Penguins and other seabirds in Antarctica

Overall, there are 10 species of birds that breed on the continent and 17 in the AP region

Penguins are not the most diverse group of birds in Antarctica, but their greatest concentrations are south of the convergence

The petrels and gulls/skuas have more species present south of the Antarctic convergence

Order Sphenisciformes

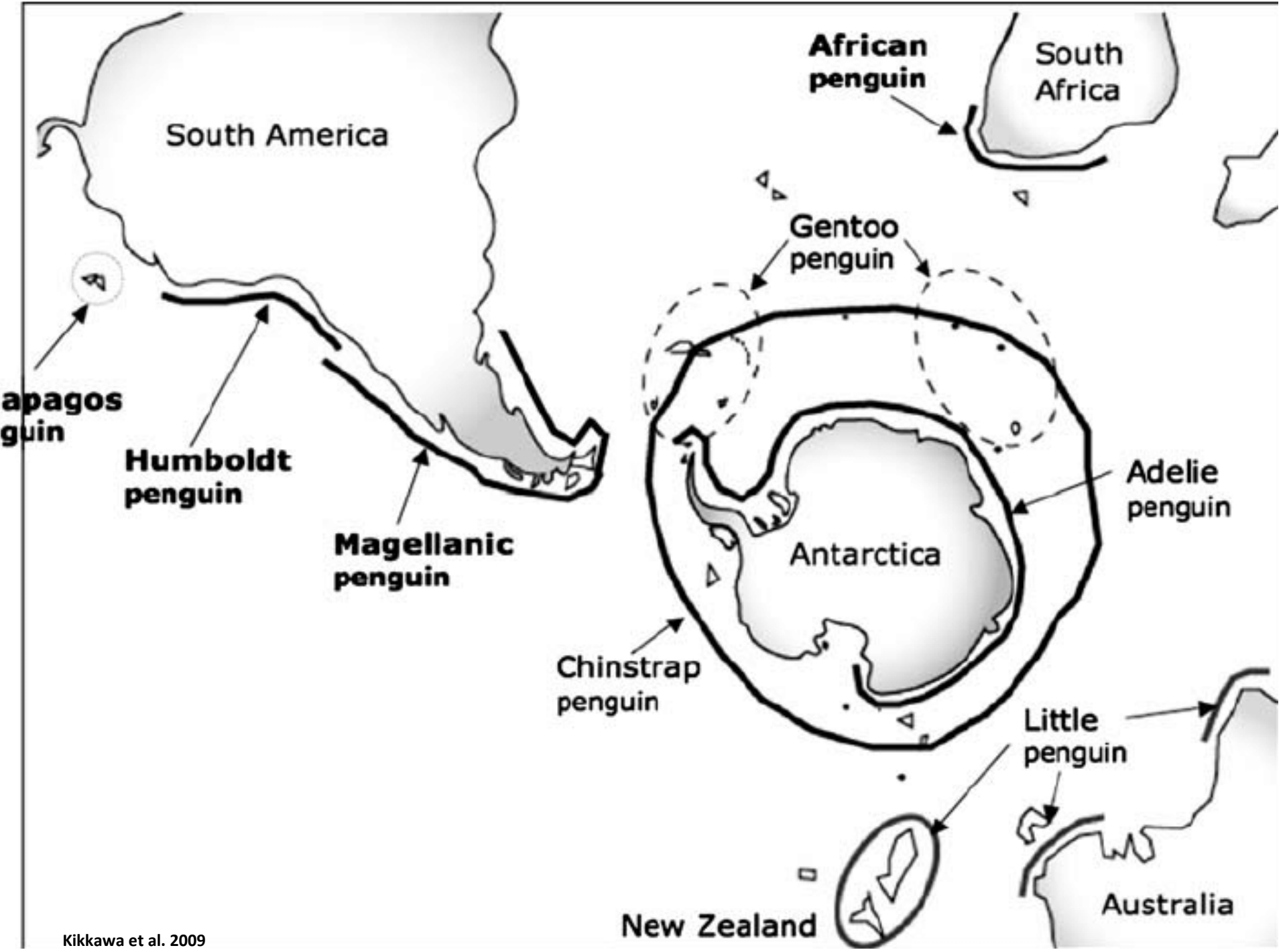
Penguins

18 species, all Southern Hemisphere

Evolved around ~62 mya, earliest fossils in New Zealand

All are flightless marine diving birds

Use their wings as flippers for propulsion under water, tail as a rudder



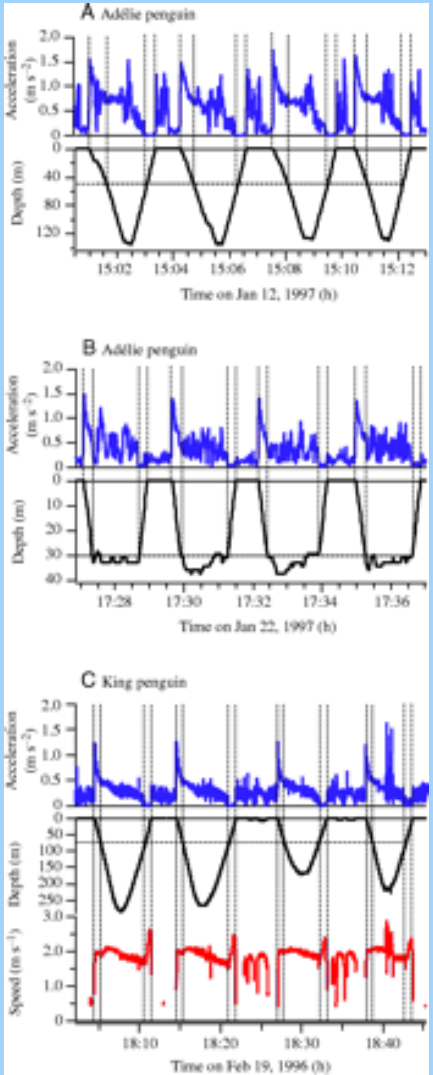
Kikkawa et al. 2009

Penguins can swim up from 2-4 mph, faster when ‘porpoising’

Porpoising allows penguin to breathe, see direction without slowing down

Diving behavior varies among species with largest species (Emperor) diving the deepest

Most dives are shallow, but smaller penguins can go 50-80 m, while Emperor Penguin has been recorded at over 500 m depth



