風力発電と野生生物への影響に関する国際学会
（Conference on Wind energy and wildlife impacts）
の参加報告

目的：海外と比べ日本では研究が遅れている風力発電と野生生物に関する分野の研究について、世界の最新情報を得るために参加しました。
特に、今後は日本で導入が検討される洋上風力発電の話題について注目しました。

自然保護室
浦　達也

2011年 5月2～5日／ノルウェー・トロンハイム市、Radisson Blu Royal Garden Hotel

まずは、ノルウェーホルン♪でお出迎え

Detailed Scientific Programme

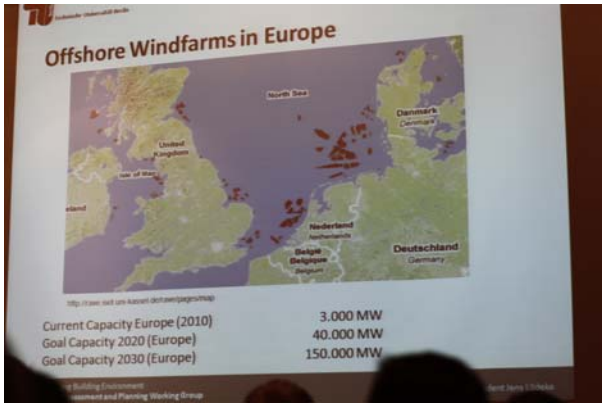
Unless stated otherwise, all scientific activities will take place in the conference auditorium "Olav Tryggvason"

Monday 2nd of May 2011		
13:00 - 18:00	Registration	– Conference area, 1st floor –
18:00 - 19:30	Ice-breaker	– Conference foyer, 1st floor –
Tuesday 3rd of May 2011		
08:00 - 09:00	Registration and coffee start	– Conference area and foyer –
09:00 - 10:30	**Opening and plenary session [Convenor: Dr. Kjetil Bevanger]**	
09:00 - 09:10	Kjetil Bevanger (NINA, Norway)	Opening
09:10 - 09:20	Norunn S. Myklebust (NINA, Norway)	Welcoming speech
09:20 - 09:35	Bjørn Tuell (Statkraft AS, Norway)	The right climate for environmentally-friendly wind energy
09:35 - 09:50	Kjetil Bevanger (NINA, Norway)	Wind energy and wildlife impacts: lessons learned from Smøla
09:50 - 10:05	Micheal O'Briain (EU DG Environment)	EU guidelines on wind energy and nature conservation
10:05 - 10:20	Rowena Langston (RSPB, United Kingdom)	Birds and Wind Energy
10:20 - 10:35	Mark Desholm (NERI, Denmark)	Studying wildlife and wind power - pros and cons of methodologies
10:35 - 11:00	Coffee break	– Conference foyer –
11:00 - 12:30	**Session 1: EIAs and site selection [Convenor: Prof. Dr. Johann Köppel]**	
11:00 - 11:15	Jens Lüdeke (Germany)	Proposing an approach for the Assessment of Environmental Impacts of Offshore Wind Farms in Europe
11:15 - 11:30	Jason Jones (Canada)	Modeling habitat distributions of bats using GIS: wind energy and Indiana bats
11:30 - 11:45	Ernst Retief (South Africa)	The development of an Avian Wind Sensitivity Map for South Africa
11:45 - 12:00	Thomas Dahlgren (Norway)	Methods Development for Cost-Effective Marine Environmental Monitoring at Offshore Wind Farms in Norwegian Waters
12:00 - 12:30	Questions & Answers Session	
12:30 - 13:30	Lunch break	– Restaurant Cicignon, ground floor –
13:30 - 15:00	**Session 2: Pre- and post-construction monitoring [Convenor: Prof. Dr. Johann Köppel]**	
13:30 - 13:45	Elzbieta Kret (Greece)	Assessing the impact on birds of prey of nine established wind farms in Thrace, NE Greece
13:45 - 14:00	Simon Pickering (United Kingdom)	Pre- and post construction monitoring and stake holder involvement of on-shore turbines adjacent to Severn Estuary Ramsar site
14:00 - 14:15	Thoralf Hoth (Germany)	Impacts on demersal fish communities in the North Sea based upon data from the first German offshore wind farm
14:15 - 14:30	Karen Krijgsveld (Netherlands)	Flight patterns of birds in an offshore wind farm in the Netherlands
14:30 - 15:00	Questions & Answers Session	
15:00 - 16:00	Poster break	– Kristiansten Hall, 1st floor, vis-á-vis the auditorium –
16:00 - 17:30	**Session 3: Fatality studies [Convenor: Dr. Edward Arnett]**	
16:00 - 16:15	Shawn Smallwood (United States)	Comparing Avian and Bat Fatality Rate Estimates among North American Wind Energy Projects
16:15 - 16:30	Manuela Huso (United States)	Expanding fatality estimates from the search plot to the entire site
16:30 - 16:45	Regina Bispo (Portugal)	A Web based application to estimate wildlife fatality: from the bias correction factors to the corrected fatality estimates.
16:45 - 17:00	Alvaro Camina (Spain)	The effect of wind farms on vultures in northern spain: fatalities behaviour and correction measures
17:00 - 17:30	Questions & Answers Session	
19:30 - 21:30	**Evening workshop on estimating fatality at wind-power plants [Chairs: Dr. Manuela Huso & Dr. Regina Bispo]**	
19:00 - 22:30	Evening activity: Beaver-watching	– Meet up at the hotal entrance –

