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Eolien et biodiversité

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Liberté • Égalité • Fraternité
RÉPUBLIQUE FRANÇAISE
MINISTÈRE DE LA TRANSITION ÉCOLOGIQUE ET SOLIDAIRE

ADEME
Agence de l'Environnement et de la Maîtrise de l'Énergie

France Energie Eolienne

SYNDICAT DES ÉNERGIES RENOUVELABLES

Throwing Precaution to the Wind;

Uncertainty and the Precautionary Principle in Wind Farm Assessment

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RSPB

giving nature a home


The development of renewable energy has a crucial role in mitigating the effects of climate change.
©Andy Hay (rspb-images.com)

“Where uncertainty still exists we must give the environment the benefit of the doubt.”

Former Norwegian
Prime Minister Jan P. Syse

Birds *are* affected by wind farms

Habitat change/loss (positive or negative)

Changes in prey or predators (positive or negative)

Disturbance causing displacement or altered behaviour

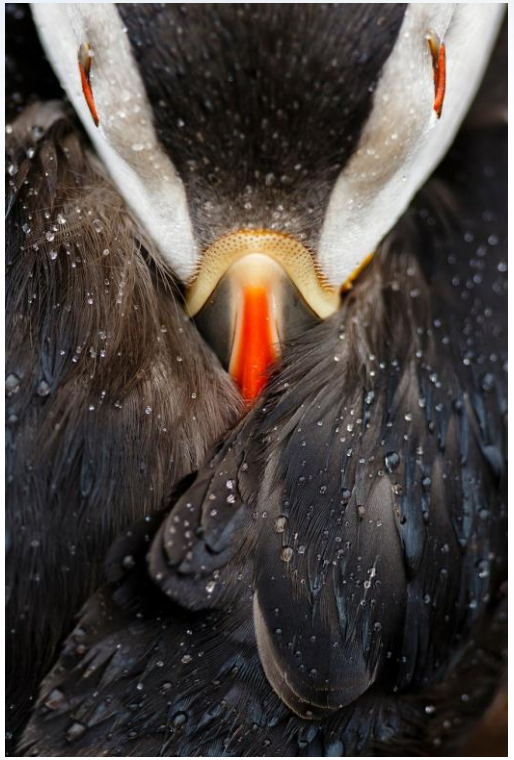
Collision with structures

Additional energy cost of avoiding structures

What is the Precautionary Principle?

It aims at ensuring a higher level of environmental protection through preventative decision-taking in the case of risk

This means that the principle ensures that where there are threats of serious or irreversible damage, lack of full scientific certainty is not used as a reason against preventative decision, thus ensuring that the existence of the risk/ uncertainty is sufficient to ensure environmental protection.



Preliminary Conditions

The European Commission stresses that the precautionary principle may only be invoked in the event of a potential risk and that it can never justify arbitrary decisions.

The precautionary principle may only be invoked when the **three preliminary conditions** are met:

- identification of potentially adverse effects;
- evaluation of the scientific data available;
- the extent of scientific uncertainty.

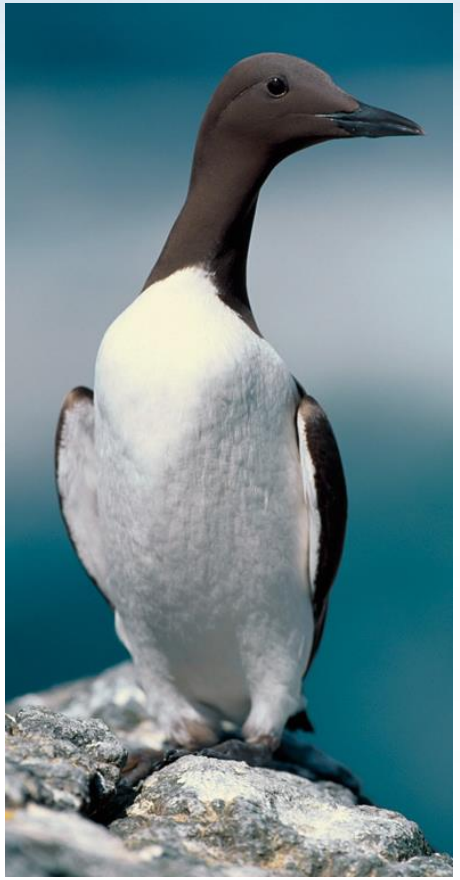
Principles

The precautionary principle should be informed by **three specific principles**:

- the fullest possible scientific evaluation, the determination, as far as possible, of the degree of scientific uncertainty;
- a risk evaluation and an evaluation of the potential consequences of inaction;
- the participation of all interested parties in the study of precautionary measures, once the results of the scientific evaluation and/or the risk evaluation are available.