Dives can be V-shaped when penguins are searching for food

U- or W-shaped dives indicate foraging at depth

Sato et al. 2002

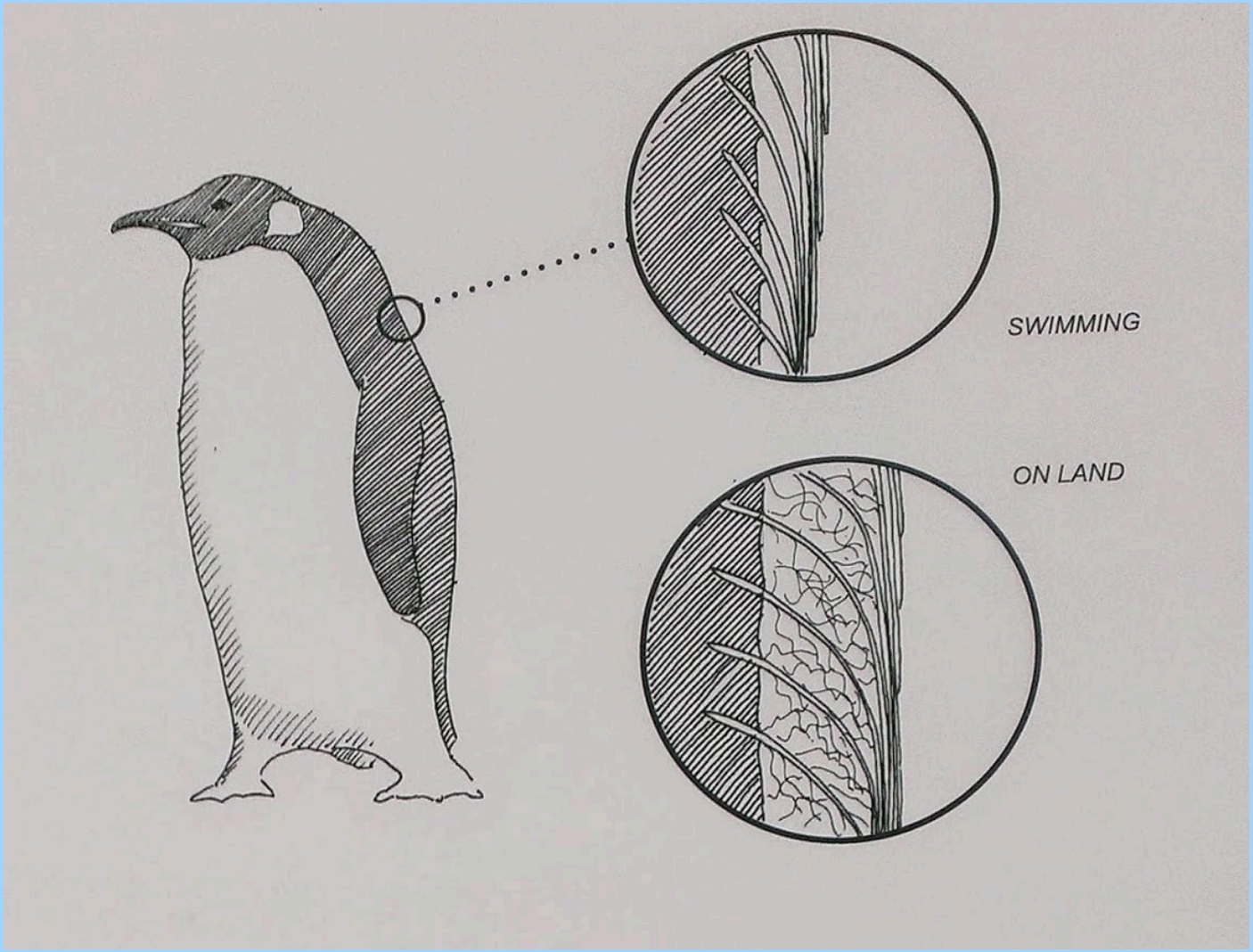
Feathers

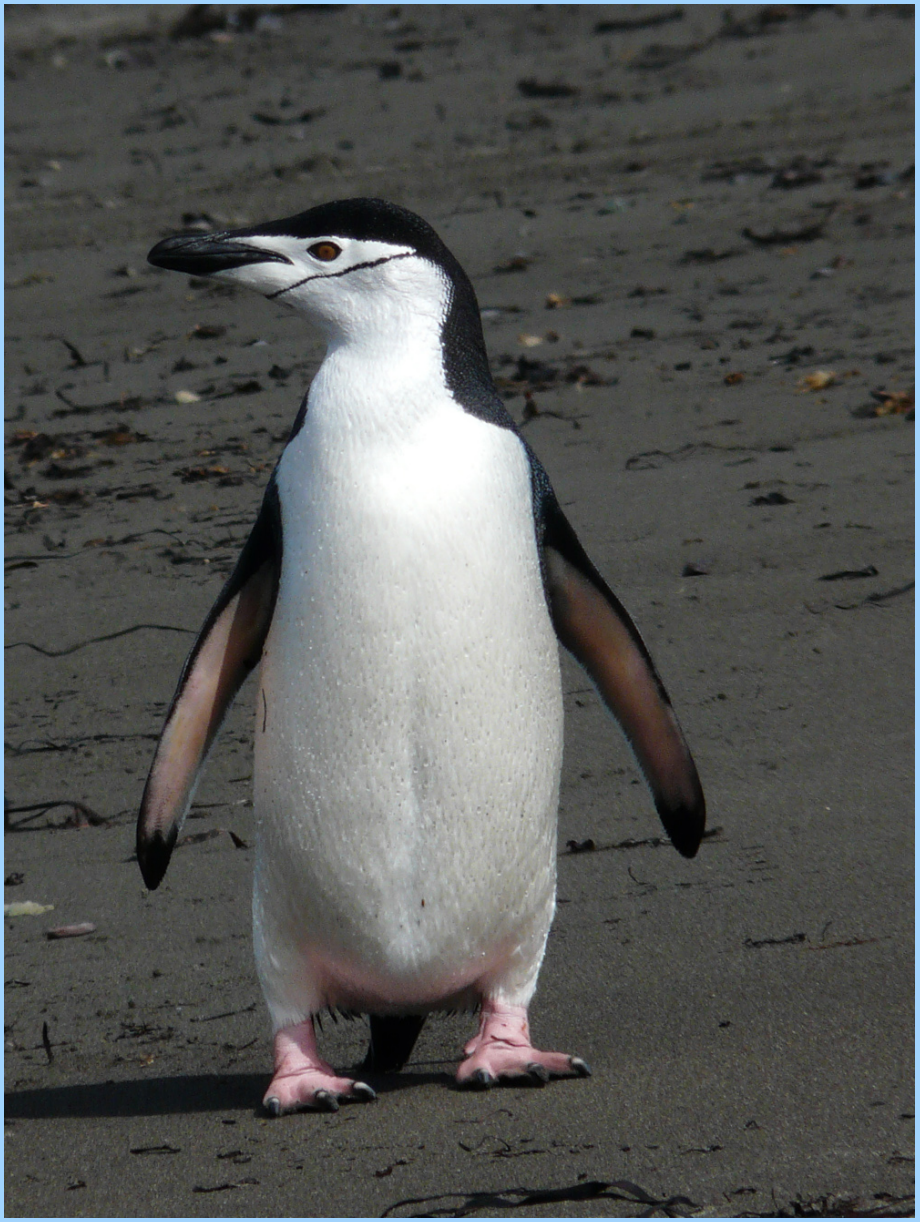
Many types of feathers in penguins, packed over the entire body and not along tracts as in other birds

Have downy filaments to add insulative layers

Can flatten feathers when swimming to form water-tight barrier and keep downy feathers below from getting wet

Can fluff out feathers on land to have air pockets adding to insulation





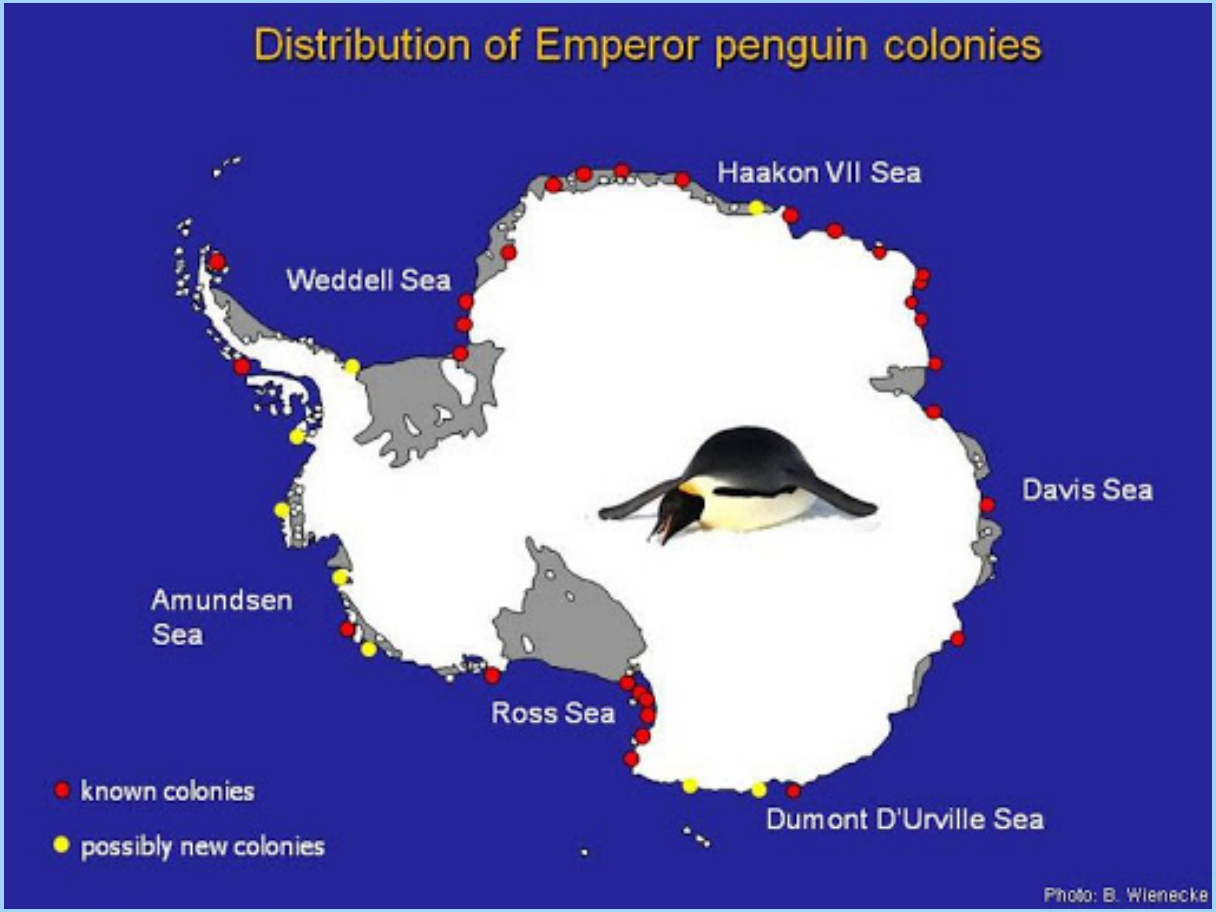
Can expel heat from bare skin under their flippers or on their feet

