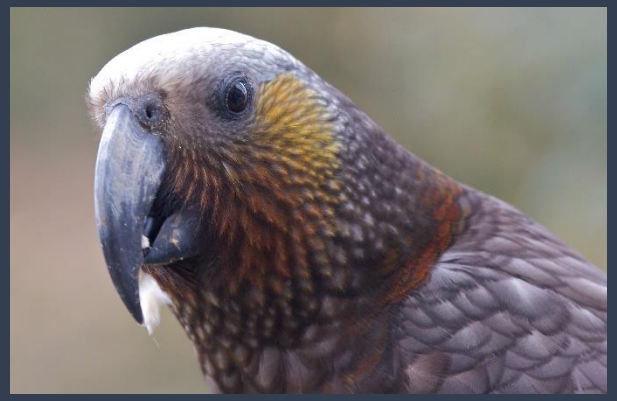




NZWEA Wind Energy Conference
Session 2 - Empowering New Wind

Avifauna and Wind

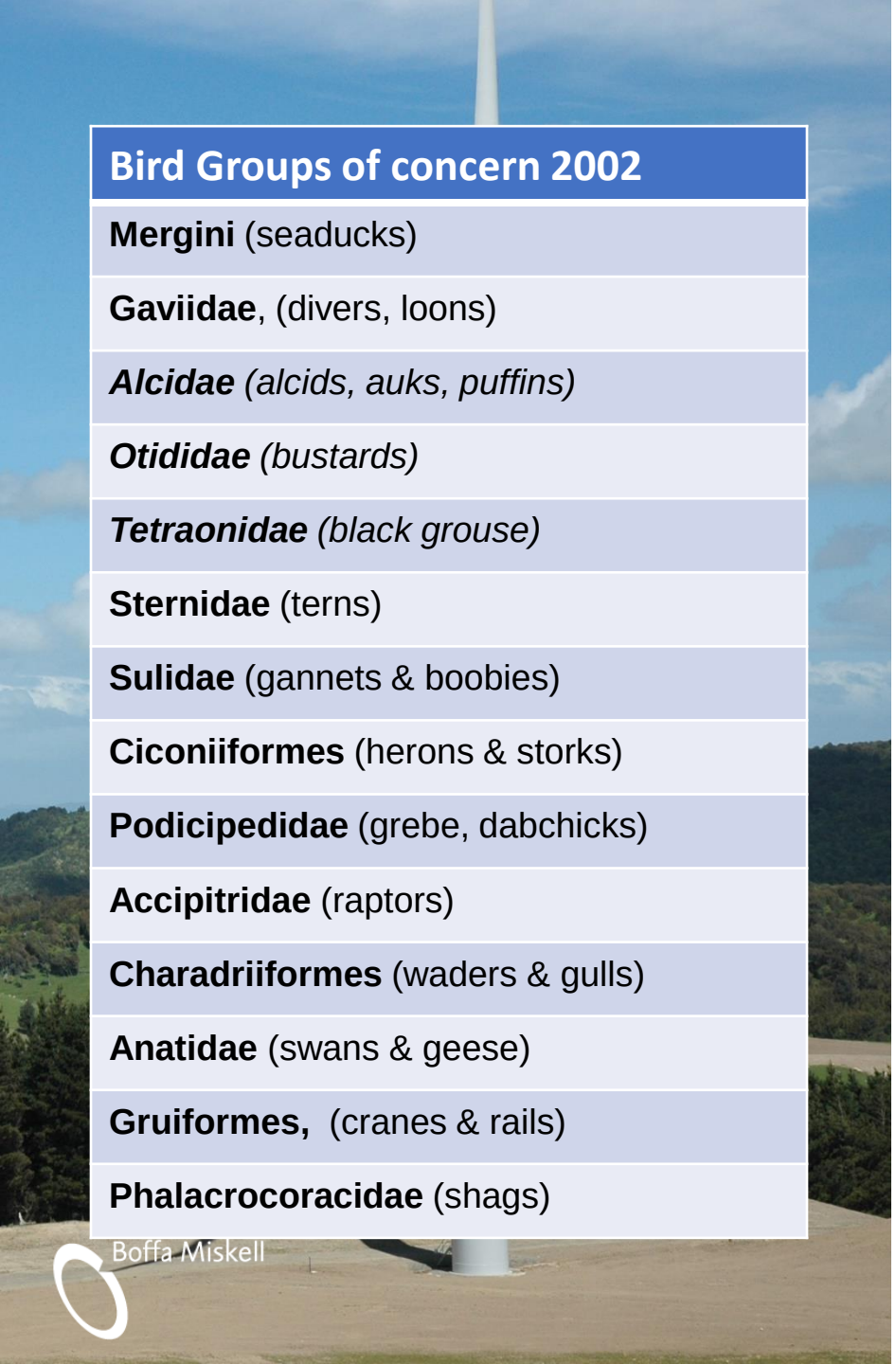
A retrospective and a look into the future