In addition, the **general principles** of risk management remain applicable when the precautionary principle is invoked. These are the following five principles:

- proportionality between the measures taken and the chosen level of protection;
- non-discrimination in application of the measures;
- consistency of the measures with similar measures already taken in similar situations or using similar approaches;
- examination of the benefits and costs of action or lack of action;
- review of the measures in the light of scientific developments.



What is uncertainty?

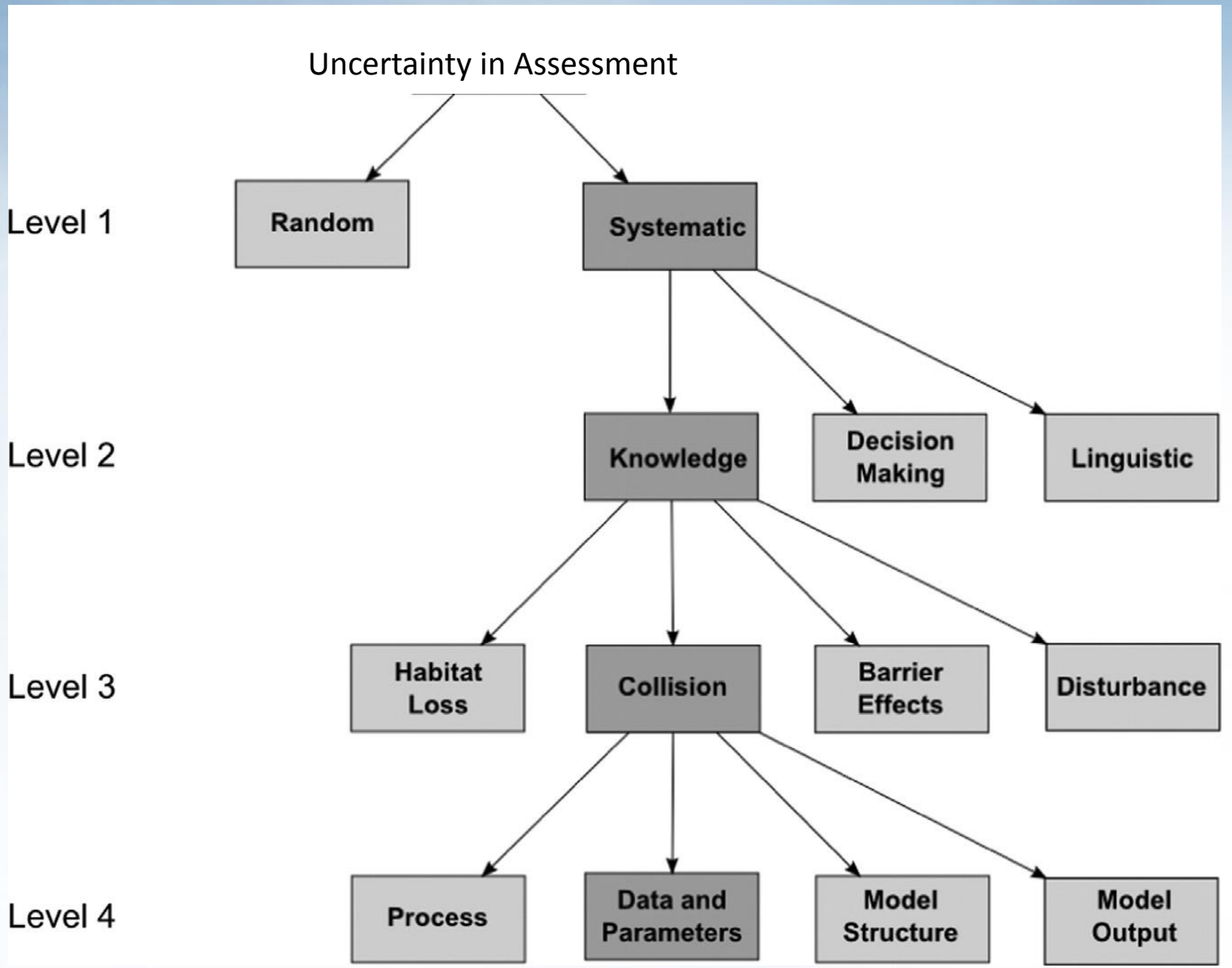
"There are almost as many definitions of uncertainty as there are treatments of the subject"*

For this talk we define it as a lack of knowledge, or incomplete information about a particular subject.