Turn bright orange to red when first coming out of the water as blood flow is increased to these ‘thermal windows’

Five species breed in Antarctica with two endemic:

Emperor Penguin
Adélie Penguin

Gentoo Penguin
Chinstrap Penguin
Macaroni Penguin (rare, only in the northern AP)



https://en.wikipedia.org

Emperor Penguin

Circum-Antarctic distribution
Largest penguin at ~1.2 m high, >40 kg weight

Diet of fish, squid, some crustaceans
can dive up to >500 m depth, 18 min duration,
but most dive to 150 m or less

Nests on ice in winter, takes 5-6 months to incubate egg, hatch and raise chick

Starts nesting in mid-winter so chick fledges during summer when food is plentiful

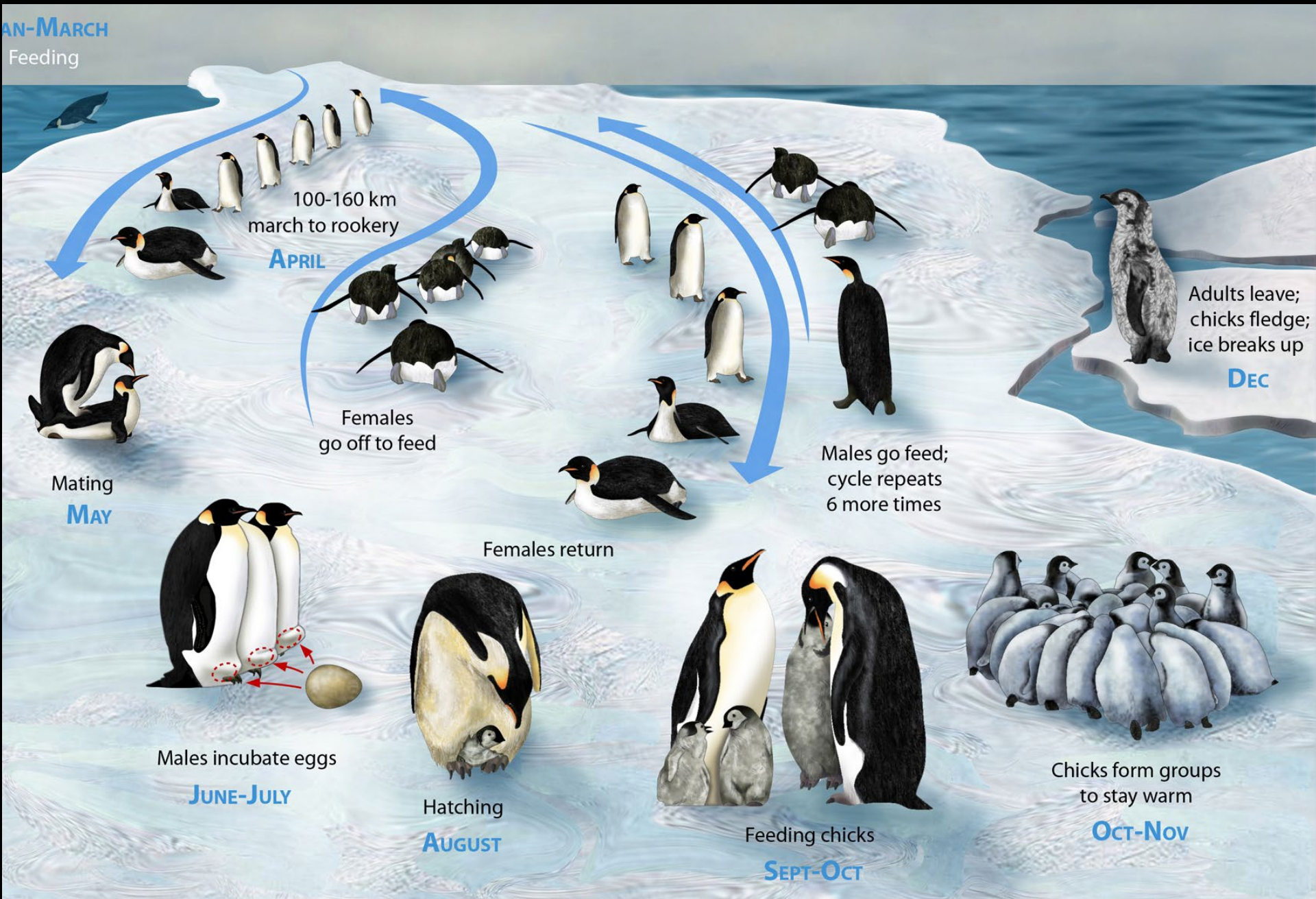
Emperors nest on sea ice or shelf ice. May walk over a hundred km across ice to nesting area, but by summer the ice breakup may place them closer to shore.

After female lays the egg, she returns to sea to regain energy while the male takes over incubation

Must fast for 1-2 months in cold temperatures and wind, keep egg on feet to avoid freezing

Like most seabirds, pairs mate for life and both must help incubate egg and raise the chick to have reproductive success

