

Seabirds and Conservation Challenges

A photograph of a seabird, likely a booby, in flight over a deep blue ocean. The bird is shown from a side profile, flying towards the right. Its wings are fully extended, revealing the intricate patterns of its feathers. The background is a vast expanse of blue water with gentle ripples.

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Photo: R.L. Pitman

Conservation challenges for seabirds
are derived from their reproductive
biology and foraging ecology.

Preface: Seabirds 101

A seabird:

- Is a bird
 - Flight - All seabirds fly or evolved from flighted ancestors
 - Feathers, scales, no teeth, skeletal modifications, homeothermic
 - Lay a hard-shelled egg that must be incubated



All seabirds must reproduce on land

- Feeds in the marine environment

➤ The interaction between the constraints of breeding on land, and feeding in the sea results in a characteristic and distinctive life history strategy, and suite of behavioral and ecological traits that uniquely define seabirds.

“The Seabird Syndrome”*

➤ Seabirds are colonial

- Few available terrestrial habitats in proximity to marine systems

- Most breed on islands
- In huge numbers with high density

*Gaston 2004; based on Lack 1968, Ashmole 1963, Ricklefs 1990, and many others



The Seabird Syndrome

➤ Seabirds have small clutch sizes and relatively large egg(s)

- Feeding far from nest sites restricts ability to provision chicks



Photo: R.L. Pitman

- Most species lay only 1 egg
- Some lay 2 eggs (incl. obligate and facultative siblicide)
- Few lay 3 or more
 - Restricted to coastal species and/or those feeding in environments of extremely high productivity

The Seabird Syndrome

➤ Seabirds have a long period to chick independence

– Feeding far from nest sites restricts ability to provision chicks

- Fledging at 2-6 mos
- Post-fledging feeding in some species
 - Pronounced in species with complex feeding methods



Photo: R.L. Pitman

The Seabird Syndrome

➤ Seabirds have bi-parental care, long-term pair bonds, and reduced sexual dimorphism

- Feeding far from nest sites restricts ability to provision chicks



Photo: R.L. Pitman

- Only frigatebirds with less than full bi-parental care
- Divorce occurs, more so in some species, but life-long pair bonds are the general rule
- Marked sexual dimorphism only in boobies, frigatebirds

The Seabird Syndrome

- Seabirds have delayed reproductive maturity
 - low annual reproductive output selects for longevity (e.g. delayed reproductive maturity)
 - Locating and capturing prey in the ocean requires complex suite of behaviors
 - Acquisition of pair-bonds lasting a life time takes time

- Age of first reproduction:
 - Gulls, terns: 2-5 yrs
 - Penguins: 4-8 yrs
 - Albatross: 7-13 yrs
 - Frigatebirds: 9-10 yrs