In order to manage uncertainty it must first be identified

*Argote, L. (1982) Adm Sci Q1982

Hierarchy of Uncertainty

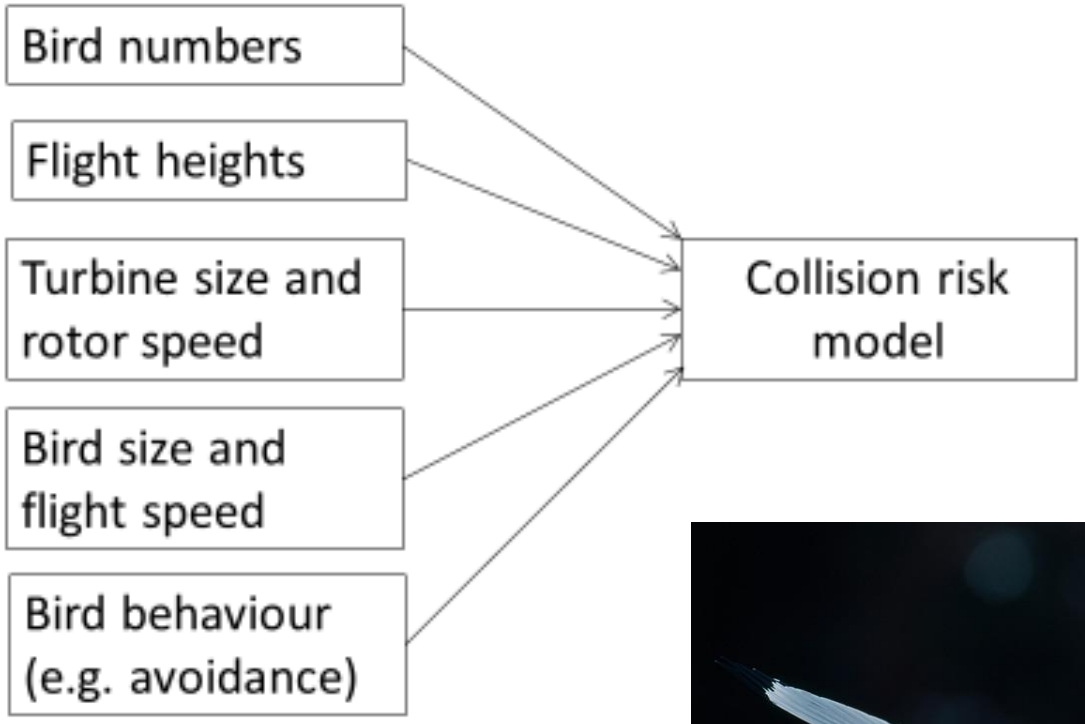


Masden *et al.,* (2015) Marine Policy

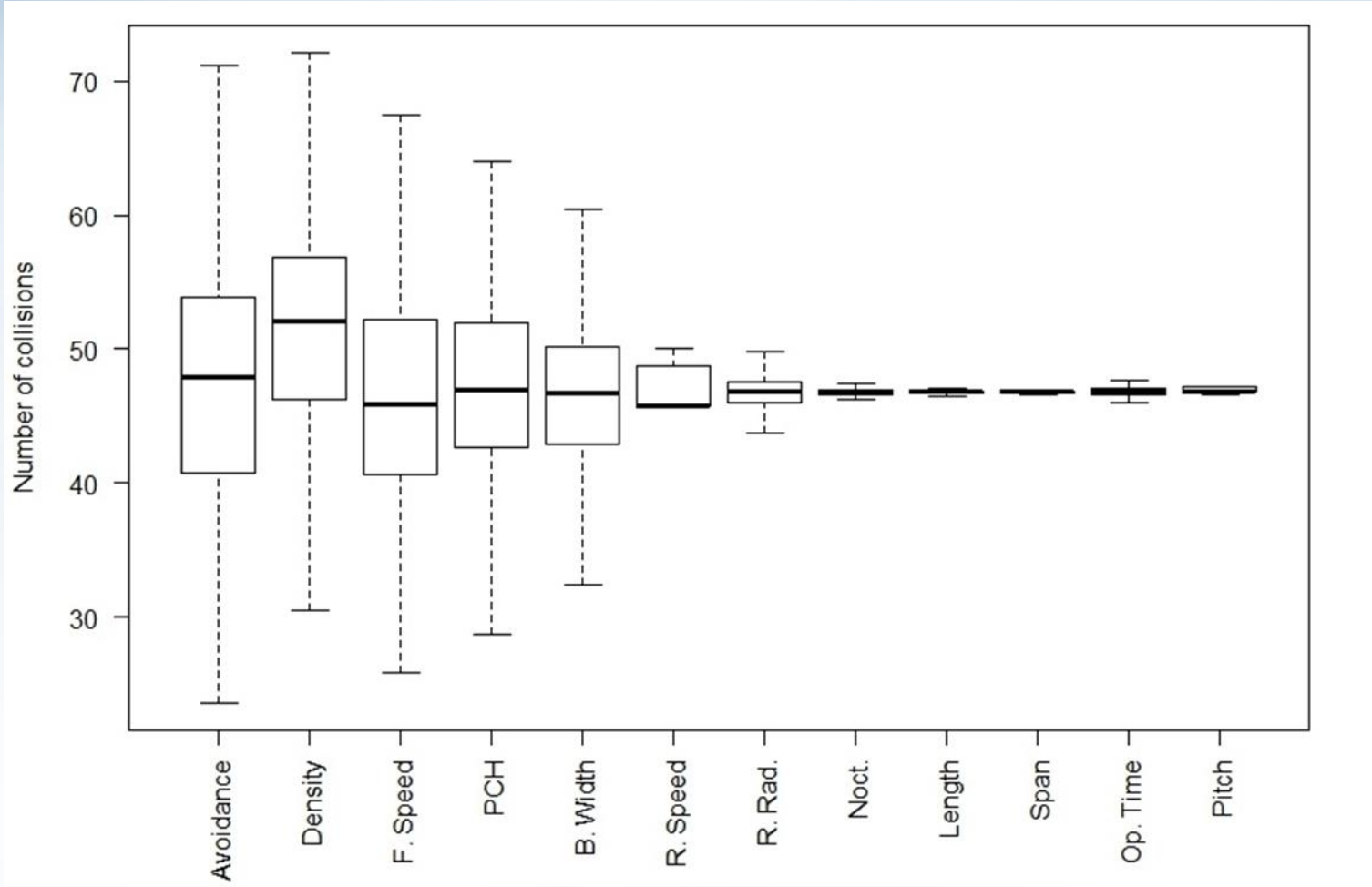
Collision Risk Modelling and Avoidance Rates

- In the UK is almost always the Band (2012) model
- Uses a simple mechanistic calculation that gives the probability of a rotating blade of fixed dimensions and rotational speed making contact with a bird
- It is dependent on a number of parameters, related to the turbine specifications and the birds morphology and biology
- Validation of these models has been infrequent and any biological sense checking of the parameters underpinning the model scant.
- Sensitivity analysis of the model undertaken by Chamberlain *et al.,* (2006), and since then focus has been on avoidance rates