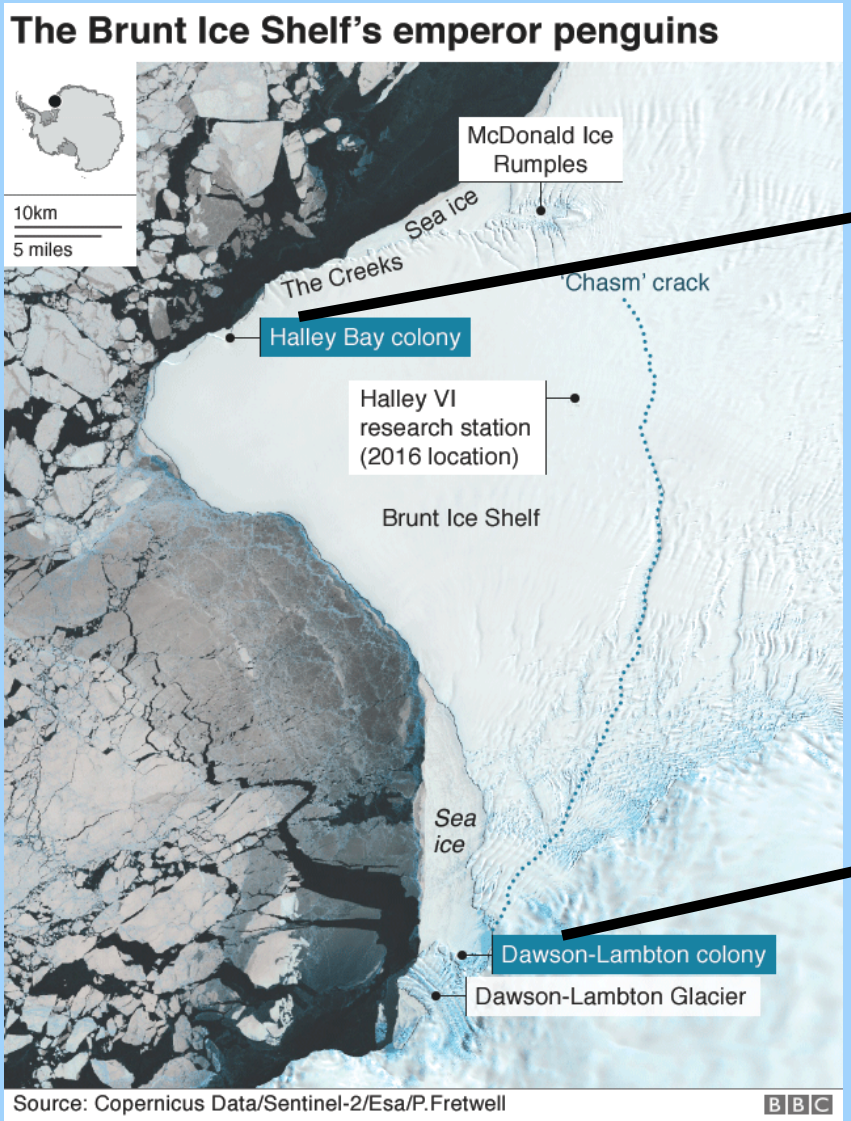
Emperors are the most extreme



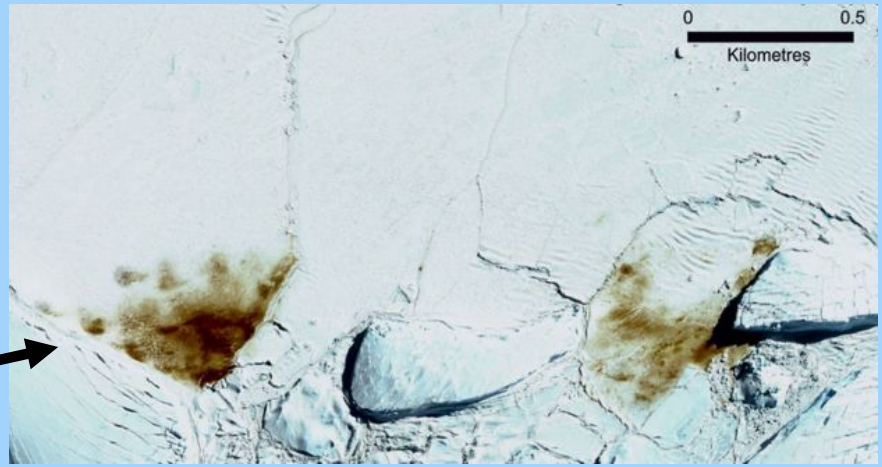
After breeding, adults molt on ice floes for ~4 weeks

Currently about 600,000 Emperor Penguins at ~45 colonies

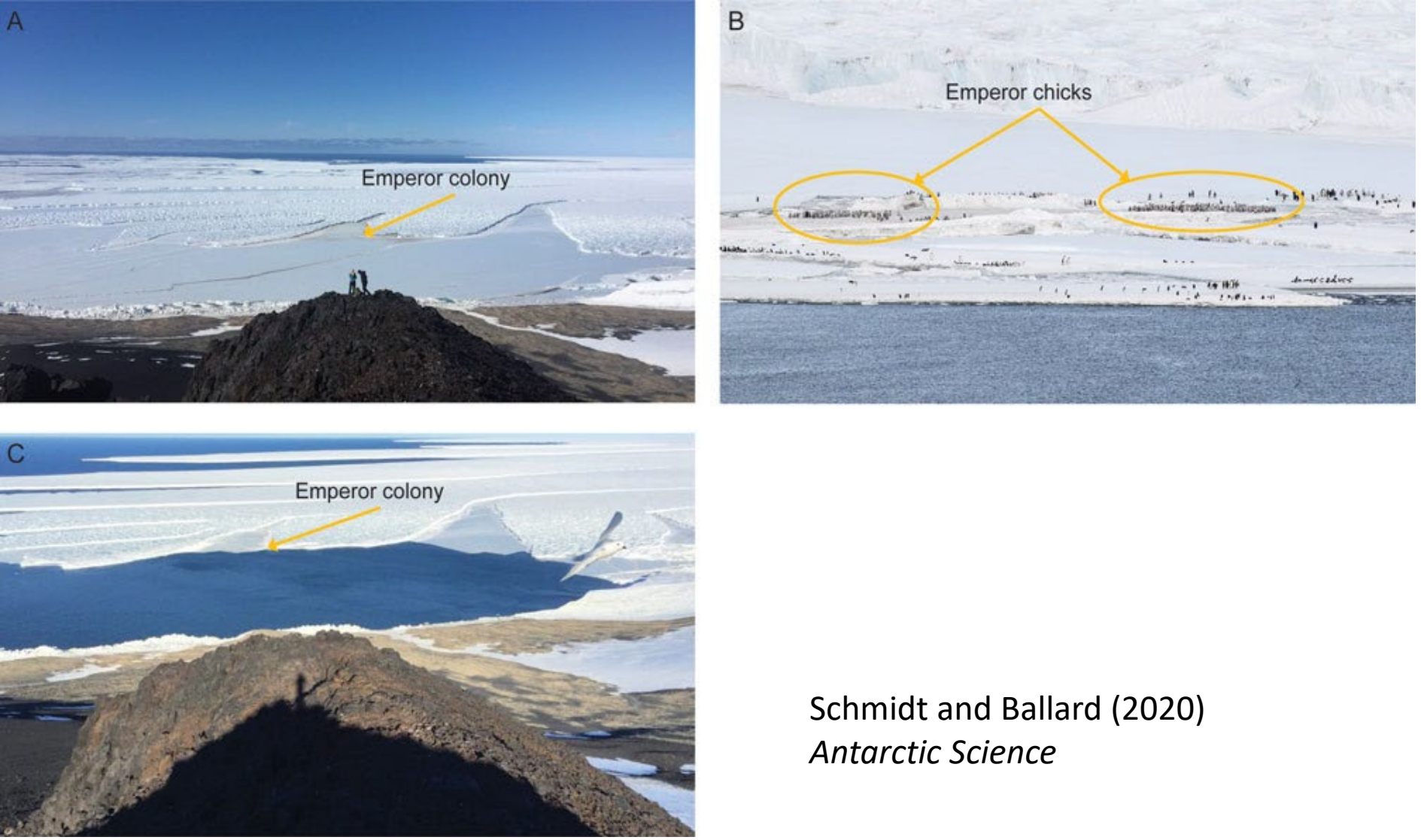
Threats to sea ice habitat may reduce population by up to 20% by the year 2100



Guano stains on sea ice



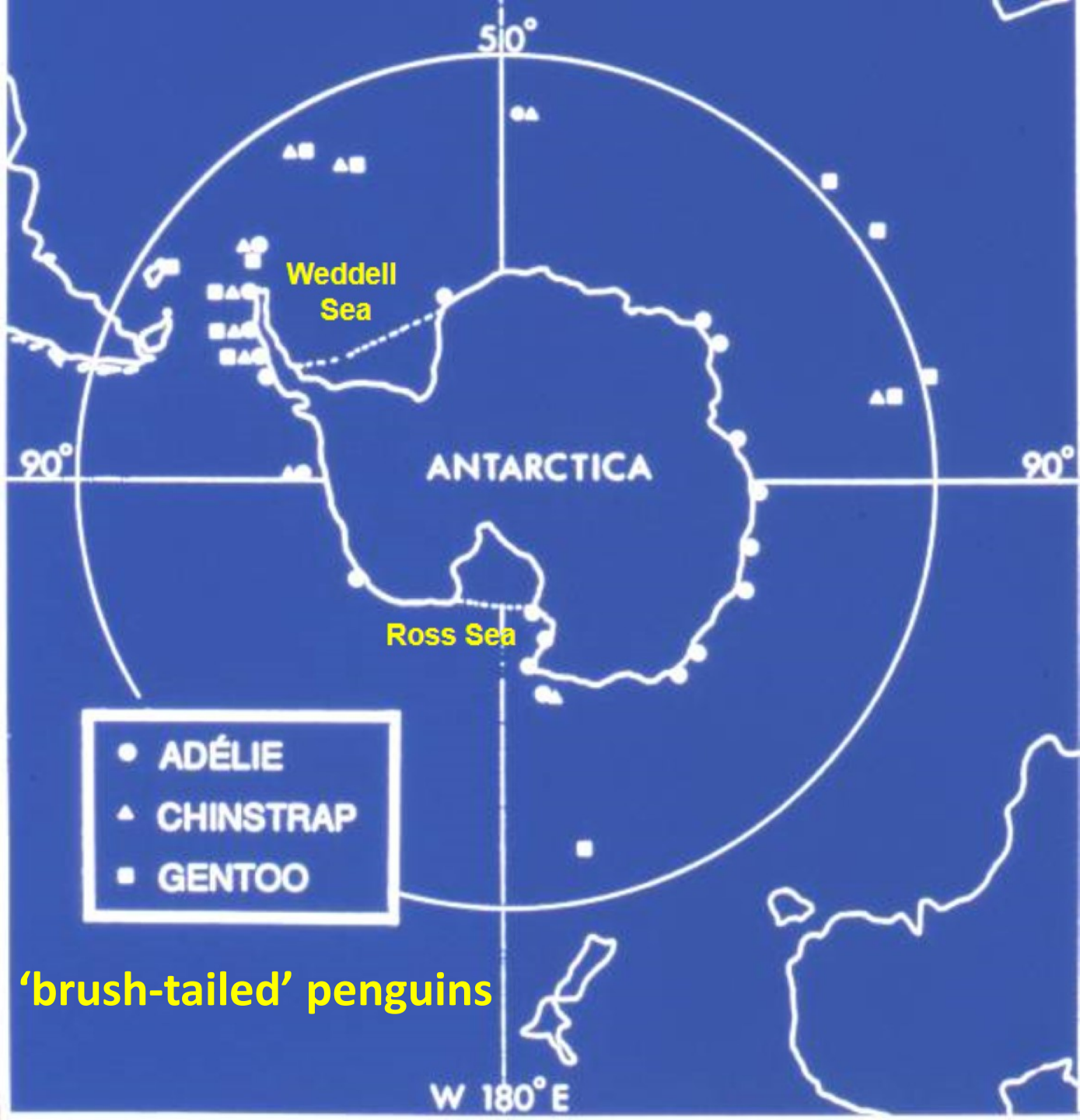
Fretwell and Trathan (2019)
Antarctic Science