The Seabird Syndrome

- Seabirds have high adult survival and are long-lived



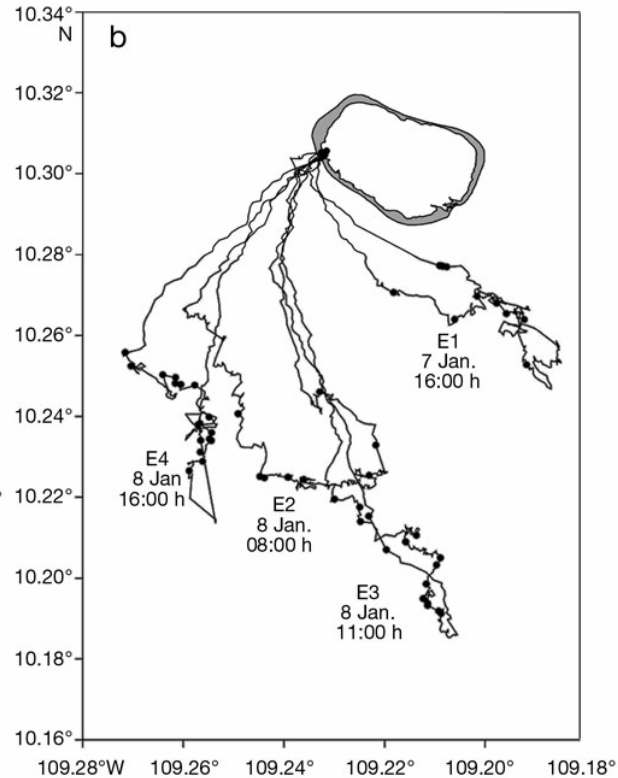
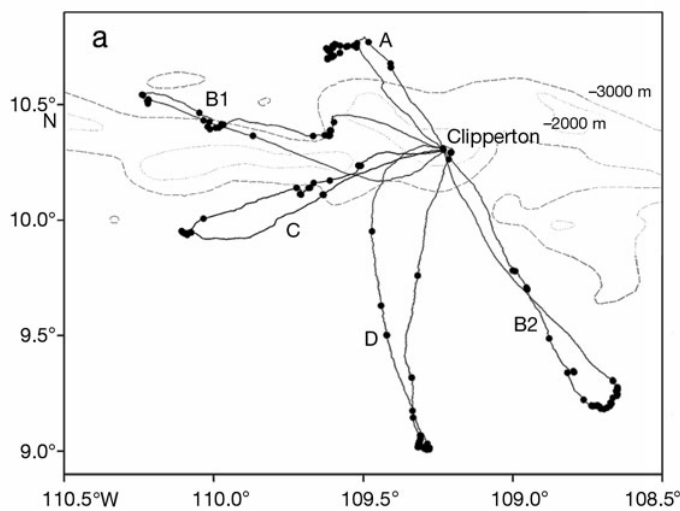
- Adult survival
 - Generally ~85% or higher
- Life span (minimum estimate of maximum):
 - Gulls and terns: 20 yrs
 - Petrels and shearwaters: 30-40 yrs
 - Albatross: 50-70 yrs



The Seabird Syndrome

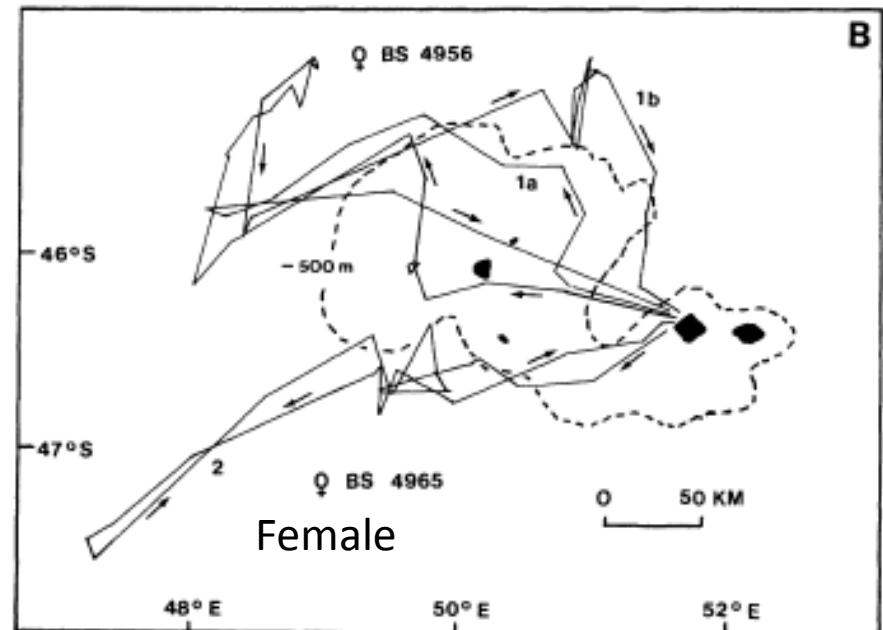
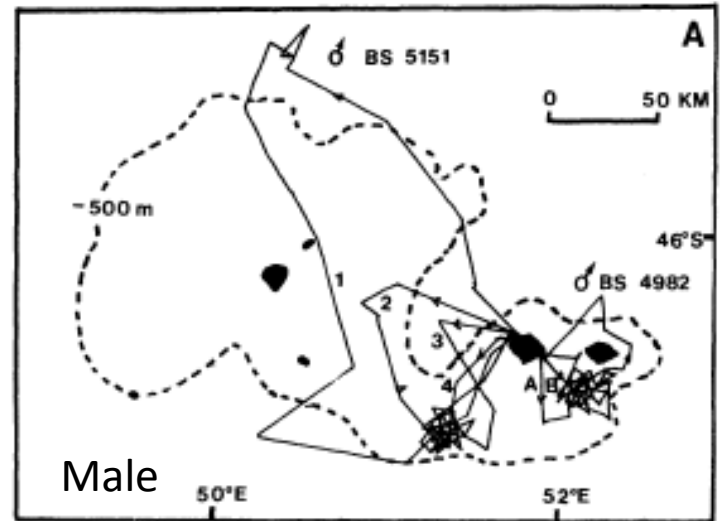
	Delayed Reproductive Maturity	Low Adult Mortality (High Chick Mortality)	Small Clutch Size	Long Period to Chick Independence	
	Age of first breeding (Yrs)	Adult annual survival rate (%)	Clutch size	Incubation period (days)	Chick-rearing period
Penguins	4-8	75-85	1-2	33-62	50-80
Albatrosses	7-13	92-97	1	60-79	116-150
Petrels	4-10	90-96	1	43-62	42-120
Pelicans	2-3	85	2-3	30	55-60
Frigatebirds	9-10	?	1	44-55	140-170
Auks	2-5	80-93	1-2	29-42	15-50