Collision risk models – many variables

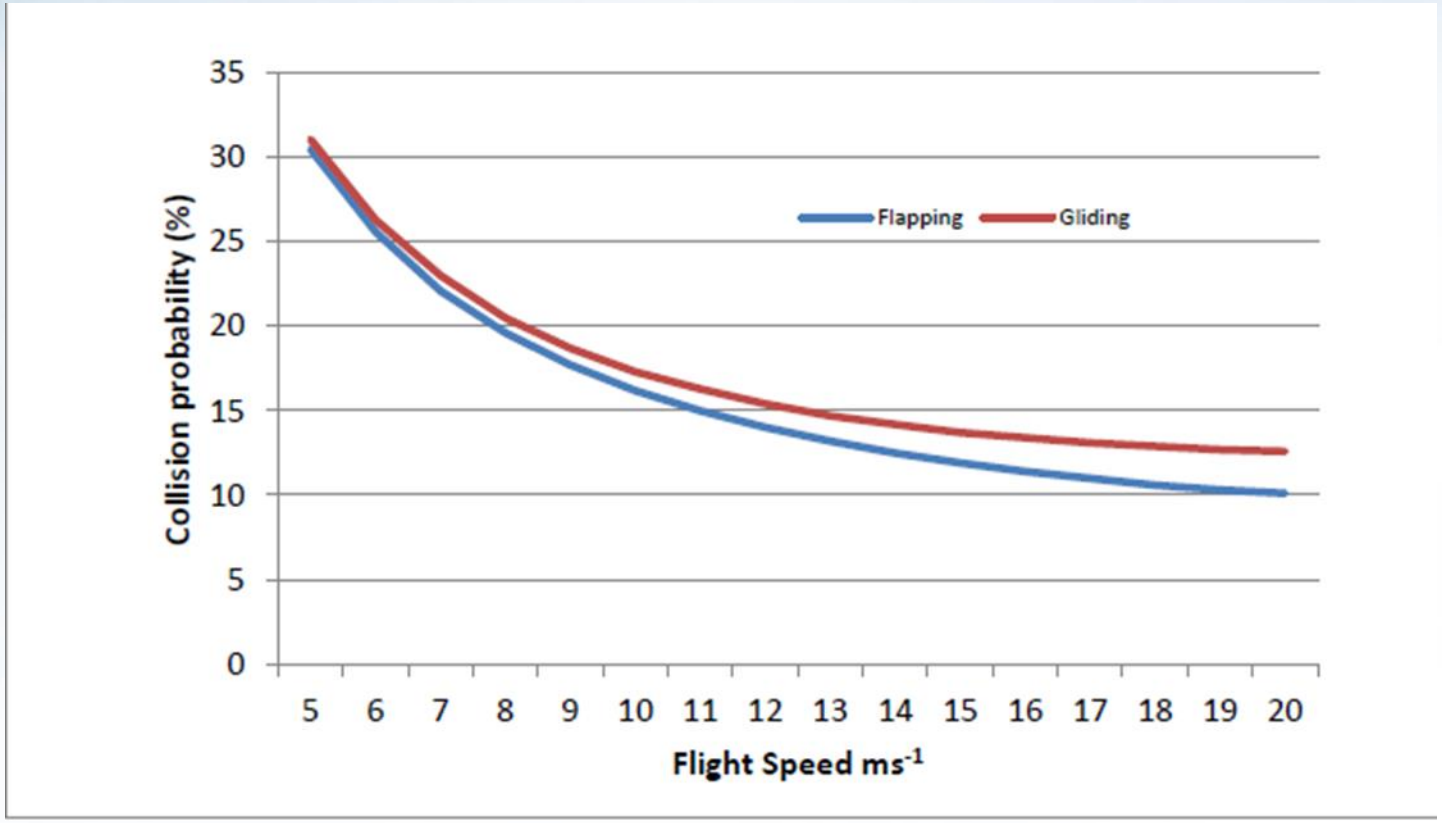


CRM sensitivity to input parameters



From Masden, 2015

Flight Speed and Collision Probability



Some CRM Conclusions

There should be focus not just on improving certainty around avoidance rate but also around the other input parameters.

Reducing the uncertainty around these will increase confidence in the outputs of the CRM and thereby decrease the need for precaution.