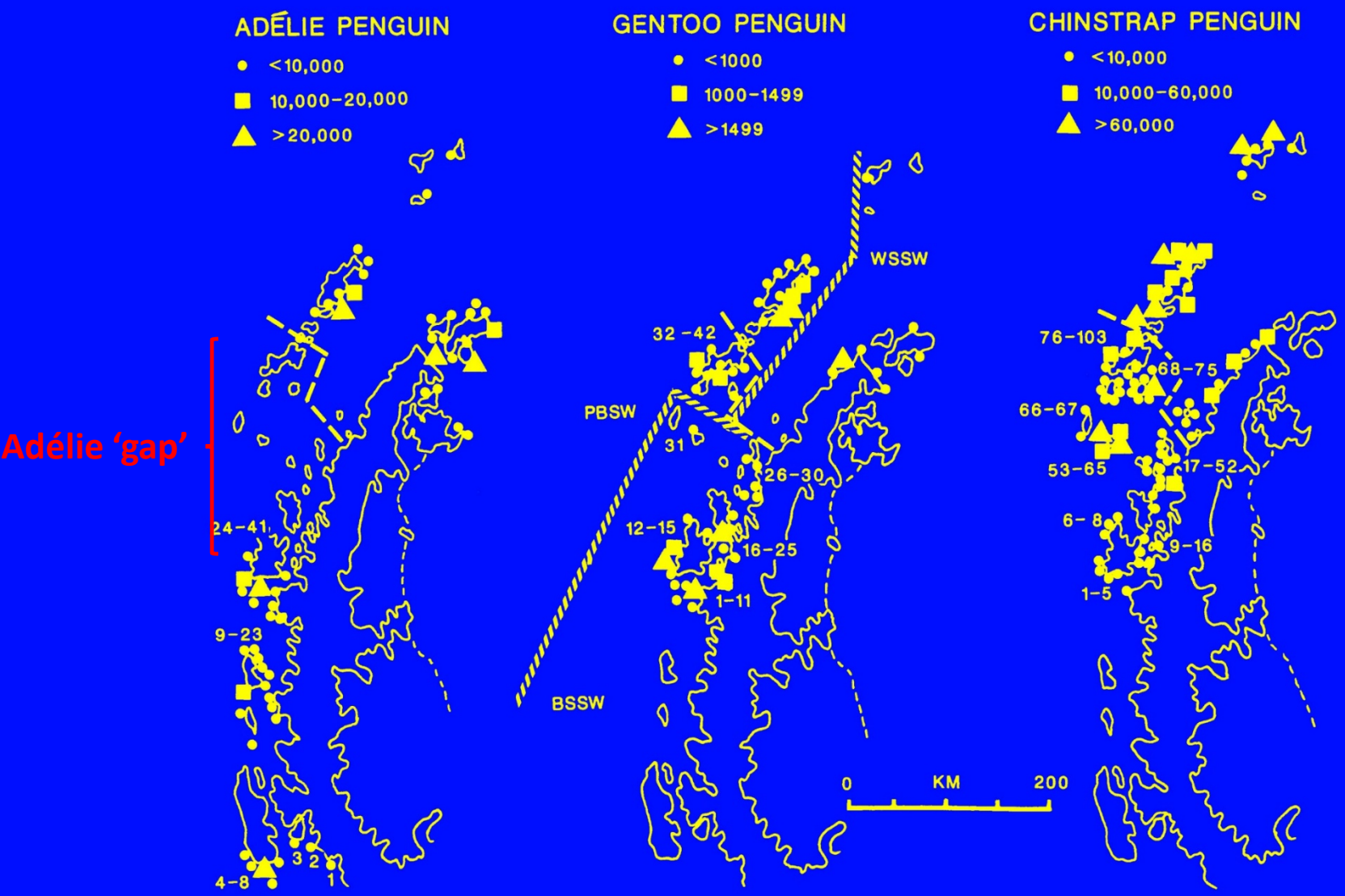
Schmidt and Ballard (2020)
Antarctic Science

Fig. 3. a. Photograph showing fast ice between the Ross Ice Shelf and Ross Island and the location of the emperor penguin colony on 3 December 2018, the day before the fast ice broke up. b. Close-up photograph from5 December 2018, the day after the storm, showing groups of emperor penguin chicks on two separate ice floes that subsequently disappeared. The Ross Ice Shelf is visible in the background. c. Photograph from 7 December 2018, 3 days after the storm, showing the extent of the fast ice breakout, and ice floes with emperor penguin chicks missing. Photographs by A.E. Schmidt and G. Ballard.