Stephen Fuller, Boffa Miskell

24 August 2022

“Best practice in ecological assessment for wind farms”

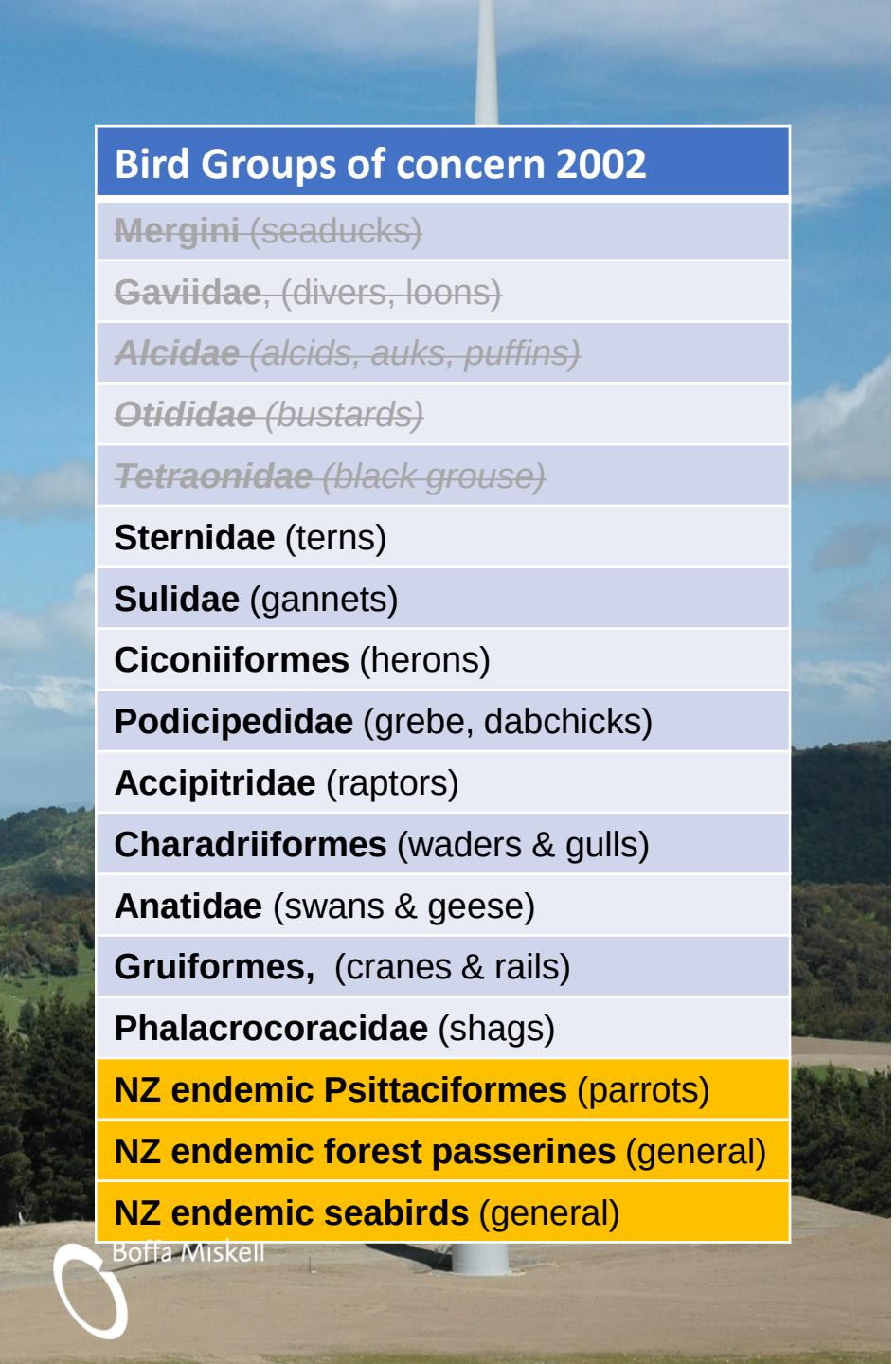
- 2004 presentation to NZWEA on best practice for impact assessment and commented;
  - All guidance was international (relevant?),
  - Data on many NZ species very poor,
  - No data to risk profile any species,
  - Were starting from scratch.
- Since then nearly 20 years of research.
- First formal baseline avifauna study 2005.
- First post-construction monitoring started 2009.



