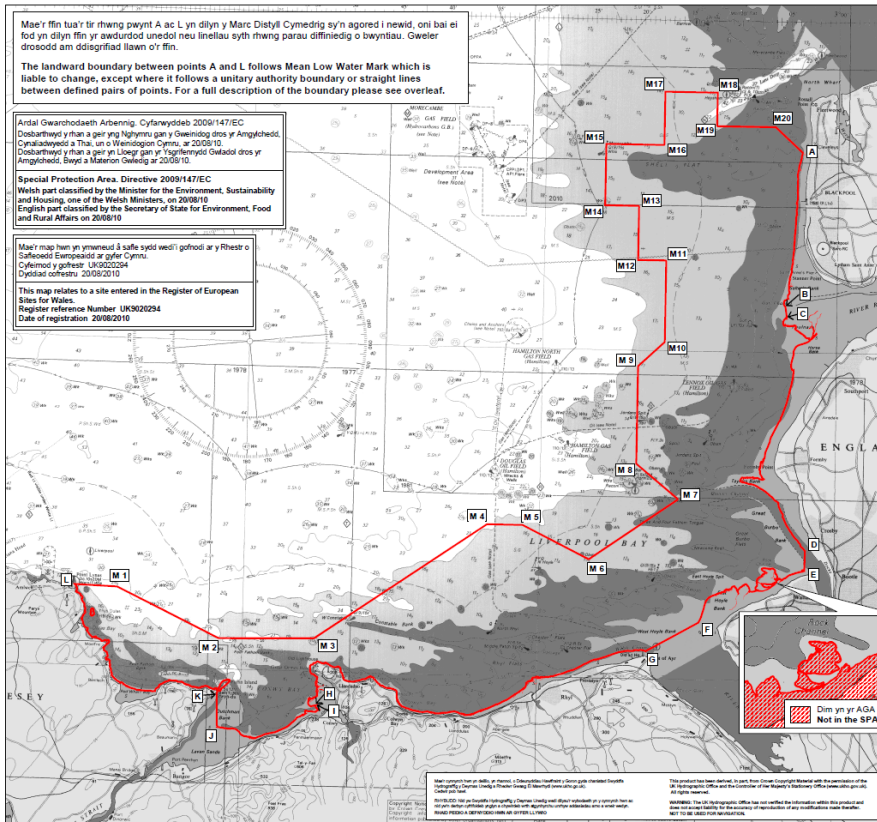
N.O. Mae'r figurau Lledred/Hydred i gyd wedi delio o System Geoesydd y Byd B4 (WGS 84)  
 N.B. All Latitude/Longitude figures have been derived from World Geodetic System 84 (WGS 84).  
 Talfarniad map: Y Grid Cenedlaethol Prydeinig  
 Projection: British National Grid

Rhif diweddariad Version number 6 20/08/2010  
 Graddfa / Scale 1: 350,000

Noder: Cofnod y data eu cynnyd ar raddfa 1:2500 o Brif Fap yr Arwyng Odrans 2006, eu gosod ar Sian y Morys OS 1826, ar raddfa 1:200,000 a'u lleihau i 1:350,000.  
 Note: Data captured at 1:2500 scale from Ordnance Survey Master Map, 2006 placed on Admiralty Chart OS 1826, scale 1:200,000 and reduced to 1:350,000.

Yn seiliedu ar map hwn o ddiwydiad yr Arwyng Odrans gyda characteraid Arwyng Odrans ar ran rhywng Lloegr a Cymru. Mae'r map hwn yn dangos y ffin parhau ym 1000 metr o'r ffin hon. Rhif trwydded Cyngror Cefn Cwlad Cymru: 100018113\_2009  
 This map is based upon Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationary Office. © Crown copyright. Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings. Countryside Council for Wales Licence No. 100018113\_2009





Classified December 2010, EU Birds Directive

1702 km<sup>2</sup> in area

922 red-throated divers (5.4% GB)

54,675 common scoter

55,597 bird assemblage

Classified at same time as Outer Thames SPA (6466 – 38% GB)

# Monitoring requirements

- SPAs require management if they are to be more than lines on maps
- Definitions within conservation objectives for SPA assessing condition of site
- Natura 2000 site condition reported on every 6 years



# Conservation objectives



Attribute	Measure	Target
Population size (Mandatory attribute)	Estimated population size derived from standardised site condition and monitoring programme	Maintain or enhance populations on the site subject to natural fluctuations. There should be no permanent decline, only non-significant fluctuation around the mean to account for natural change.
Habitat extent (Mandatory attribute)	Area of supporting habitat	No significant decrease in the extent of supporting habitat available for red-throated diver.