Pygoscelids



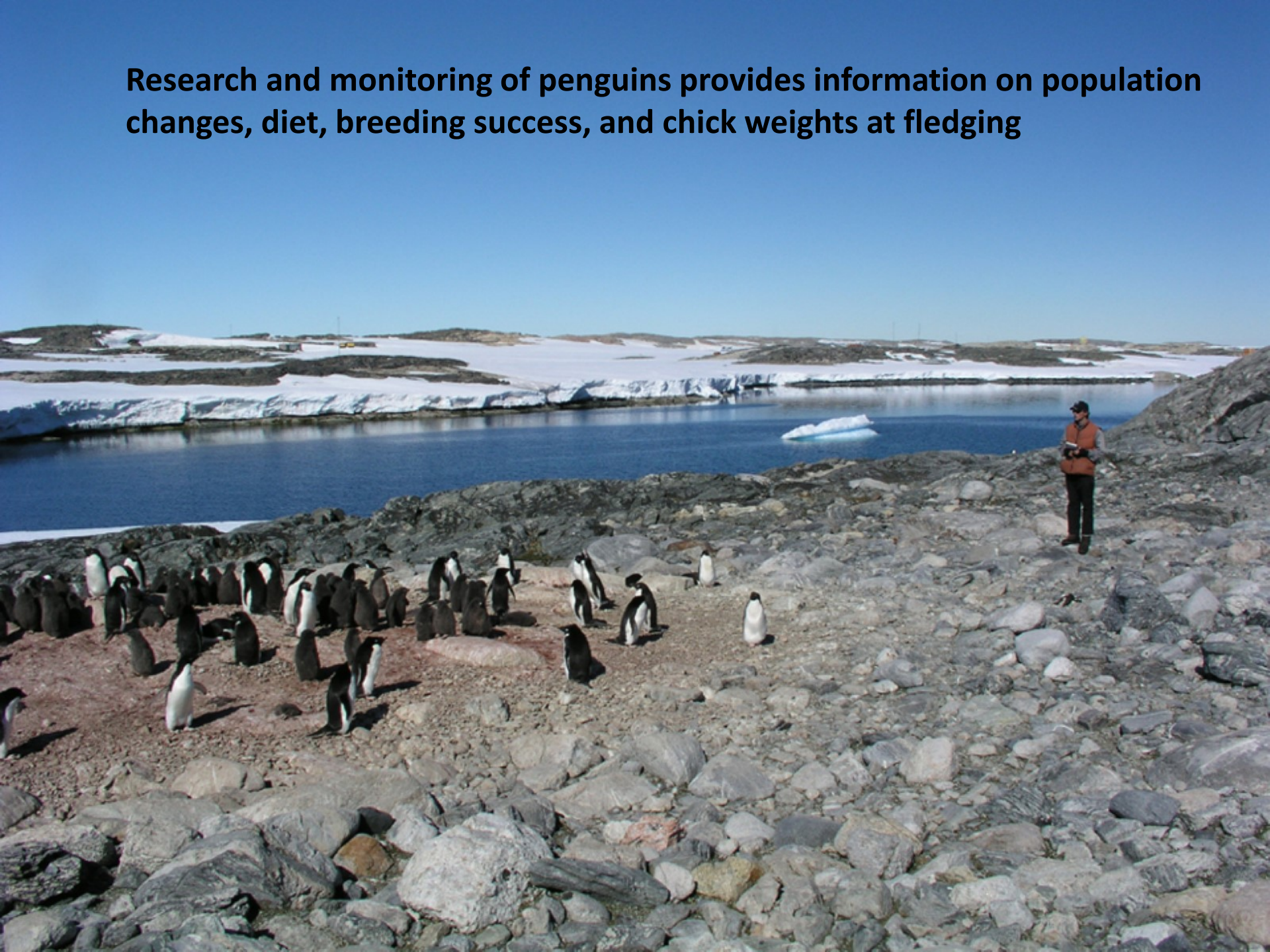
‘brush-tailed’ penguins


ADÉLIE PENGUIN
<10,000
10,000–20,000
>20,000
Adélie 'gap'
24–41
9–23
4–8
3
2
1
GENTOO PENGUIN
<1000
1000–1499
>1499
WSSW
32–42
PBSW
31
26–30
12–15
16–25
1–11
BSSW
0
KM
200
CHINSTRAP PENGUIN
<10,000
10,000–60,000
>60,000
76–103
68–75
66–67
53–65
17–52
6–8
9–16
1–5

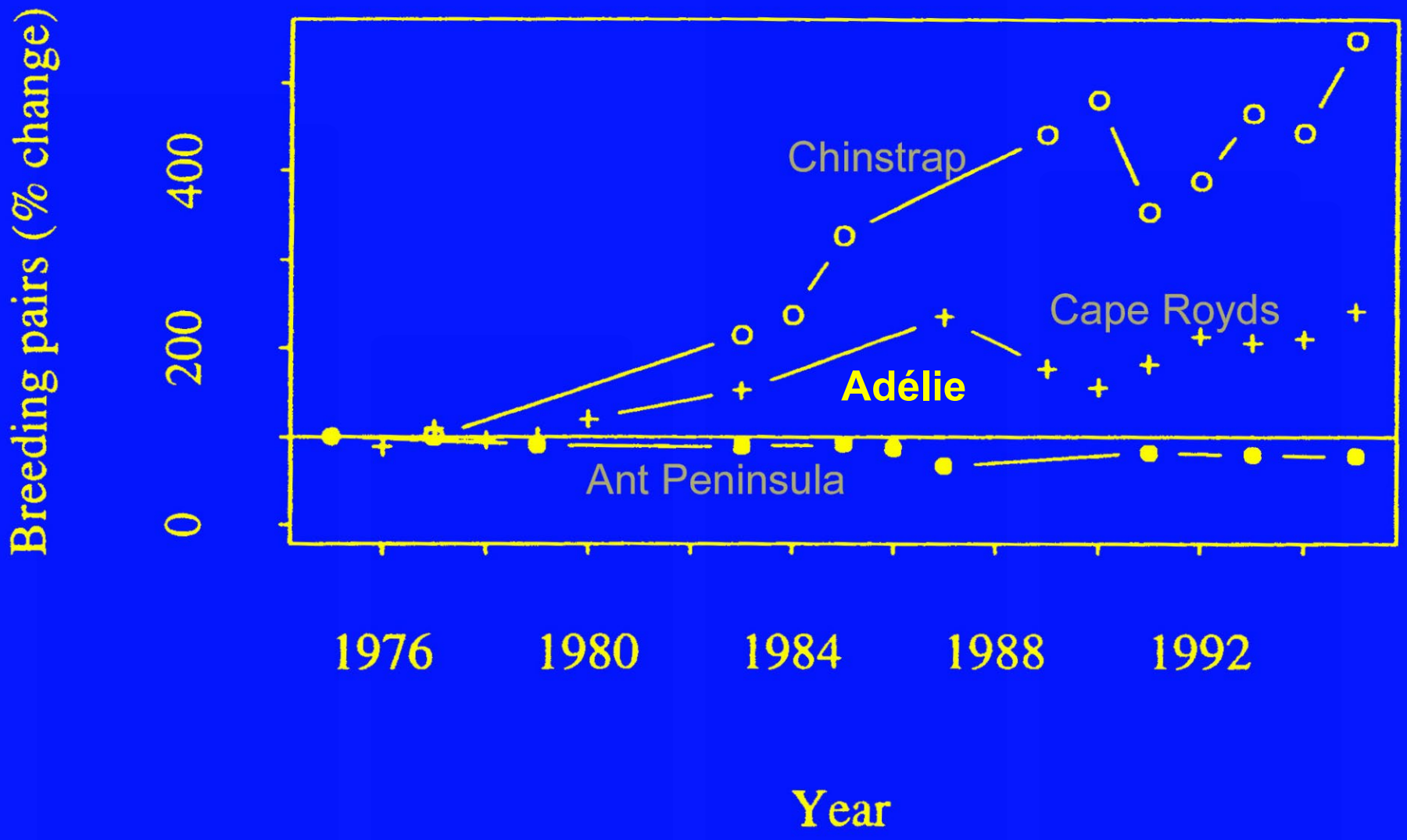
Adélie penguin is a true ice-adapted species, feeds at pack ice edge and remains in Antarctica year-round

Penguin ‘Highway’

Research and monitoring of penguins provides information on population changes, diet, breeding success, and chick weights at fledging