Seabirds are central place foragers when breeding (because they are tied to land).

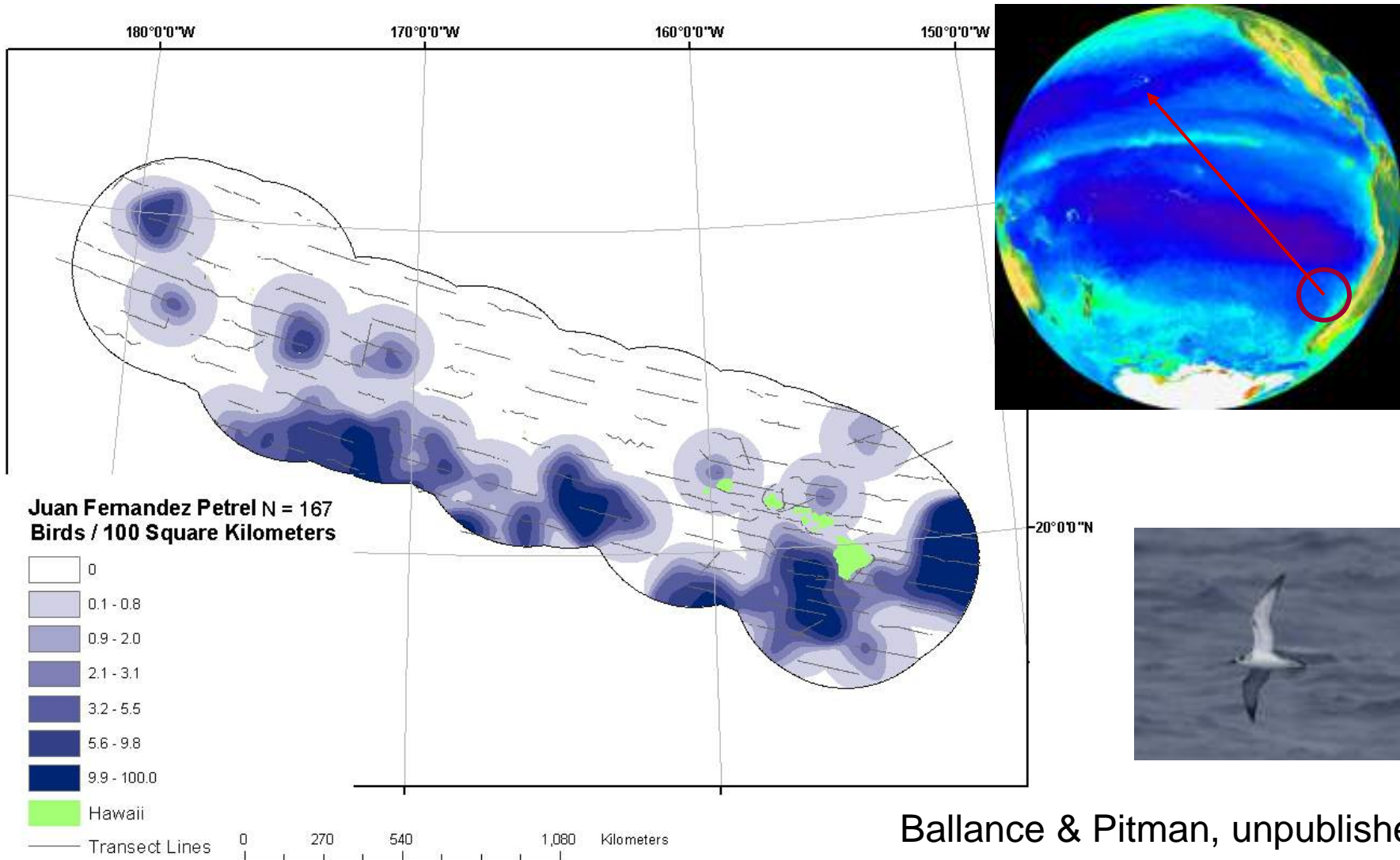


Many alternate between long trips for self-provisioning (a), and short trips for provisioning chicks (b).

Many have sex-specific preferences with respect to foraging areas.



Seabirds are highly migratory (especially when not breeding).