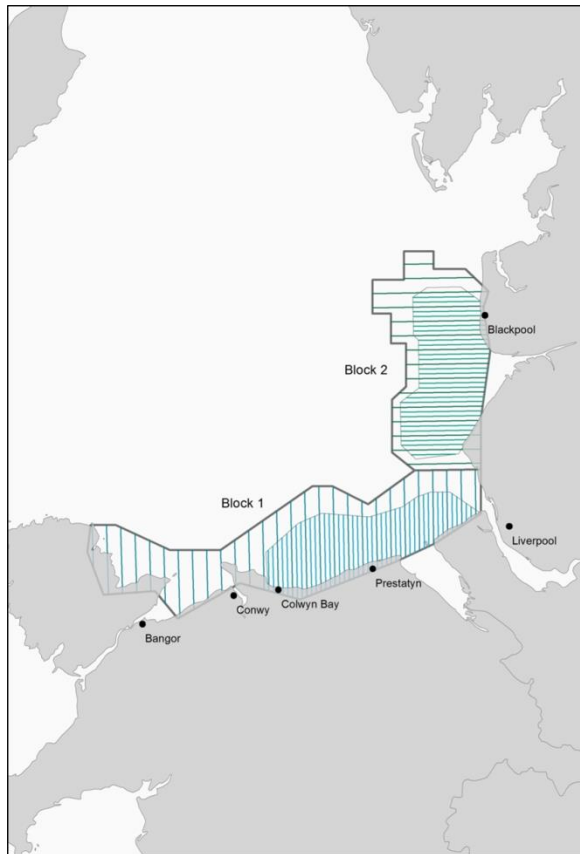
# Conservation objectives

- What type of information can be delivered during monitoring surveys?
- What is the power of these surveys to detect change?
- Is there a smarter way to set conservation objectives?

# Using new technologies

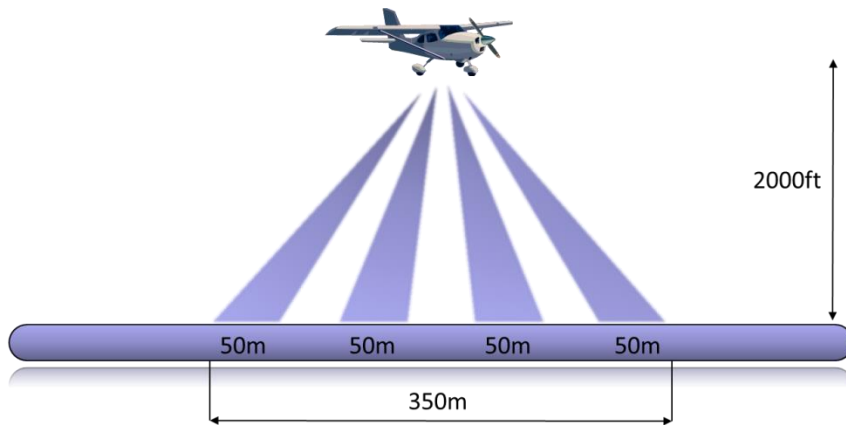
- New digital aerial survey techniques emerged in 2008 in UK
- Potential for more precise estimates of abundance
- Less disturbance of sensitive species
- Need to over-fly large structures at sea

# Survey design



- Two complete surveys
- February and March 2011
- Transects spaced 3km and 1km apart
- Each transect sampled 175m strip

# HiDef survey technique



- Sample in comb pattern
- 3 cameras sample at 2cm GSD (50m)
- 1 camera sampled at 1cm GSD (25m)
- Audited review of footage
- Audited identification of objects