Bird Groups of concern 2002
Mergini (seaducks)
Gaviidae, (divers, loons)
Alcidae *(alcids, auks, puffins)*
Otididae *(bustards)*
Tetraonidae *(black grouse)*
Sternidae (terns)
Sulidae (gannets & boobies)
Ciconiiformes (herons & storks)
Podicipedidae (grebe, dabchicks)
Accipitridae (raptors)
Charadriiformes (waders & gulls)
Anatidae (swans & geese)
Gruiformes, (cranes & rails)
Phalacrocoracidae (shags)

What bird groups were of concern?

- In 2002 we began with this Northern Hemisphere List of birds of concern.
- Didn't know how relevant it was.
- Assessments relied on local knowledge and predictions based on behaviours.
- Removing groups absent from Southern Hemisphere and adding groups endemic to NZ we got . . .



NZ birds at risk (onshore)

- To date no mortalities from terns, gannets, herons, grebes or dabchick, cranes, rails, shag, & parrot groups,
- Raptor group - swamp harrier,
- Waders & gulls group - southern black-backed gull & spur winged plover,
- Swan, geese & ducks group - paradise shelduck,
- 2 forest species in low numbers - waxeye & tui,
- 2 individual seabird mortalities - both prions.

Summary of post construction monitoring

- Combined available data from 5 wind farms
- Mortalities of 26 spp. 18 introduced, 8 native.
- Most frequent were swamp harrier (23%), finch spp. (18%), skylark (17%), magpie (14%), and mallard duck (8%).
- 7 native species with few mortalities.
- And 29 native species without observed mortalities.

Have learnt – presence does not equal risk

Site 1:

- Baseline = 40 spp., 22 native
- Mortalities = 9 spp., 2 native

Site 2:

- Baseline = 36 spp., 17 native
- Mortalities = 18 spp., 6 native

Site 3:

- Baseline = 30 spp., 15 native
- Mortalities = 8 spp., 3 native

Have also learnt – each site is unique - Site 1

	Abundance	Mortality
Black-backed gull*	32%	
Starling	16%	
Spur-winged plover*	15%	
Finch spp.	12%	17%
Skylark	3%	28%
Mallard	3%	8%
Australasian magpie	2%	3%
Swamp harrier*	1%	36%
House sparrow	< 1%	3%
Broad-billed prion*	0%	< 1%

Site 2

	Abundance	Mortality
Starling	37%	
Finch spp.	29%	33%
Waxeye*	7%	
Skylark	4%	4%
Black-backed gull*	3%	8%
Swamp harrier*	1%	23%
Paradise shelduck*	1%	9%
Mallard	1%	8%
Fairy prion*	0%	< 1%

Site 3

	Abundance	Mortality
Finch spp.	29%	
Skylark	12%	29%
Welcome swallow*	11%	
Magpie	9%	35%
Swamp harrier*	4%	19%
Fantail*	4%	
Tui*	4%	
Kingfisher*	3%	
Starling	3%	
Paradise shelduck*	2%	
Black-backed gull*	< 1%	3%

Why do they differ so much?

Identified many factors affecting risk profile of site. All need to be considered in combination:

- Topography & habitat distribution,
- Size, number and type of turbines used,
- Spatial arrangement of turbines,
- Wind farm proximity to defined flight paths,
- The particular species of bird present at the site,
- Their breeding, feeding, and roosting behaviour,
- Their preferred flight height & avoidance rates.

Flight height & avoidance

- Now have good data on flight height from many species.
  - Some rarely seen within RSA, e.g. NZ Pipit, Banded dotterel,
  - Some mostly seen within RSA, e.g. Swamp Harrier, Black-backed gull,
  - And everything between.
- Avoidance is significant for all species! 100% for most, and likely 98% to 99.9% for the remainder.
- Avoidance rates not yet confirmed by research.

Mortalities per turbine

- Modelled results to date range from 1 to 11 mortalities per turbine per year depending on many factors.
- In all cases the % of natives has been very low, though total numbers of natives is skewed by swamp harrier, the most affected bird in NZ.