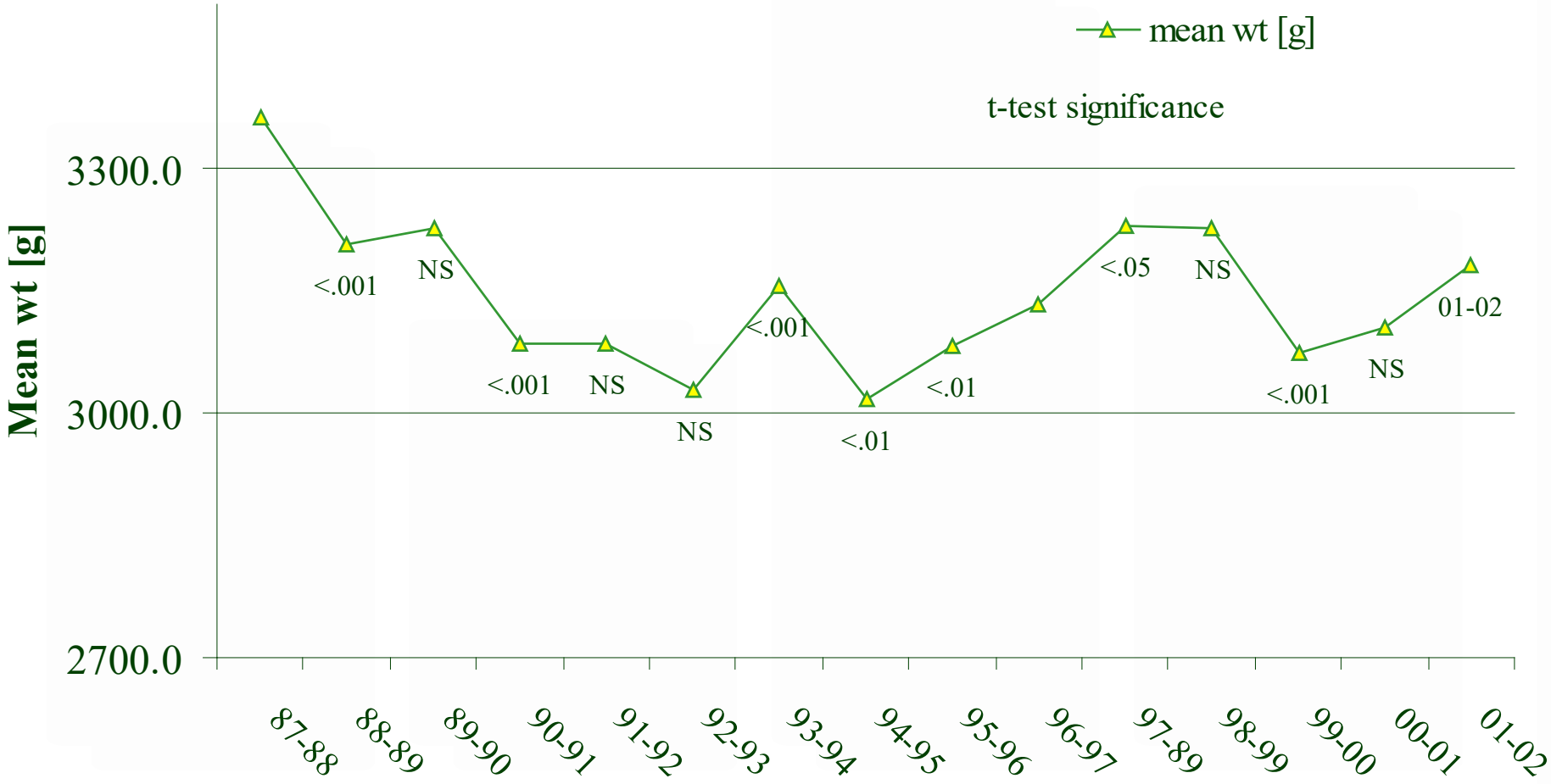


Stomach lavage



Smith et al. 1999

Adélie Penguin fledgling weights at King George Island, Antarctic Peninsula



Data from Wayne and Sue Trivelpiece

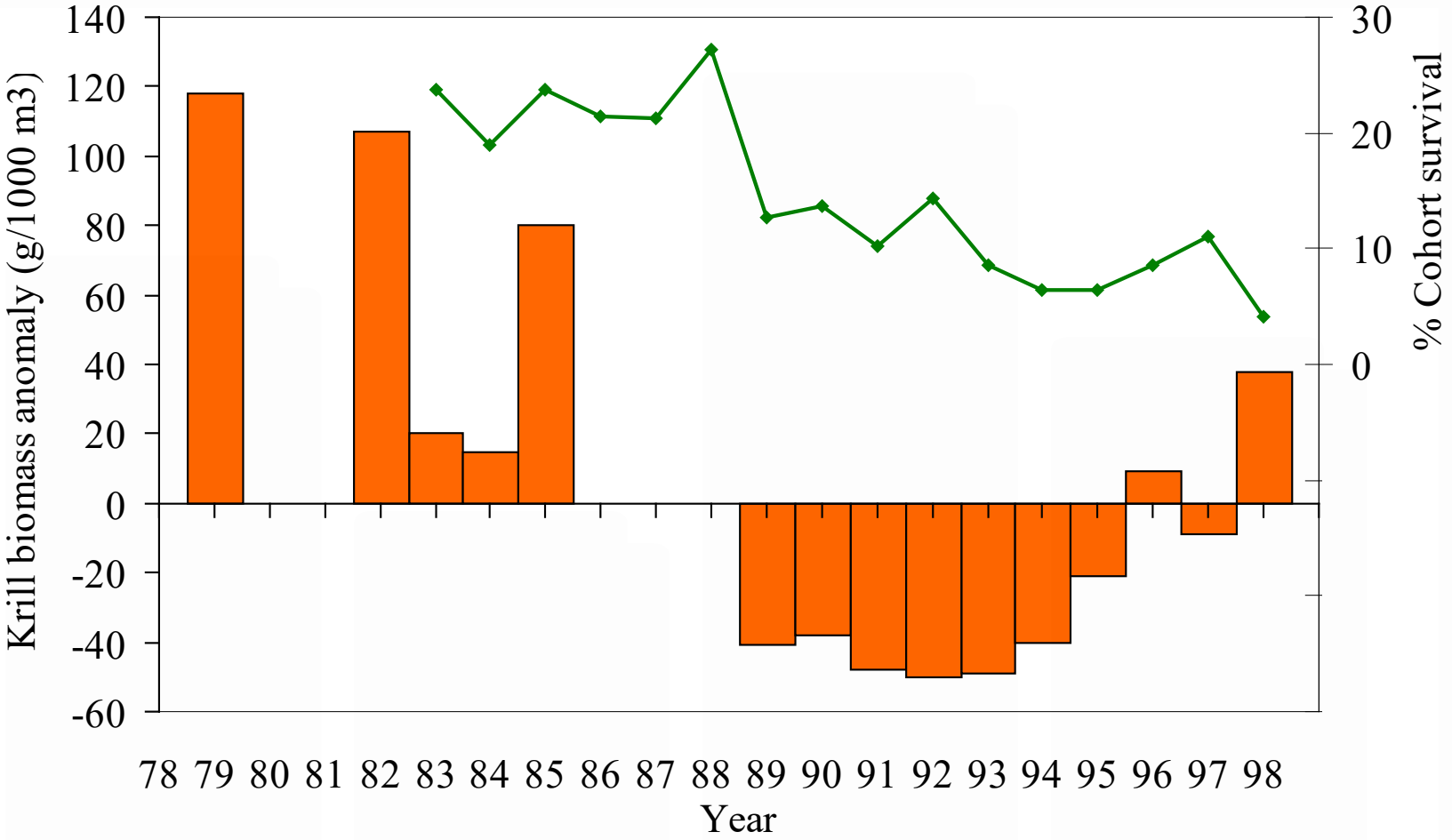


Fig. 3. Krill biomass anomaly, and Adelie penguin cohort survival from Copacabana, 1978-1998.

Bars represent the krill biomass anomaly (annual difference from 20 years mean biomass); line represents the % of cohort survival; year designations are CCAMLR split years (e.g., 82 = 1981/1982).

Data from Wayne and Sue Trivelpiece

http://www.penguinscience.com/


http://www.penguinscience.com/

Post-breeding catastrophic molt in penguins

Gentoo Penguin

Largest of the three pygoscelids

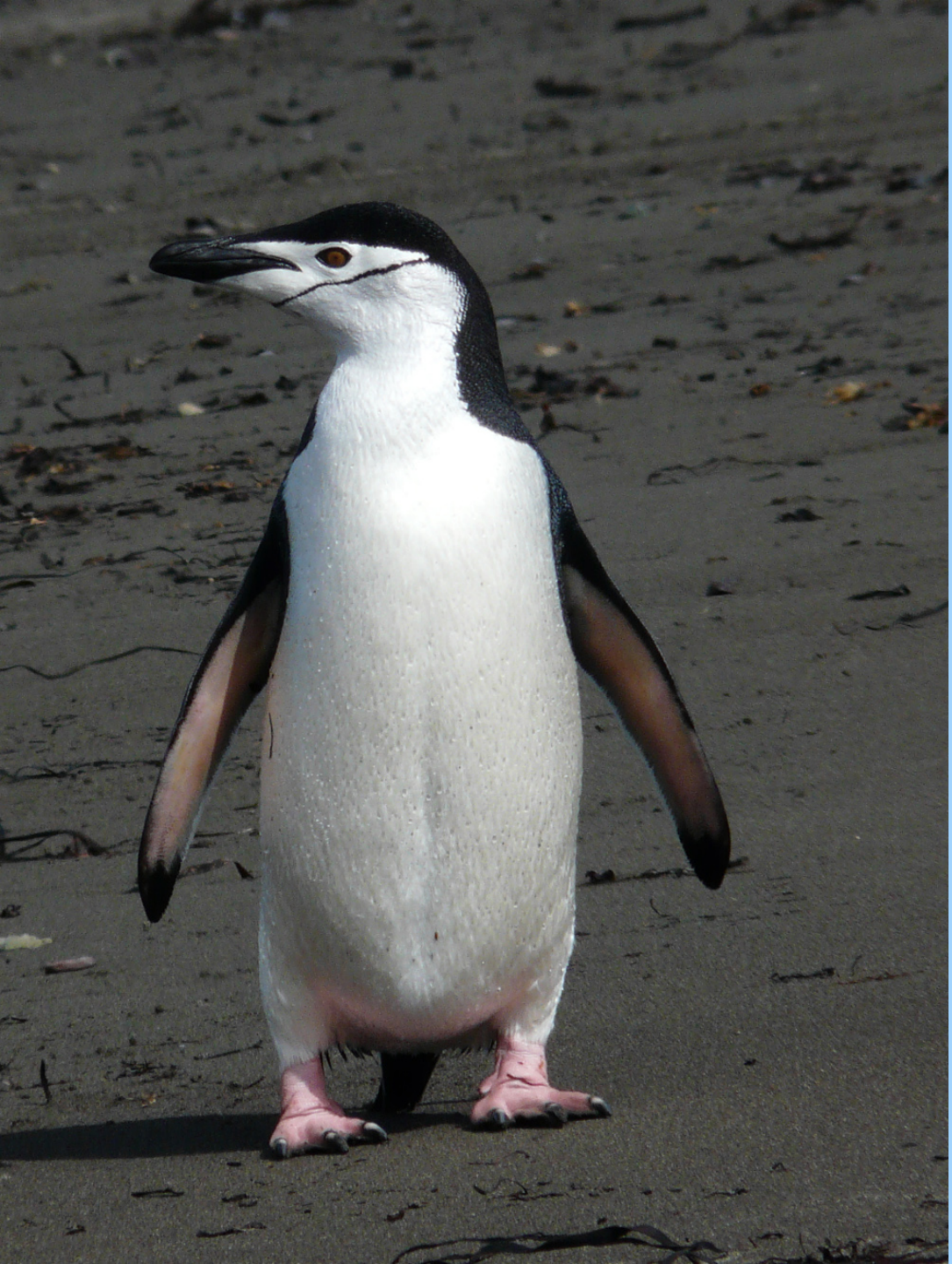
Mostly subantarctic, but in recent decades has been expanding south along the Antarctic Peninsula