# Survey effort

Date	Zone	Spacing	Length (km)	Area (km <sup>2</sup> )	% coverage
12-Feb-2011	Whole	3km	1140.8	199.6	9.8%
	Hotspots	1km	1745.6	305.5	29.5%
7-Mar-2011	Whole	3km	1109.3	194.1	9.5%
	Hotspots	1km	1708.5	299.0	28.8%
Both surveys	Whole	3km	2250.0	393.8	19.4%
	Hotspots	1km	3454.1	604.5	58.3%

# Counts

Species	Whole SPA		Hotspot	
	17-Feb	07-Mar	17-Feb	07-Mar
	3km	3km	1km	1km
Eider	0	0	16	0
Common scoter	3467	3492	11078	6801
Red-b merganser	0	0	7	5
Red-throated diver	88	51	135	118
diver sp.	155	76	266	191
Great c grebe	9	3	139	85
grebe sp.	9	6	139	81
Cormorant	16	17	38	13
cormorant/ shag	28	19	36	37
Little gull	0	0	0	12
small gull sp.	743	342	1548	321
auk sp.	888	690	741	477

# Example images

Diver sp. / red-throated diver

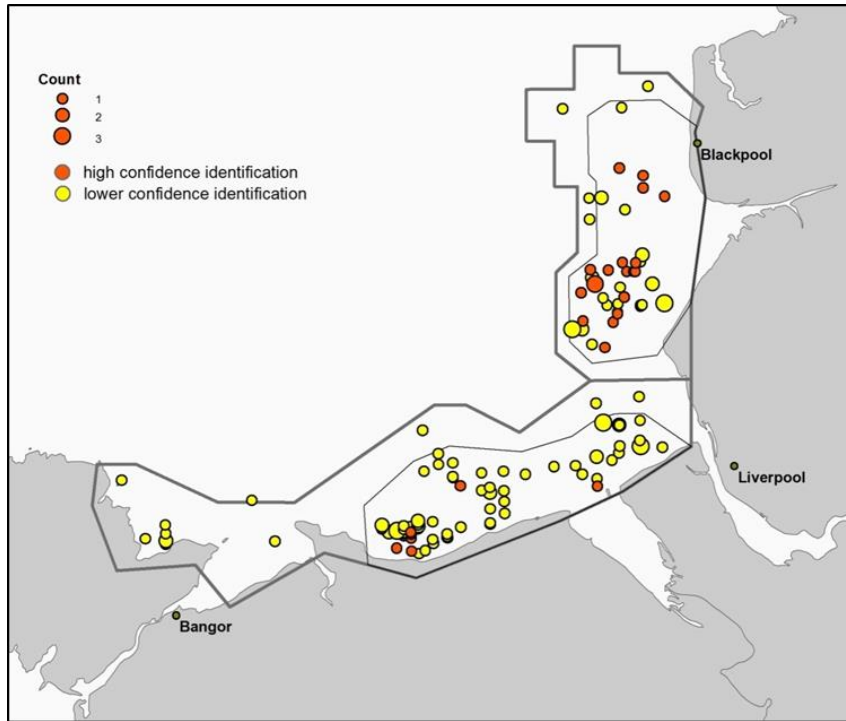


Scoter sp. / common scoter

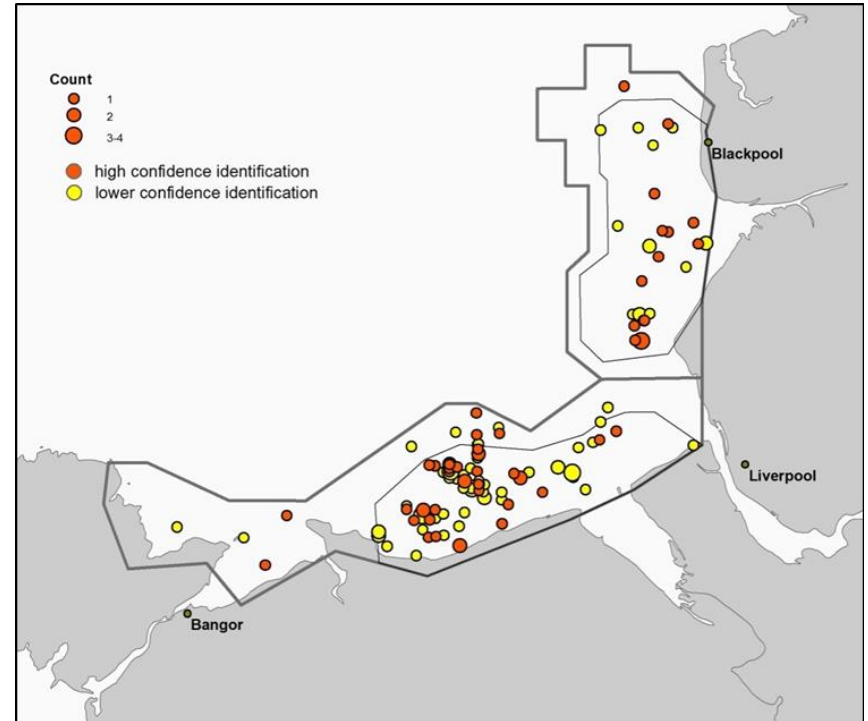