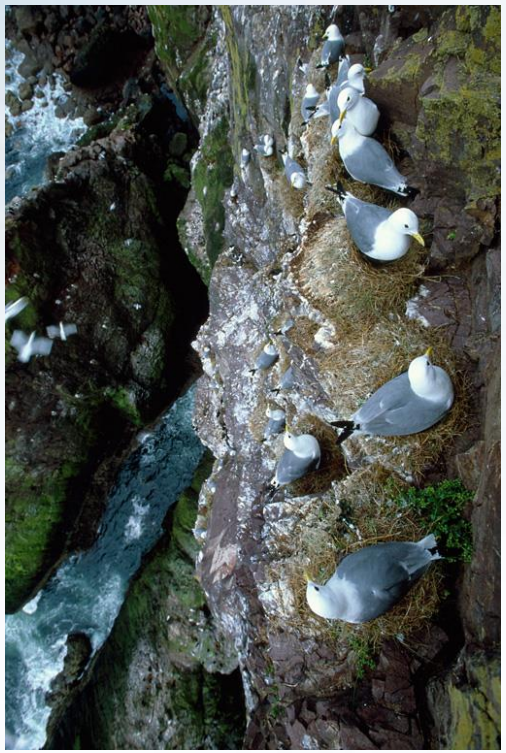
Foraging Ranges and SPA Apportioning

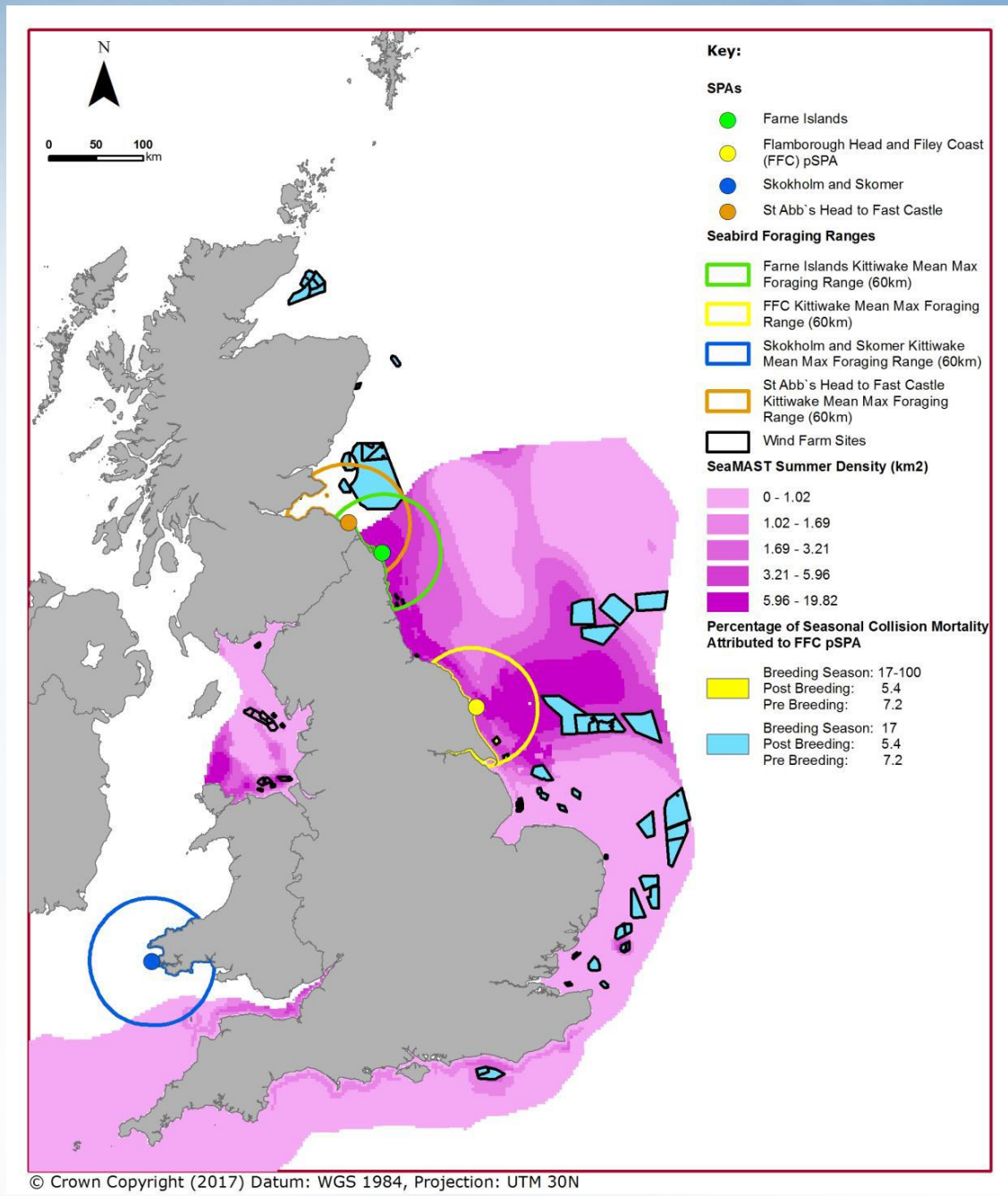
Typically data from Thaxter *et al.,* (2012) used to determine whether wind farm is within foraging range of an SPA