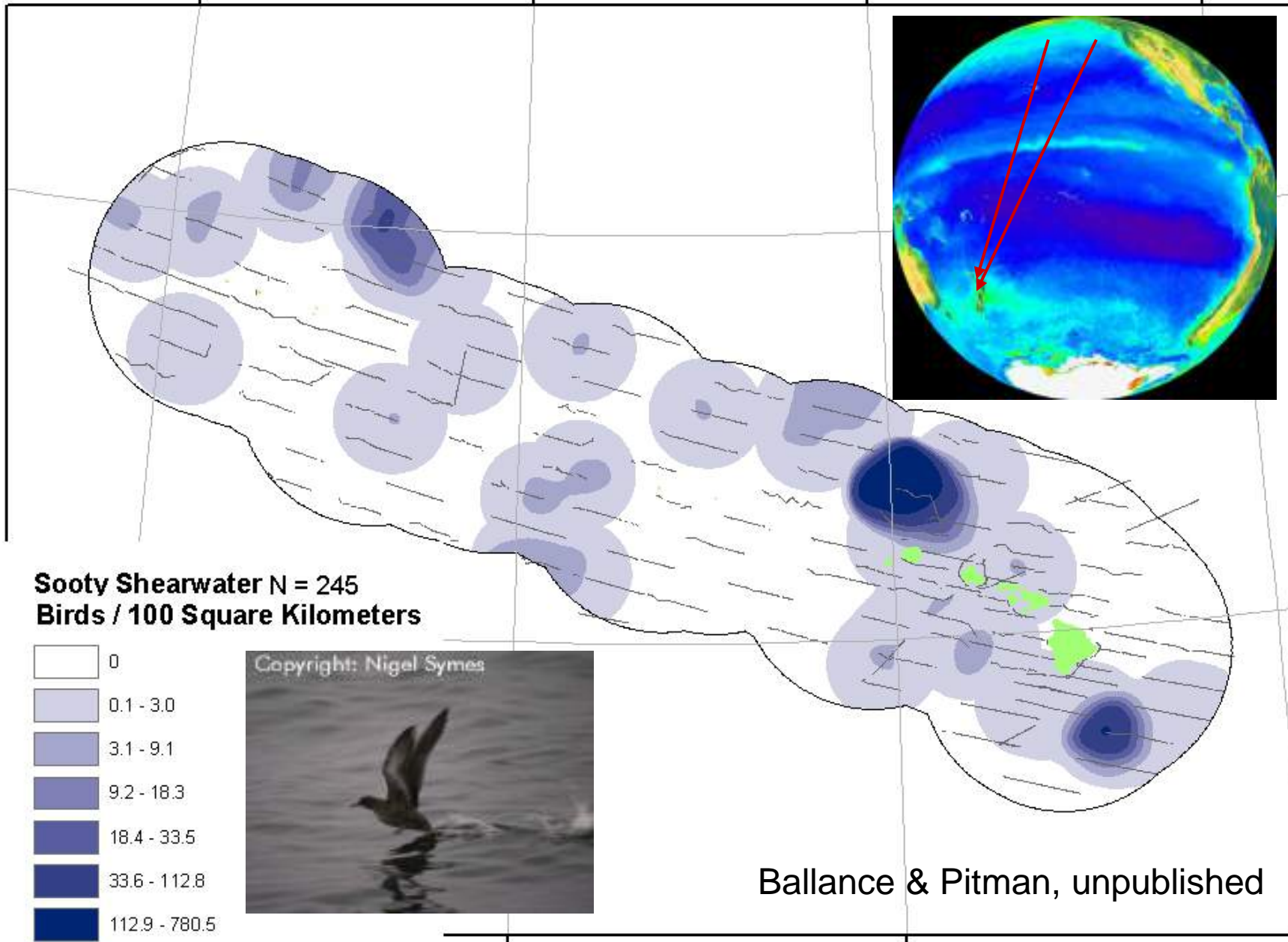
Ballance & Pitman, unpublished

180°0'0"W

170°0'0"W

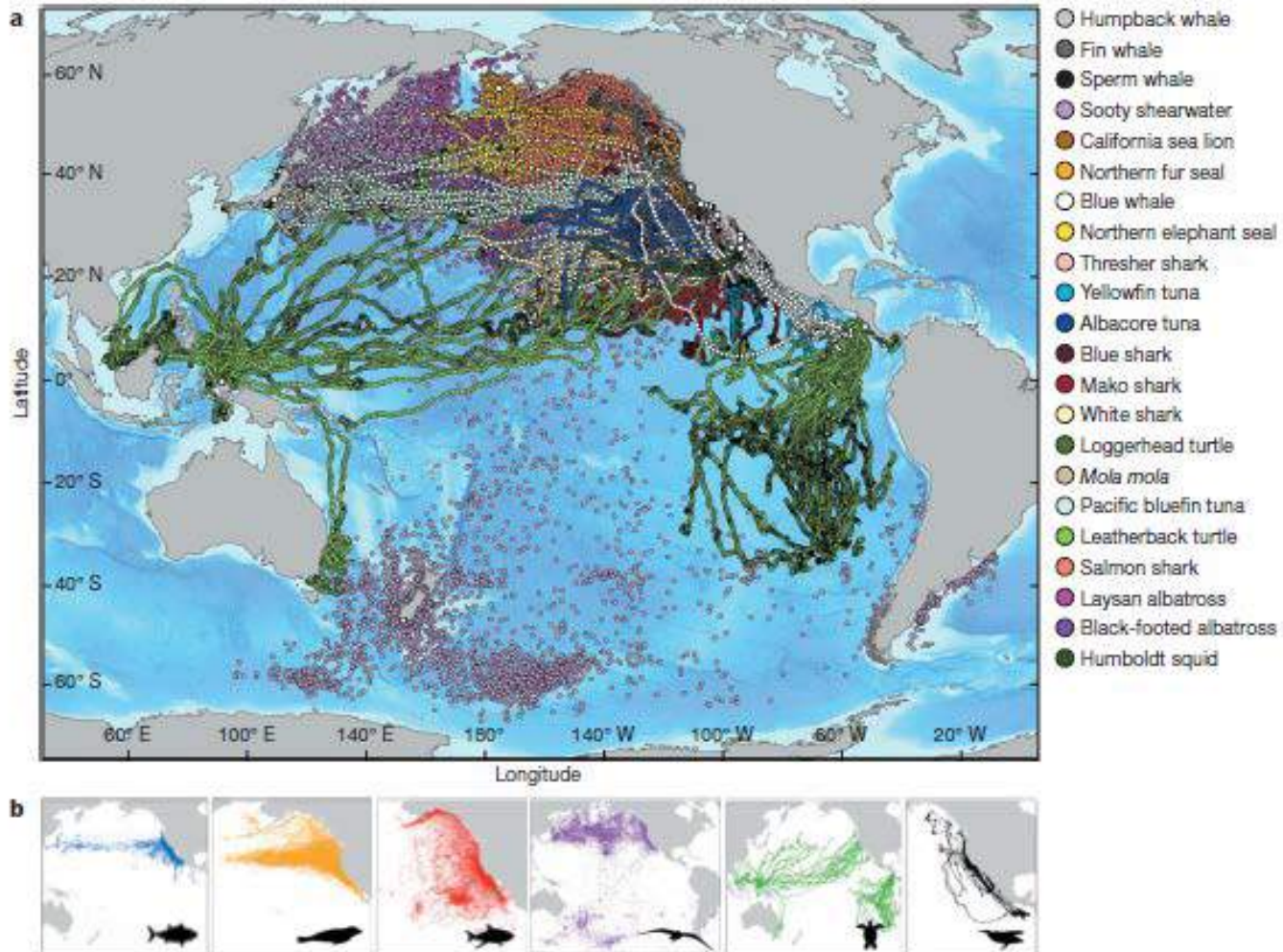
160°0'0"W

150°0'0"W



Ballance & Pitman, unpublished

* “ scale itself is a positive virtue, because, all too often, ecologists tend to study