# Maps – red-throated divers

## Flight 1 – 12 February 2013

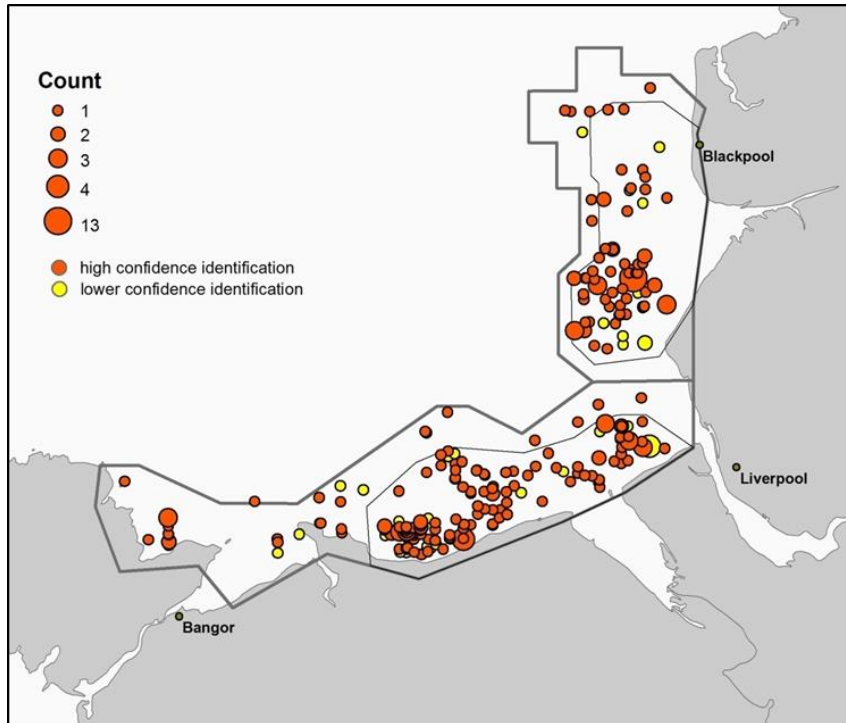


## Flight 2 – 7 March 2011

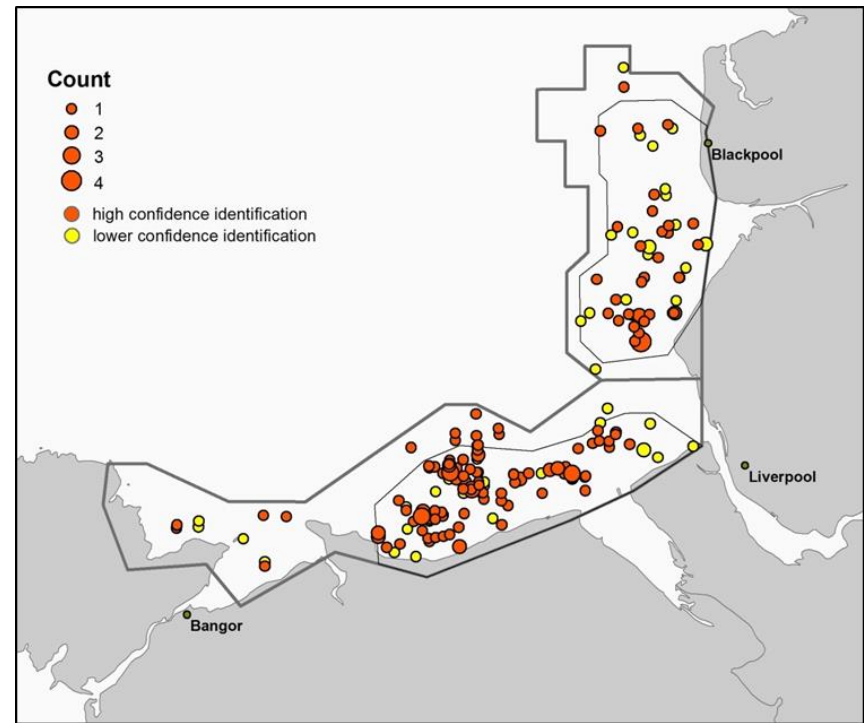


# Maps – all divers

## Flight 1 – 12 February 2011

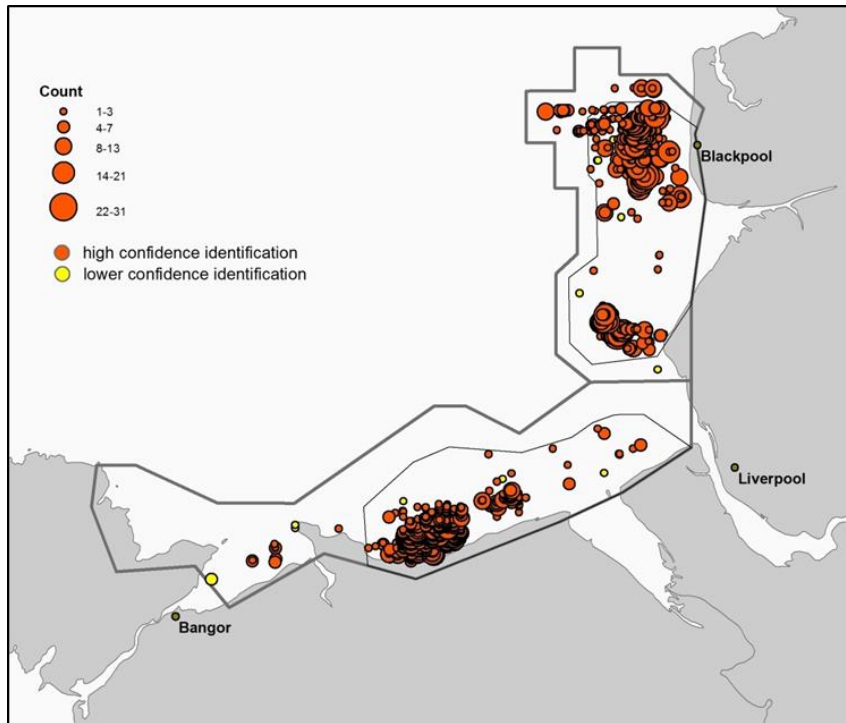


## Flight 2 – 7 March 2011

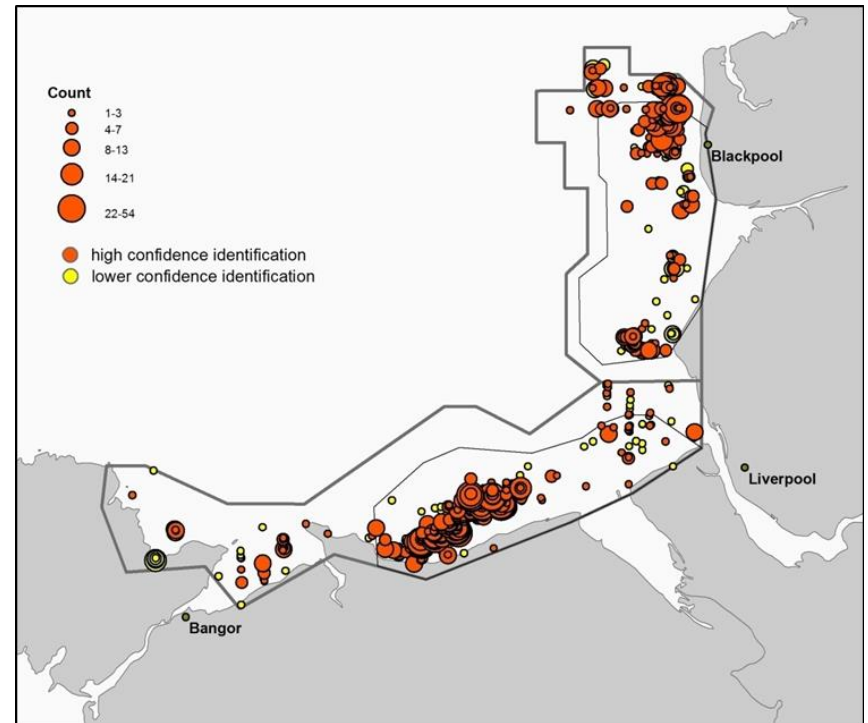


# Maps – common scoter

## Flight 1 – 12 February 2011

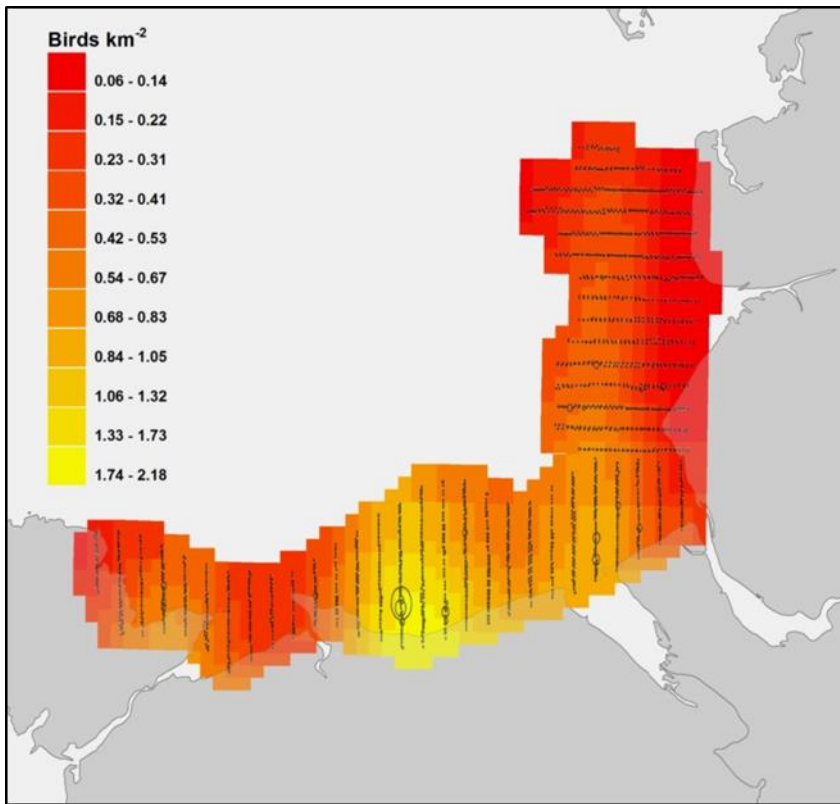