プログラム
（1～2日目）

開会と
全体集会

環境影響評価
と立地選択



建設前と後の
モニタリング

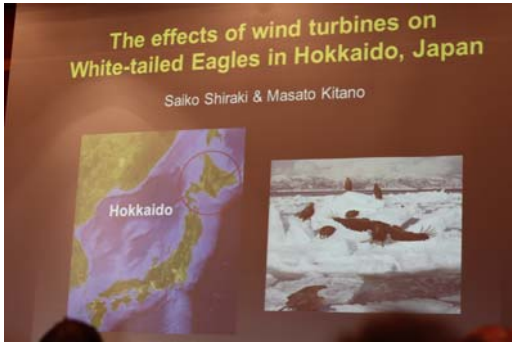
死亡率の研究

PROGRAMME Conference on Wind Energy and Wildlife Impacts

Wednesday 4th of May 2011		
08:30 - 09:00	Coffee start	– Conference foyer –
09:00 - 09:20	Keynote speaker: Thomas Kunz (United States)	Aeroecology: An Emerging Frontier
09:20 - 10:30	**Session 4: Species-specific vulnerabilities and population effects [Convenor: Dr. Rowena Langston]**	
09:20 - 09:35	Saiko Shiraki (Japan)	The effects of wind turbines on White-tailed eagles (Haliaeetus albicilla) in Hokkaido, Japan
09:35 - 09:50	Jens Rydell (Sweden)	Effect of wind turbine mortality on noctule bats in Sweden: predictions from a simple population model
09:50 - 10:05	Hans Chr. Pedersen (Norway)	Mortality of radio collared willow ptarmigan in Smøla wind-power plant
10:05 - 10:30	Questions & Answers Session	
10:30 - 11:00	Coffee break	– Conference foyer –
11:00 - 12:30	**Session 5: Behavioural and spatial responses [Convenor: Dr. Edward Arnett]**	
11:00 - 11:15	Marc Reichenbach (Germany)	Windturbines and meadow birds in Germany – results of a 7 years BACI-study and a literature review
11:15 - 11:30	Francisco Alvares (Portugal)	Assessing ecological responses of wolves to wind power plants in Portugal: methodological constrains and conservation implications
11:30 - 11:45	Miriam Brandt (Germany)	Displacement effects of pile driving during offshore windfarm construction on harbour porpoises (Phocoena phocoena)
11:45 - 12:00	Jay Pruett (United States)	Wind Energy's Subtle Effect: Habitat Fragmentation
12:00 - 12:30	Questions & Answers Session	
12:30 - 13:30	Lunch break	– Restaurant Cicignon, ground floor –
13:30 - 15:00	**Session 6: Collision risk modelling [Convenor: Dr. Shawn Smallwood]**	
13:30 - 13:45	Roel May (Norway)	Collision risk in white-tailed eagles – Avoiding risky modelling
13:45 - 14:00	Oliver Behr (Germany)	Using acoustic monitoring to measure and mitigate the risk of bat-collisions at wind turbines in central Europe
14:00 - 14:15	Cindy Hull (Australia)	Behaviour and turbine avoidance rates of eagles at two wind farms in Tasmania, Australia
14:15 - 14:30	Maria Mateos (Spain)	Modelling seabird collision risk with off-shore wind farms
14:30 - 15:00	Questions & Answers Session	
15:00 - 16:00	Poster break	– Kristiansten Hall 1st floor, vis-á-vis the auditorium –
16:00 - 17:30	**Session 7: Methods and statistics [Convenor: Dr. Mark Desholm]**	
16:00 - 16:15	Niall Burton (United Kingdom)	Evaluating the statistical power of detecting changes in the abundance of seabirds at sea
16:15 - 16:30	Blanca Pérez Lapeña (Netherlands)	Statistical power in testing marine fauna displacement due to an offshore wind farm
16:30 - 16:45	Fiona Mathews (United Kingdom)	The effectiveness of search dogs compared with humans in searching difficult terrain at turbine sites for bat fatalities
16:45 - 17:00	Espen Lie Dahl (Norway)	Using DNA analysis to assess territory structure, mortality and partner shifts in a population of white-tailed eagle breeding inside and close to the Smøla wind-power plant
17:00 - 17:30	Questions & Answers Session	
19:30 - 21:00	**Evening workshop on large terrestrial mammals and wind power [Chairs: Dr. Jan-Olof Helldin & Francisco Alvares]**	
19:00 - 22:30	Evening activity: Beaver-watching	– Meet up at the hotel entrance –