Have explored various tools

- Radar for migrants.
- GPS transmitters for raptors.
- Bio-acoustics & night vision for nocturnal activity.
- Collision risk modelling & population modelling.
- Understand strengths and weaknesses.

Have explored methods to minimise risk?

- Site Selection.
- Removal of one or several turbines.
- Limits to turbine layout, for example establishing no-turbine flyways, habitat buffers.
- Removal of habitat:- deliberate displacement of birds.
- Risk modelling to test different layouts
- Curtailment has been discussed but not used, no data on effectiveness for any NZ species.

In summary for onshore wind

- Each site unique in terms of species presence and relative abundance.
- Each species has a unique risk profile that can vary site to site.
- To date mortalities of natives very low.
- In terms of rarity, 2 mortalities of relict species, no recorded mortalities of threatened species.
- Some design interventions have been effective.
- Have added considerably to knowledge of onshore birds in NZ.

Caveats

- Only access to data from 5 wind farms out of 21 commissioned – a very small sample size.
- These sites occur in a range of environments – so results from one cannot be assumed for another.
- Are still environments where species are present that have not yet been studied post construction.
- Sampling bias means some mortalities not recorded, so not all affected species known.
- Post construction monitoring needs to continue to increase our knowledge and confidence.

Looking forward to offshore wind

- Many very large sites being prospected, likely to be seeking consent in the next 2 to 5 years.
- Current focus on the quantum of energy generation, not so much the ecological effects.
- Yet uniqueness of NZ coastal and seabird fauna will be a significant issue for offshore wind.
- Also of concern, are very few NZ seabird experts. How to resource the looming demand.

Order	At-Risk	Threatened
Penguins	3	3
Albatross, shearwaters, petrels	28	14
Shags, gannets	6	2
Terns, gulls, skuas	14	12

NZ has a unique and highly endemic seabird fauna

- 86 species of seabirds breed in NZ.
- More than 1/3 are endemic.
- 82 are “At Risk” or “Nationally Threatened”.
- Many only or mostly found in southern oceans.
- Huge variation in abundances, hundreds for the most threatened, to millions for the most abundant.

Biologically and physically diverse

Challenge for method development for survey and effects assessment. e.g.

- Antipodean albatrosses (nationally critical) 8.5kg,
- NZ storm petrel (nationally vulnerable) 35g.