things at a scale that is far smaller than that on which natural populations and natural events really occur. [MTs], through their vast foraging ranges and migrations, force us to work and think on a large scale. This can be annoying and frustrating, but also it can be enlightening.” (Gaston 2004).

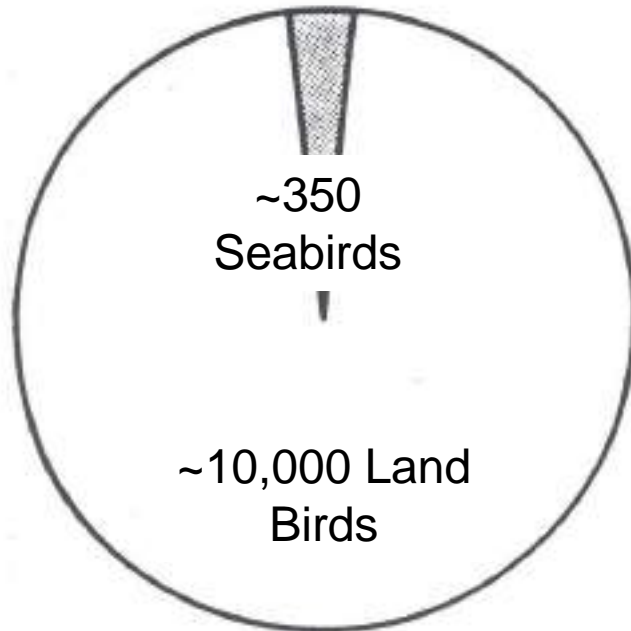


Block et al. 2011

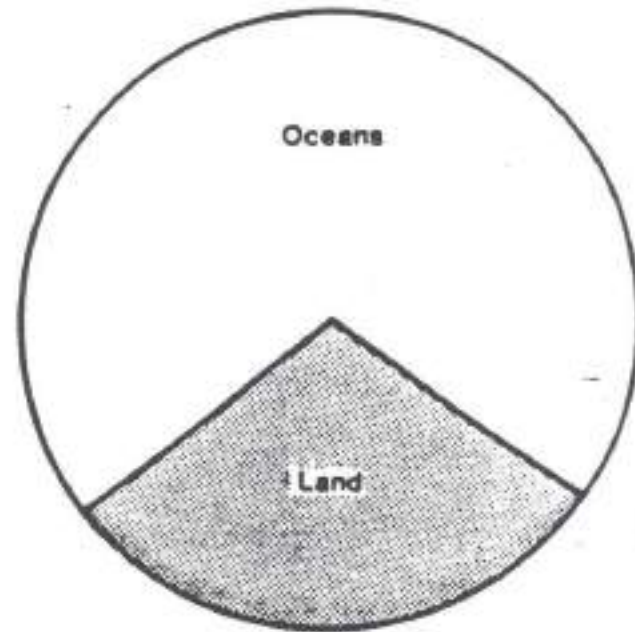
Seabird Diversity:

low relative to terrestrial counterparts

NUMBER OF AVIAN SPECIES



AREA OF WORLD SURFACE



Penguins

(Order Sphenisciformes)