## Flight 2 – 7 March 2011

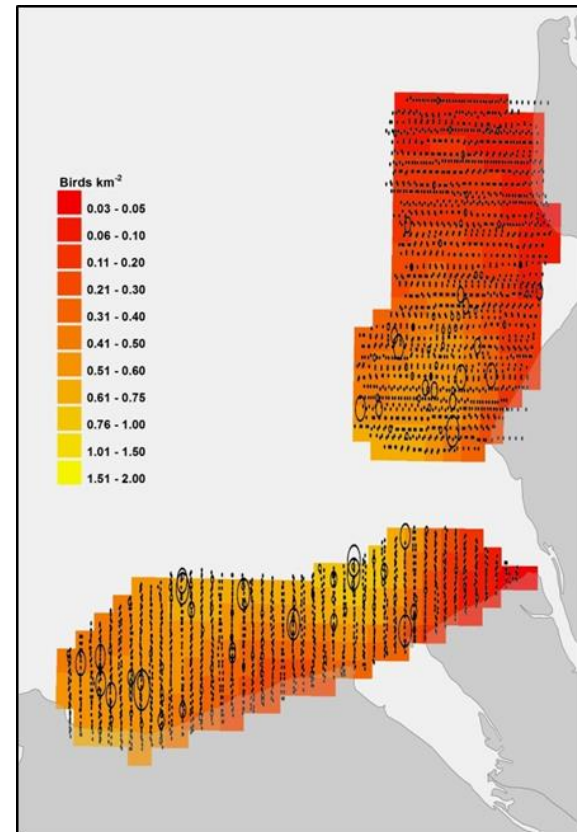


# Density surface maps – all divers

## Whole SPA – 3km spacing



## Hotspots – 1km spacing



# Strip transect analysis – whole SPA

Spacing	Flight	Density (birds/km <sup>2</sup> )	Est. birds	95% CI	CV (%)
3km	12-Feb	0.718	1561	1030 - 2418	21.9
3km	07-Mar	0.295	803	521 - 1278	24.0
3km	Both	0.585	1189	910 – 1553	13.7



