

Risk of commercial fisheries to seabird populations within the New Zealand EEZ

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Introduction

New Zealand: "seabird capital of the world"

- 85 species, many of them endemic
- Many species are listed as threatened, and their interaction with fisheries may be one of the major causes
- Level-2 risk assessment, contracted by the Ministry of Fisheries (now MPI)

Introduction

Level-2 risk assessment

- Built up on Sharp (2011) and Waugh (2009)
- Explicit parameter uncertainty
- Compared estimated fisheries mortality with estimated population productivity
- Only commercial trawl, bottom and surface longline fishing
- Species and fishery type level (64 species, 16 fishery groups)
- Semi-quantitative (lack of data to build population models)

Seabird bycatch



- So far on a few species with enough observations
- http://data.dragonfly.co.nz/psc publicly available soon
- Demographic impact?
- Poorly observed fisheries?



Protected species captures Even Acost
White-caped abatross - Treat - Exclusive Consent Zone - 2019 Capture of white-capped albatross in trawl fisheries





Fishing effort and observed captures of white-capped albatross by month, during the 2003-10 fishing year







Map of Bhilding effort and observed captures, 2004-16. Politing effort is mapped into 0.2-degree only, with the colour of each one being related to the amount of effort. Observed failing overta are indicated by black, and observed captures are indicated by and obse. Phillips in only allows 11 the effort captures are indicated by and observed to any observed captures are indicated by and observed to any observed captures are indicated by and observed to any observed captures are indicated by and observed captures are indicated by and observed captures are indicated by any observed captures are in



Estimating fatalities

Data

- From bird captures recorded by government observers
- In trawl, surface & bottom longline fisheries
- Data between 2003/04 and 2008/09

Vulnerability

- Captures assumed to be proportional to the density of birds at each fishing event.
- Species vulnerability to capture, varying among fisheries.

 $C_{fgs} \sim ext{Poisson}(\mu_{fgs})$ $\mu_{fgs} = v_{gs} d_{fs} N_s E_f$

- μ_{fgs} mean captures for fishing event *f* in fishery group *g* and for species *s*
- v_{gs} vulnerability of species s to captures in fishery group g
- $d_{fs}N_s$ number of birds of species s present at fishing event f
- *E_f* fishing effort during event *f*



Bird density

- Used NABIS, Birdlife Tracking database, data on colonies.
- Two distributions: with and without colonies.

Example: White-capped albatross (Thalassarche steadi).

Without colonies



With colonies





Potential annual fatalities

Estimating observable captures

· Fitted model to predict captures on unobserved fishing events

Estimating potential fatalities

- Included cryptic mortality
- Multipliers based on Watkins et al. (2008) & Brothers et al. (2010)
- Depends on type of seabirds

Estimating population productivity

Potential Biological Removal (PBR)

- based only on population size and maximum growth rate
- designed to maintain populations above their Maximum Net Productivity Level (MNPL)
- · developed and tested for marine mammals

$$PBR = \frac{1}{2}r_{\max}N_{\min}f$$

N_minconservative estimate of population sizer_maxmaximum population growth ratefrecovery factor





- Life history strategies, allometry. Niel & Lebreton (2005)
- Estimated from survival rate (S) and age at first reproduction (A)





- Estimated from survival rate (S) and age at first reproduction (A)
- N_{min} by taking the lower quartile of the distribution of N_{BP}



Potential Biological Removal (PBR)

- PBR calculated only from S, A, P_B, and f
- Estimates of *S*, *A*, and *P*_B from literature, groomed to keep best and most recent ones
- 205 final estimates, 65 using proxy species
- *f* defined according to IUCN red list status, from 0.1 (Critically Endangered) to 0.5 (Least Concern)
- · Uncertainties from literature or created to match typical values

Species at risk

Black petrel Salvin's albatross Flesh-footed shearwater Stewart Island shaq NZ king shag Campbell albatross Southern Buller's albatross Gibson's albatross White-capped albatross Northern royal albatross Antipodean albatross White-chinned petrel Northern Buller's albatross Chatham albatross Cape petrel Southern royal albatross Westland petrel Northern giant petrel Light-mantled albatross Grey-headed albatross



Side analyses



Sensitivity to uncertainties

- Inshore fisheries poorly observed
- Adult survival rate and number of annual breeding pairs

Time variation

- Captures in trawl fisheries has decreased, following fishing effort and the use of mitigation devices
- Possible increase in surface longline fisheries

Limitations

Some intrinsic problems...

- Wrong species identification
- Movement in/out the NZEEZ
- A few fisheries not included
 - e.g. recreational, setnet fisheries
- Other sources of mortality not taken into account underestimate risk
 - · e.g. harvest at colonies, pollution, indirect trophic effects
- PBR might often be overestimated
 - r_{max}, adult ratio

Conclusions

- · The species the most at risk are not the most caught
- Black petrel clearly at risk, urgent action needed
- · Some fisheries with obvious lack of observations
 - Inshore fisheries: especially flatfish trawl, small bottom longline
- Some flaws potentially important
- Need international cooperation
- · Risk assessments can guide management of research and fisheries



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The report can be downloaded from: http://fs.fish.govt.nz/Page.aspx?pk=113&dk=22912