（3日目）

種特異的
脆弱性と
集団効果

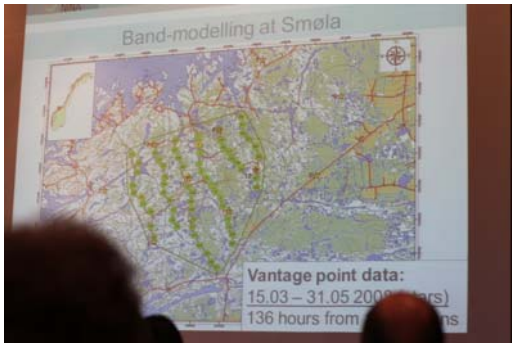


行動的および
空間的応答

日本人研究者の白木博士

衝突危険度の
数学モデル化

調査方法と
統計的手法

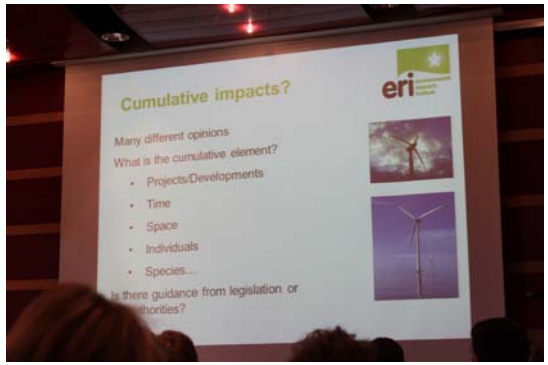


Conference on Wind Energy and Wildlife Impacts PROGRAMME

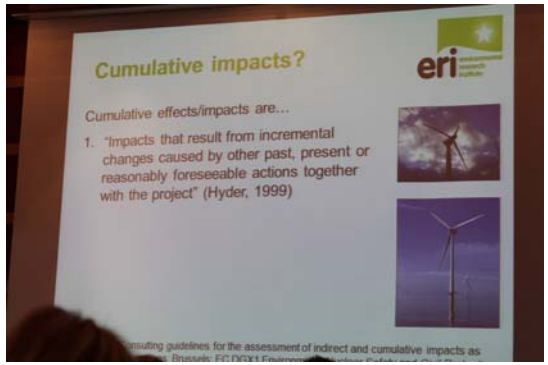
Thursday 5th of May 2011		
08:30 - 09:00	Coffee start	– Conference foyer –
09:00 - 09:20	Keynote speaker: Elisabeth Masden (United Kingdom)	The challenge of cumulative impacts
09:20 - 10:05	**Session 8: Cumulative effects [Convenor: Dr. Roel May]**	
09:20 - 09:35	Ian Smales (Australia)	Linking turbine collision risks with population models to assess cumulative impacts of multiple wind farms on threatened birds
09:35 - 09:50	Mark Collier (Netherlands)	Cumulative effects of wind farms in the Dutch North Sea on bird populations
09:50 - 10:05	Questions & Answers Session	
10:05 - 10:30	Coffee break	– Conference foyer –
10:30 - 12:00	**Session 9: Tools and technology [Convenor: Dr. Mark Desholm]**	
10:30 - 10:45	Janine Aschwanden (Switzerland)	Which radar systems are suitable to study what kind of question? – An overview
10:45 - 11:00	Caleb Gordon (United States)	new technologies for offshore wildlife risk studies
11:00 - 11:15	Bertrand Delprat (France)	ID Stat: innovative technology for assessing wildlife collisions with wind turbines
11:15 - 11:30	Timothy Coppack (Germany)	Automated in situ monitoring of migratory birds at Germany's first offshore wind farm
11:30 - 12:00	Questions & Answers Session	
12:00 - 13:00	Lunch break	– Restaurant Gidgnon, ground floor –
13:00 - 14:30	**Session 10: Mitigation and compensation [Convenor: Dr. Andrew Gill]**	
13:00 - 13:15	Scott Cole (Sweden)	Ex Post Compensation for White-tailed Eagle (Haliaeetus albicilla) Impacts at the Smøla Wind Farm: An Application of Equivalency Analysis