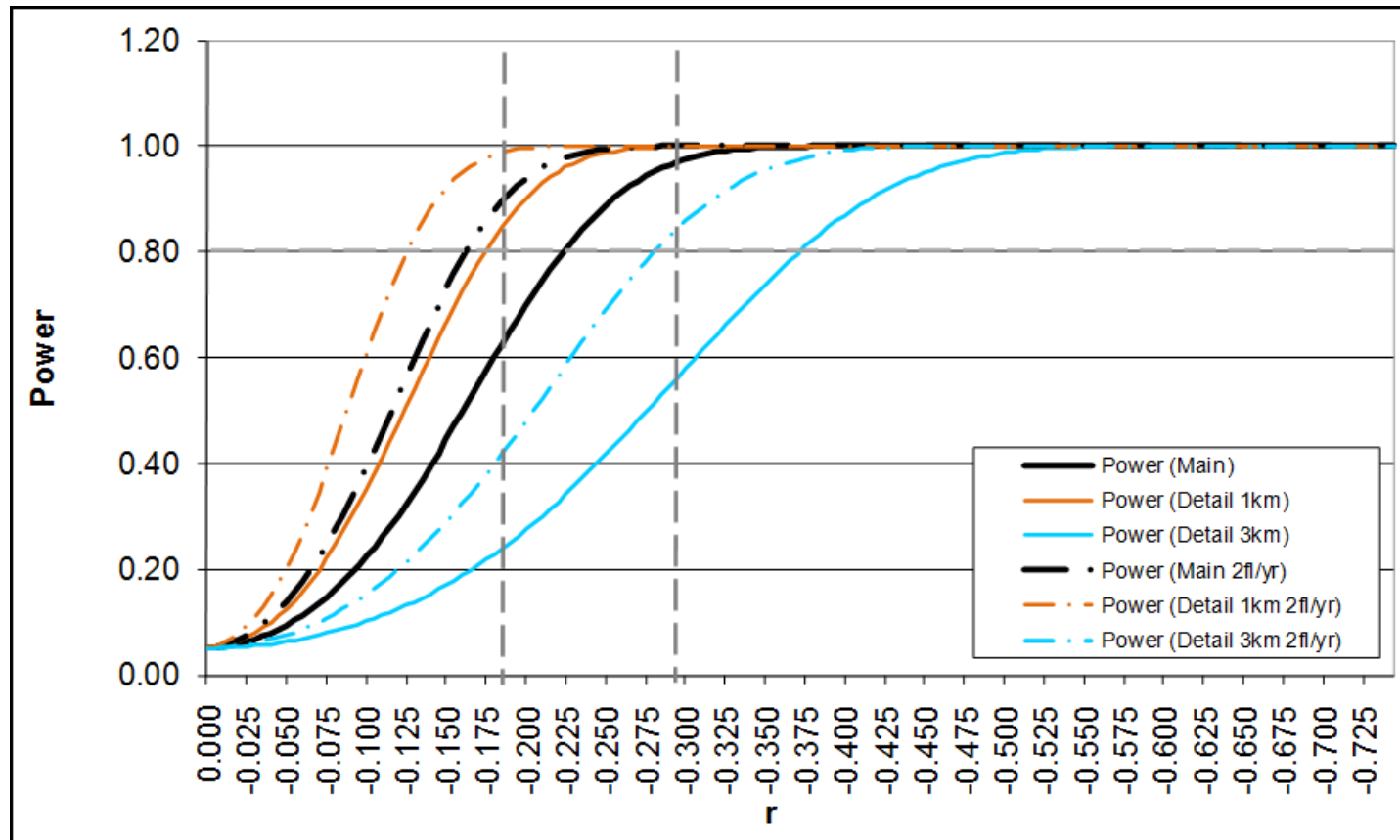
# Strip transect analysis – hotspots

Spacing	Flight	Density (birds/km <sup>2</sup> )	Est. birds	95% CI	CV (%)
1km	12-Feb	0.853	876	633 - 1255	15.9
	07-Mar	0.648	681	486 - 915	15.6
	Both	0.754	782	657 – 931	8.9
3km	12-Feb	1.146	1189	715 - 1871	29.1
	07-Mar	0.512	533	349 - 903	35.5
	Both	0.835	866	639 – 1173	15.6

# Density surface modelling – all flights

Species	Zone	Density (birds/km <sup>2</sup> )	Est. birds	95% CI	CV (%)
Common scoter	Whole SPA	17.52	35,643	26201 - 48488	15.8
	Hotspot -1km	27.09	28,098	21097 - 37423	14.7
	Hotspot - 3km	20.00	20,496	10777 - 38981	33.7
Diver sp.	Whole SPA	0.58	1,188	920 - 1534	13.1
	Hotspot -1km	0.69	716	589 - 871	10.0
	Hotspot - 3km	0.57	593	372 - 947	24.2

# Power curves



Diver sp. power curve using surveys every three years and density surface modelling to derive coefficients of variation. The dashed intersects identify a power of 0.8 to detect decreases of 50% and 33% over 10 years (assuming an exponential rate of decline), with a significance level  $\alpha=0.05$

# Power analysis

Power to detect a) 50% decline over 10 years of annual surveys

	Annual surveys						Triennial surveys					
	Once per season			Twice per season			Once per season			Twice per season		
Species	SPA	1km	3km	SPA	1km	3km	SPA	1km	3km	SPA	1km	3km
Common scoter	Y	Y	N	Y	Y	Y	Y	Y	N	Y	Y	N