- 1 Family, ~18 species (5% of seabird species)
- Restricted to southern hemisphere
- Mainly temperate
- Incapable of flight
- Include deepest diving seabirds

Albatrosses, Petrels, Shearwaters, Storm and Diving Petrels (Order Procellariiformes)

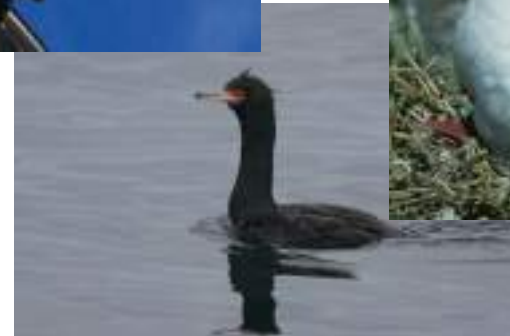


Photo: R.L. Pitman

- 4 Families, ~140 species (38% of seabird species)
- Oceanic habitat belongs to them
- Most are superb fliers
 - But some mainly dive
- Many incapable of walking
- > 4 (5?) extinct species due to anthropogenic factors

Tropicbirds, Pelicans, Boobies, Cormorants, Frigatebirds (Orders Phaethontiformes, Pelicaniformes, Suliformes)

- Single order (Pelecaniformes) split in 2008
- Collectively: 5 Families, ~70 species – many non-marine (18% of seabird species)
- Many restricted to tropics
- Most strong fliers
- Some strong swimmers
- Obvious sexual dimorphism in some species
- > 1 extinct species due to anthropogenic factors



Gulls, Terns, Auks (Order Charadriiformes)



- 4 Families, ~140 species – many non-marine (38% of seabird species)
- Most restricted to shelf systems
 - But Sooty Tern among the most oceanic
- Most strong fliers
 - But Auks among the best divers
- Includes northern counterpart of penguins
- > 1 extinct species due to anthropogenic factors

Summary - Seabird traits that make them vulnerable to anthropogenic perturbations:

Colonial when breeding

- One perturbation can have a devastating effect at the population level

Low reproductive rates

- Slow to recover

Transboundary (live in > 1 country's jurisdiction and the commons)

- Protection and enforcement is difficult

Live in two habitats (breeding and feeding)

- Protection of one habitat will not guarantee protection for the species

Threats to Seabirds

Incidental Mortality in Fisheries*



e.g., 160,000 - 320,000+ seabirds killed annually in longline fisheries alone

*THE biggest threat to seabirds at sea



Introduced Predators on Breeding Colonies*

*THE biggest threat to
seabirds on land

Cats

Rats

Dogs, Foxes, Goats,
Mongoose, Mice, etc.

- 51% of the world's Globally Threatened birds are currently threatened by alien invasive species (BirdLife International)



Other Threats to Seabirds: e.g.,

- Oiling
- Plastic ingestion
- Light pollution
- Bioaccumulation of pollutants
- Wind farms
- Direct exploitation (significant in the past)
- Competition for prey with fisheries
- Global warming and associated ecosystem changes: direct (e.g., sea level rise) and indirect (e.g., prey base changes) consequences



Anthropogenic pressure has caused extinction



The Great Auk: Direct Exploitation



Guadalupe Storm
Petrel: Introduced
predators on its sole
breeding island

Closing thoughts:
The most significant conservation challenges* may provide a window into the most effective threat mitigation solutions.

*Seabirds:

- are colonial when breeding.
- have low reproductive rates.
- are transboundary.
- live in two habitats (breeding and feeding).