13:15 - 13:30	Ansgar Diederichs (Germany)	Testing the effects of an acoustic harassment device on the behaviour of harbour porpoises (Phocoena phocoena)
13:30 - 13:45	Anabela Paula (Portugal)	Managing habitat for prey recovery – an off-site mitigation tool for wind farms' impacts on top avian predators
13:45 - 14:00	Antonio-Román Muñoz Gallego (Spain)	Raptor mortality in wind farms of southern Spain: mitigation measures on a major migration bottleneck area
14:00 - 14:30	Questions & Answers Session	
14:30 - 15:30	Poster break	– Kristiansten Hall 1st floor, vis-à-vis the auditorium –
15:30 - 16:30	**Session 11: Future challenges: onshore and offshore [Convenor: Dr. Roel May]**	
15:30 - 15:45	David Bourke (Ireland)	Developing wind energy in Ireland – consequences for our biodiversity and ecosystem services
15:45 - 16:00	Jan Kube (Switzerland)	Options for mitigation of bird collisions at offshore wind farms: a European perspective
16:00 - 16:15	Andrew Gill (United Kingdom)	Field scale experiments to assess the effects of Offshore Wind Farms on marine organisms
16:15 - 16:35	Questions & Answers Session	
16:40 - 18:00	**Final panel debate and closure [Convenor: Dr. Roel May]**	
19:30 - 23:00	Banquet	– Conference auditorium "Olav Tryggvason" –

（4日目）

累積的影響

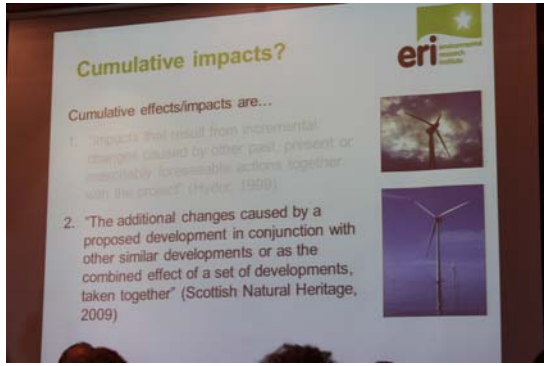


調査の手段と技術



影響の緩和と代償措置

陸上と洋上風力発電の将来的課題



OFFSHORE WIND FARMS IN THE BELGIAN PART OF THE NORTH SEA:
Early environmental impacts and spatio-temporal variability

museum

Robin Brabant (R.Brabant@mumm.ac.be), Steven Degraer, Bob Rumes & colleagues
Royal Belgian Institute of Natural Sciences
Management Unit of the North Sea Mathematical Models