Incredibly mobile

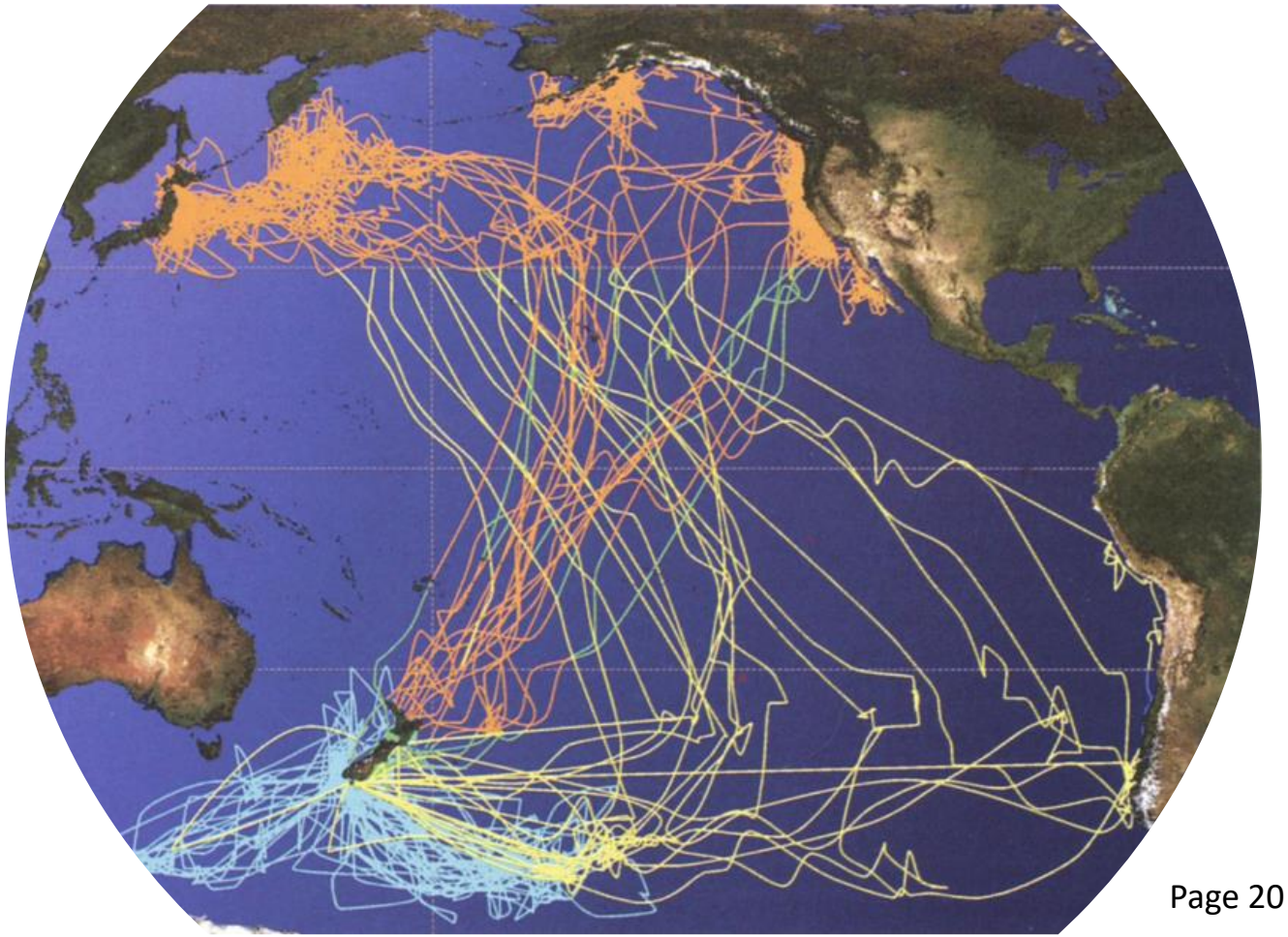


Figure 1: Interpolated geolocation tracks of 19 sooty shearwaters during breeding (light blue) and subsequent migration pathways (yellow – the start of migration and northward transit, and orange – wintering grounds and southward transit) From Shaffer et al. 2006

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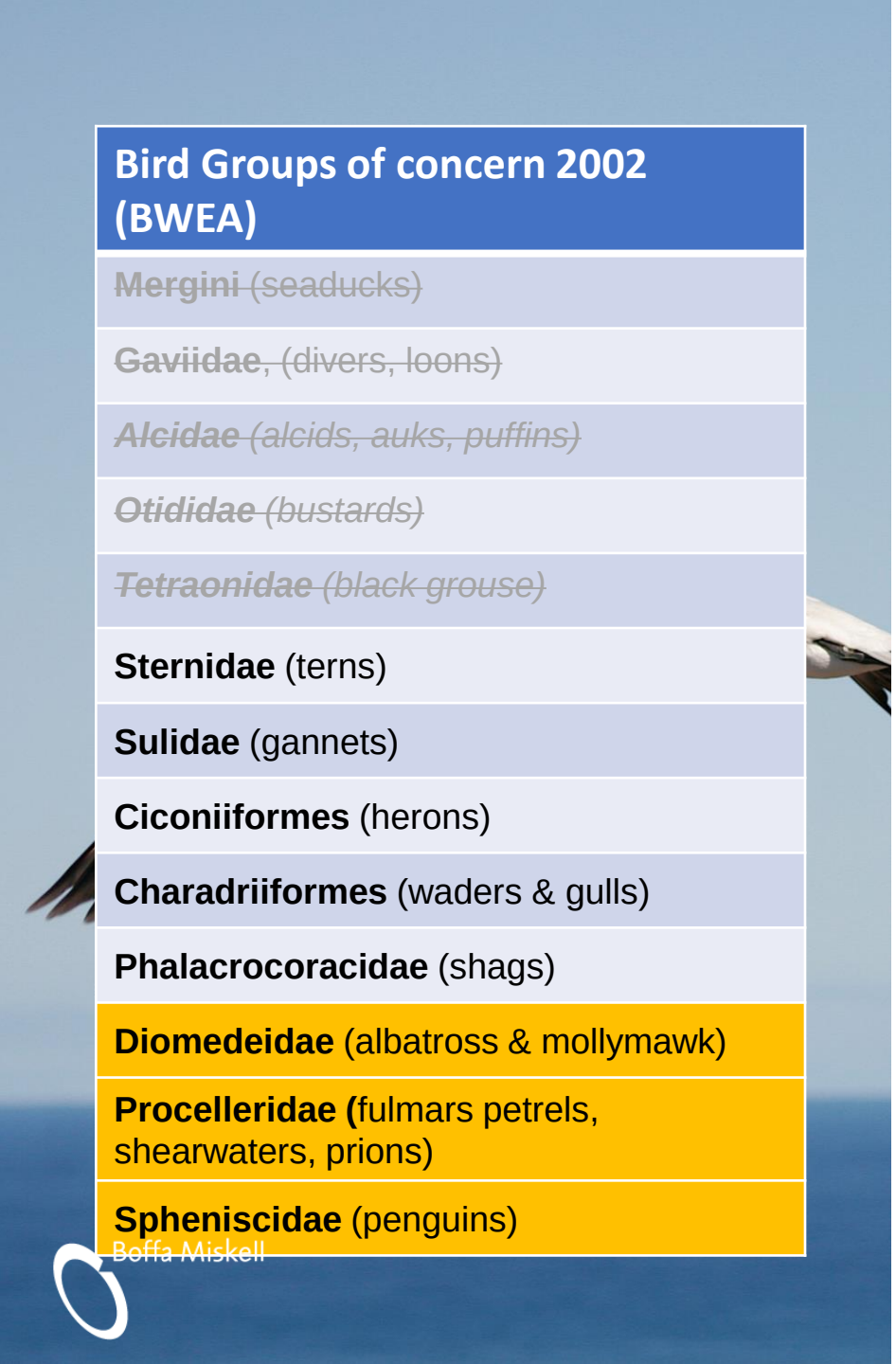
Climate change