Mean maximum value is sometimes used, (although maximum would be most precautionary)

Data from colony specific tracking shows this is not precautionary

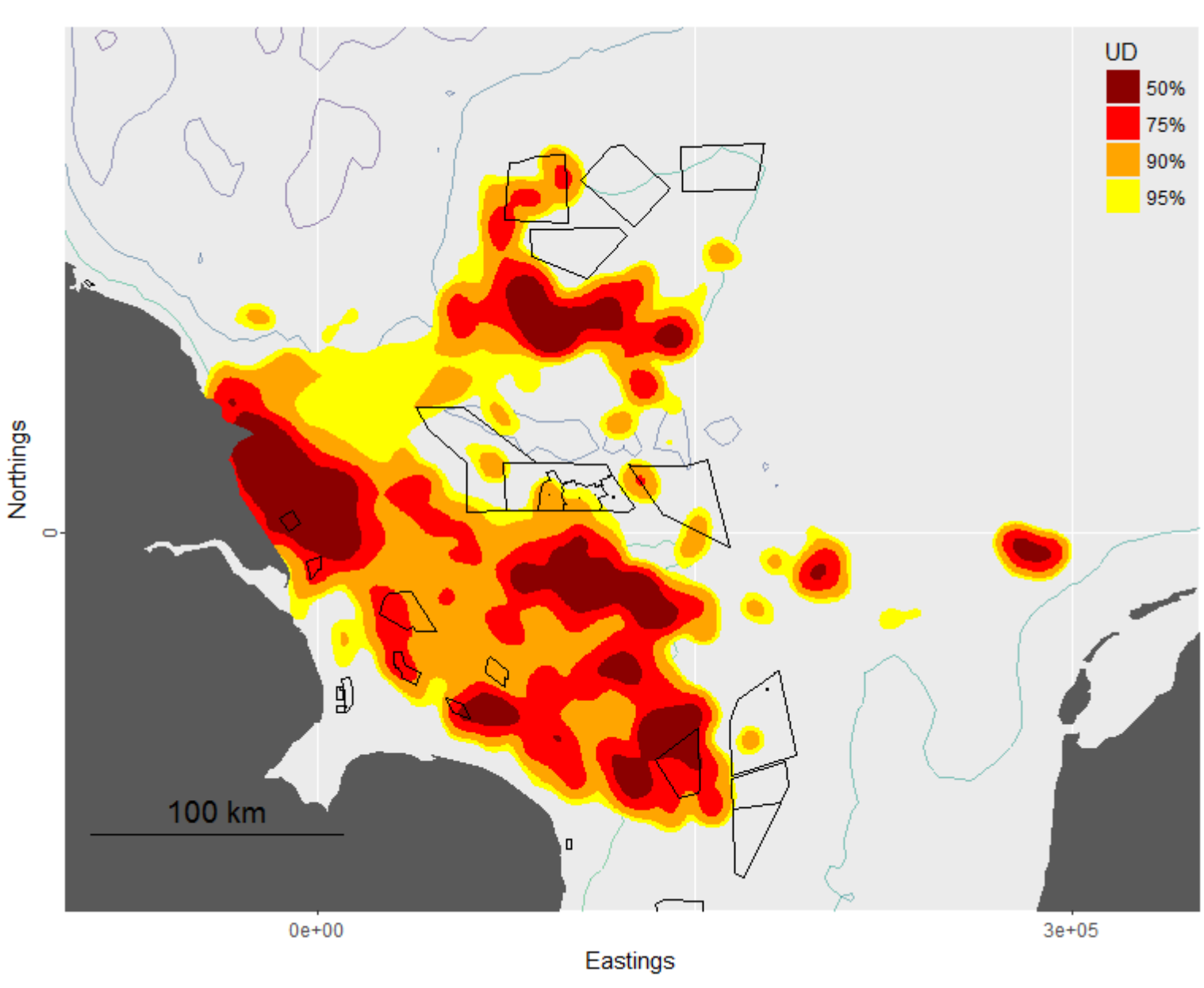
Kittiwake (Mouette tridactyle) foraging range