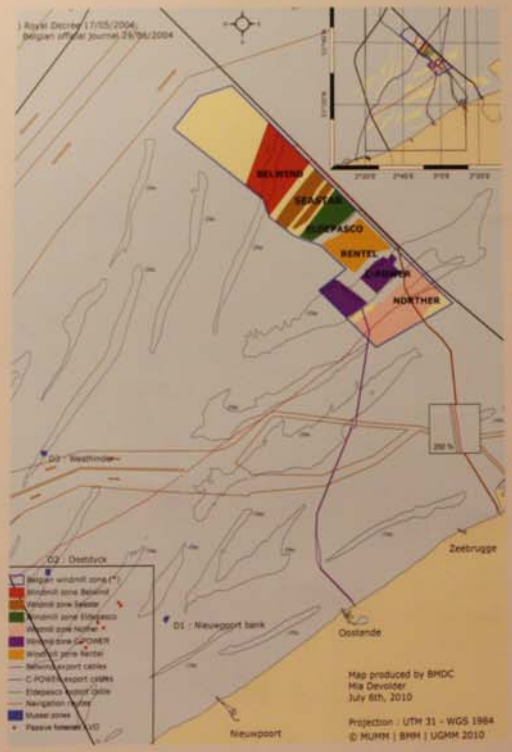
Offshore wind energy in Belgium

In 2004, the Belgian government assigned a zone for wind energy in the Belgian part of the North Sea.

Since then three companies (C-Power, Belwind and Eldepasco) were granted an environmental permit to build a wind farm. Other projects are in the pipeline.

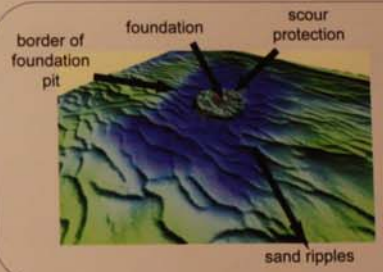
Six wind turbines on the Thorntonbank (C-Power) and 55 on the Blighbank (Belwind) are up and running.

In 2011 the construction of the next phases of C-Power and Belwind starts. In 2012, Eldepasco will start with the construction of their wind farm.



Early impacts

Most impacts will only become established and detectable when more wind turbines will be installed and/or after a certain period of time. However, some localized impacts are expressed from the early stages of the wind farm development onwards. As such, early impacts were detected for:



1. the geophysical environment:
- perspective view of bathymetry around foundation
- foundation pit still visible
- sand ripples recovered
- scour protection remains stable
- no secondary scour around scour protection

2. the establishment of hard substratum epifauna and fish as a consequence of the introduction of hard substratum, in a sandy environment:
- rapid colonisation after installation
- further ecological succession to a rich and diverse community (63 species! and over 20.000 organisms/m²)
- presence of invasive and warm water species → stepping stone effect
- dominant organisms are barnacles, mollusks, crustaceans, etc.
- attraction of fish:
  - 7 species are common around the C-Power foundations
  - up to 29.000 individuals of Pouting *Trisopterus luscus* per wind turbine!
  - Stomach analyses show that epifauna is a food source for Pouting

The necessity of environmental monitoring

ポスター発表も多数ありました

エクスカーションとして、ビーバーの巣を見学しに行きました。
★写真左側の木枝の山がビーバー作のダム

主催者らが閉会の挨拶。内容の充実した学会もこれで終了

5月6日はSmola島の風力発電所を見学に。写真は道中でみたフィヨルドの景色

参加者らと島に到着。Smola島には2MW×20基、2.3MW×48基の風車が建つ

Smola島はオジロワシの一大繁殖地だが、毎年多数が衝突死し、繁殖数が減少

Smola島では、レーダーで鳥の動きを24時間監視する

★　地球温暖化対策を行わないと、近い将来に生物多様性や生態系サービスの機能が大きく失われると予想されることから学会参加者は、CO2を排出しない風力発電が広く導入されることに期待していました。しかし、生物多様性保全のための風力発電導入で、衝突死等により生物多様性が失われることがあっては、風力発電導入の意味がなくなります。そのため参加者は、風力発電の導入を問題視し抑制するためではなく、風力発電と野生動物が共存できる方法を知り、風力発電が真にクリーンなエネルギーになるために、この問題を研究していることが分かりました

そして、学会と風力発電所の見学も終わり美しいノルウェー・トロンハイムの町並ともお別れ

日本では聴くことができないだろう世界最新の研究結果を知ることができ有意義な学会参加となりました

この成果はぜひ、今後の当会の活動に活かしてまいります

最後に、デンマーク・コペンハーゲン市の沖のミドルグロン洋上風力発電所を
眺めながら、ヨーロッパ大陸を離れました