- Climate change is already having a significant impact on seabirds critically reliant on ocean temperatures for food availability
- Recent revision to Conservation status of NZ birds has identified impacts of climate change on a number of seabird species and increased threat status accordingly.



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Sternidae (terns)
Sulidae (gannets)
Ciconiiformes (herons)
Charadriiformes (waders & gulls)
Phalacrocoracidae (shags)
Diomedeidae (albatross & mollymawk)
Procelleridae (fulmars petrels, shearwaters, prions)
Spheniscidae (penguins)

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NZ seabirds of concern (coastal and offshore)

- The risk to southern ocean endemics is unknown but could be significant.
- Cannot rely on northern hemisphere studies
- Looking at results for terrestrial wind, we can assume there will also be differential risk between oceanic species, and risk will be different at each location
- Also of concern little we can do to influence factors causing decline, so offsetting may not be available for many of these species.

In summary for offshore wind

- Risks to seabirds currently undefined, international research not relevant for key spp.
- Available data on NZ seabirds not collected for the purpose of risk assessment.
- Land based data irrelevant and land-based methods unlikely to be useful offshore. Need new methods, requiring investment and trialing.
- Like onshore wind, years of research will be needed before we have confidence in predictions of risk for each key species.

Continued . . .

- Despite overall uncertainty, are confident that:
  - effects on some seabirds are unlikely to be avoidable, and
  - effects on some or even most seabirds will not be offsetable.
- Therefore, for offshore wind to progress, some level of impact will have to be accepted.
- A different approach to effects assessment and management may be needed.

Other thoughts

- The data we have exists because we've built and observed real wind farms.
- However, increasingly national and regional policies require us to 'avoid' some effects.
- 'Avoid' requires certainty that no effects will occur before consent can be granted. In many cases this will be scientifically impossible.
- A precautionary approach is to decline
- If we can't build windfarms we can't increase our knowledge of risk, or improve tools to minimise.

Other thoughts

- Increasingly complex research needed, but current permissions process limits options.
- Greater collaboration with DOC, in some form, may be essential for future projects to progress.
- Publicly funded data should be open source.
- Equally the industry should share data with DOC.
- NZWEA could operate as a clearing house.
- NZWEA could also consider developing guidance for offshore wind.

In conclusion

- To date, onshore sites have proven to be relatively benign.
- But still some gaps in our knowledge of collision risk for some terrestrial bird groups.
- We are starting from scratch for offshore.
- We need new tools to monitor and test risk.
- We need data and lots of it
- We need to resolve the resourcing issue

In conclusion

- We need greater collaboration with DOC
- We need to agree on an approach to addressing adverse effects on threatened and at risk seabird species which cannot be avoided or mitigated.
- If done well, we have the opportunity to expand greatly our knowledge of our seabird fauna

Thank you

Boffa Miskell