From
MacArthur Green 2017

Kittiwake (Mouette tridactyle) Tracking Studies 2017



Data from FAME and STAR tracking studies

	n colonies	n colony years	n birds (n in breeding stage)*	n trips	Maximum Foraging Range	Mean-maximum Foraging range	Mean foraging range (modelled mean)	Previously reported maximum foraging range (km) (n colonies)**	% of birds where maximum exceeds previous maximum*
Guillemot (Guillemot de Troil)	11	23	190 (c126, i53, u11)	1082	338.4	67.0	15.2 (19.6)	135 (6)	6 (11 birds)
Razorbill (Pingouin torda)	14	39	302 (c154, i134, u14)	1477	312.9	93.3	22.3 (24.1)	95 (4)	21 (63 birds)
Kittiwake (Mouette tridactyle)	20	50	594 (c385, i142, u82)	2417	227.8	122.9	24.5 (23.8)	120 (8)	11 (65 birds)
Shag (Cormoran huppe)	14	34	245 (c151, i45, u49)	9364	31.5	12.3	1.5 (3.5)	17 (2)	11 (25 birds)

* c= chick rearing, i= incubating, u=unknown
** as reported by Thaxter et al. 2012

Some Tracking Conclusions

- Sample maximum is sensitive to sample size, currently used single species values for maximum foraging range (from Thaxter *et al.,*) were found to be underestimates when the larger dataset (FAME+STAR) was considered.
- Values for Mean-max and mean, two other commonly used metrics which ought to be less sensitive to sample size, were also underestimated.
- Variation in Maximum Foraging Range is high, particularly between colonies

More Tracking Conclusions

It is best to use colony specific data,
not because it is the most precautionary approach….
but because it is the most correct

Potential Biological Removal (PBR)

A method for detecting overharvesting of exploited animal populations and unsustainable additional mortality of other kinds.

Can be performed for bird populations using very few data.

- minimum current population size
- estimates of two demographic rates:
  - the mean age at first breeding
  - mean annual adult survival.

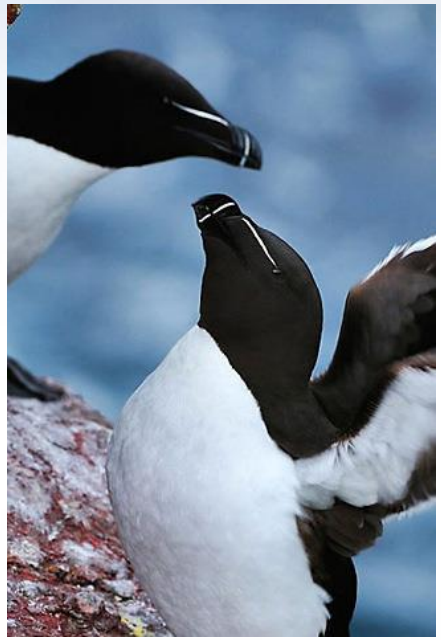
Uses the equation based upon Dillingham & Fletcher (2008)

$$PBR = 0.5\, N_{min}\, f\, (\lambda_{max} - 1)$$

N_{min} is a value of estimated population size
λ_{max} is first estimated from adult survival and mean age at first breeding
f is a “recovery factor”.

Problems with PBR

- it does not quantify the impact of additional mortality on population size
- is not appropriate to practical applications in wind farm assessments because of inadequate knowledge about density dependence
- depends upon a choice of a recovery factor (*f*)which is not supported by empirical evidence



The choice of recovery factor is often said to be “precautionary”,
But no value can be precautionary if the assessment method is so flawed

Other means of setting thresholds, such as Acceptable Biological Change (ABC) are also deeply flawed.

There is a requirement to improve our knowledge of colony populations and demographic rates in order to better model population scale impacts.

Studies to Reduce Uncertainty

Offshore Renewables Joint Industry Partnership
EOWDC Research and Monitoring
Ongoing tracking studies

It is often said that offshore wind farm assessments are over-precautionary, and therefore we should reduce precaution.
But there is precaution because of all the uncertainty.
Our primary aim should be to reduce the uncertainty not precaution

The result is more certain assessments of developments can be made, to the benefit of sustainable offshore renewable industry and internationally important populations of seabirds

Discussion