Diver species	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y

Power to detect a) 33% decline over 10 years of annual surveys

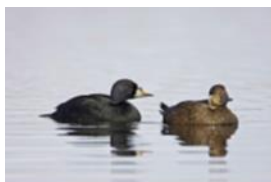
	Annual surveys						Triennial surveys					
	Once per season			Twice per season			Once per season			Twice per season		
Species	SPA	1km	3km	SPA	1km	3km	SPA	1km	3km	SPA	1km	3km
Common scoter	N	Y	N	N	Y	N	N	N	N	N	Y	N
Diver species	Y	Y	N	Y	Y	Y	N	Y	N	Y	Y	N

# Conclusions

- Digital aerial survey techniques work very well
- Density surface modelling gives better power to detect change (compared with strip transect analysis)

Species	% decline over 10 years	Survey spacing	Number of surveys per season	Transect spacing
Common scoter	50%	3 years	One	3km
	33%	3 years	Two	1km
Diver species	50%	3 years	One	3km
	33%	3 years	Two	3km

- Draft conservation objectives should reflect modern methods in setting targets for site condition monitoring



# Acknowledgements

- Thanks to JNCC (and Natural England and Natural Resources Wales) for permission to present data
- Louise Burt (CREEM) for statistical support
- Other staff in WWT Consulting and HiDef for their work





# Discussion issues

- There are biological reasons for more survey, but how often should we sample?
- Is it worth monitoring other aspects of site condition, such as human pressures at same time?
- Do we need to make the surveys and monitoring smarter?