Feeds more inshore on fish as well as krill

Nests spaced farther apart, so more susceptible to predation by skuas from the ground

Prefers to nest close to shore, rocky areas
Nests are more widely spaced, lots of pebbles


https://www.youtube.com/watch?v=4LZLyopFpvc



Chinstrap Penguin

Also more subantarctic but expanding southward in the AP

Nests more on rocky terraces near the coast

Feeds primarily in open ocean, mostly on krill


https://www.youtube.com/watch?v=V4MfL6AM1S0

Bailey Head, Deception Island
>100,000 breeding pair

Zavodovski Island

Largest colony has over 1.2 million breeding pair

Located between South Georgia and South Sandwich Islands

Volcanic eruptions could wipe out colony in the future

Photo: D. Schneider

Macaroni Penguin at Hannah Point, Livingston Island
Most southerly breeding of the crested penguins

First egg is 60% smaller than second in this species
Only 80% size of second egg in other crested penguins
First egg usually lost to predation and only one chick is raised

Penguin predators ashore: skuas and giant petrels

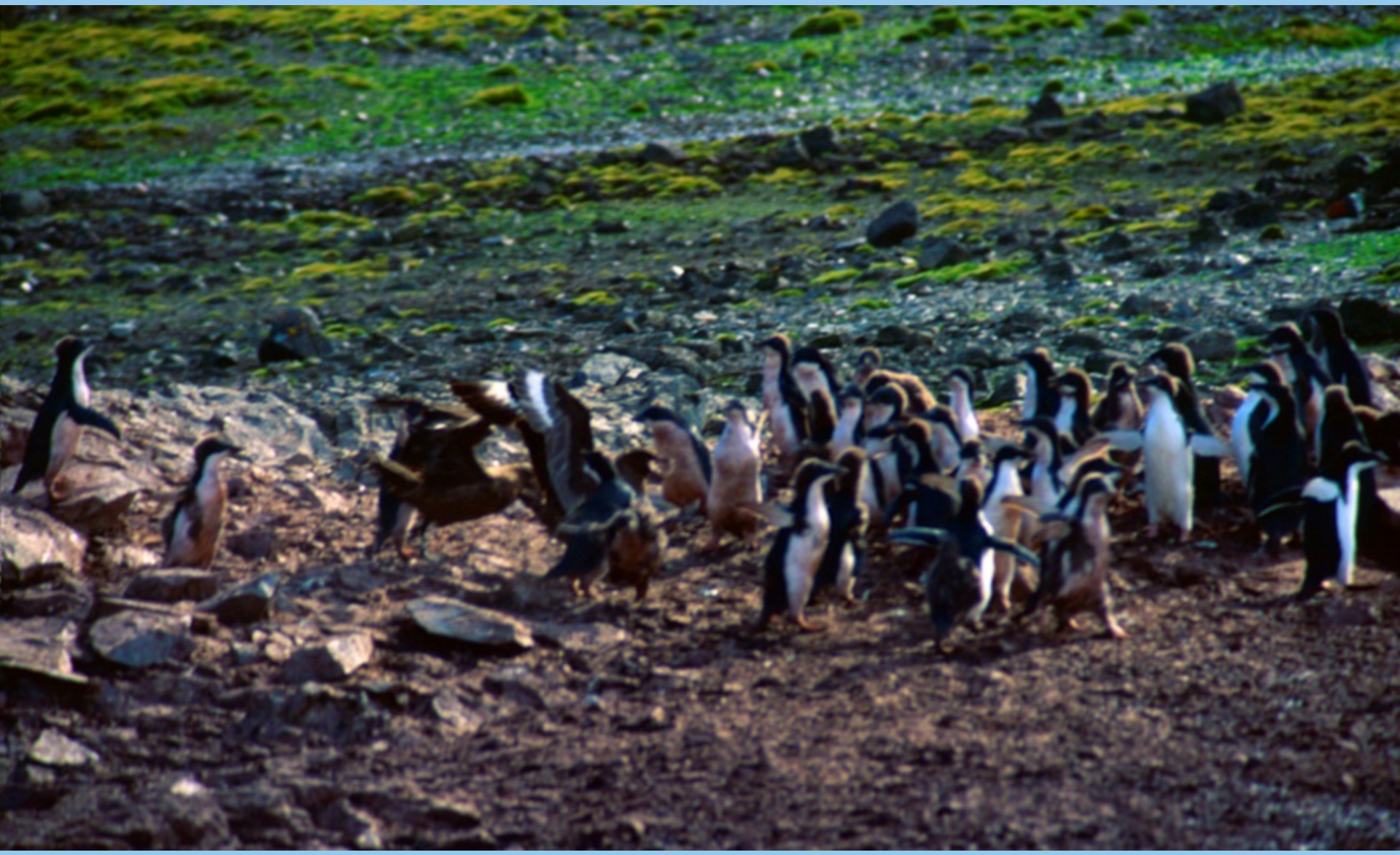
Order Charadriiformes
South Polar Skuas
Related to gulls and terns

Brown Skua long call

Brown skua stealing rockhopper penguin egg

Brown Skua fight at Stranger Point, King George Island

Predation on penguin chicks becomes more difficult as the chicks age



Siblicide also may occur as a means to reduce clutch size

-- can be obligate or facultative

-- behavior stimulated by hunger

-- obligate in egrets, south polar skua

Order Procellariiformes
The petrels, or 'tubenoses'

--true seabirds, spending most of their lives at sea

--have tube on top of bill to drain salt gland and perhaps help with olfactory capabilities

--four families including petrels, shearwaters, albatross, and storm-petrels

--breed in colonies, mate for life, and all lay only a single egg

Giant Petrels take large penguin chicks and even adults

Isolated chicks are doomed

Albatross and giant petrels have long incubation and chick-rearing periods, must fast for weeks

Can produce a stomach oil while fasting to feed to the chick

Can also be used in defense

Snow Petrel

--only petrel endemic to Antarctica

--possibly two species, Greater and Lesser Snow Petrel

Snow petrel is the most southerly breeding bird in the world

Has even been sighted at the South Pole, but breeds on rocky outcrops, cliffs along coast

Often seen foraging near pack ice

Sooty Shearwater

~20 million worldwide
very common in subantarctic
forms huge feeding flocks


Cape Petrel

wikimedia.org

Nests in Antarctic Peninsula as well as subantarctic

Nests on cliffs

Feeds on small crustaceans including krill

Antarctic petrel is closely related to the Cape Petrel

--similar breeding range and diet

--common in Ross and Weddell Seas


American Sheathbill

Diverse diet, from penguin eggs to copepods washed up on the beach, scavenging of carcasses, and even penguin guano

sheathbill interrupting penguin feeding chick

Other sub-Antarctic species that breed in the Antarctic Peninsula

http://beesleyantarctica.blogspot.com

http://www.samoppenheim.com

https://www.audubon.org/

https://en.wikipedia.org

More information on all these and other Antarctic seabirds can be found at:

http://www.antarctica.gov.au/about-antarctica/wildlife/animals/flying-birds

Quiz

1. What three species of seabirds are endemic to Antarctica?

2. Why does the Emperor penguin lay eggs in winter and how do they keep their egg from freezing?

3. What are pygoscelid penguins and how do the three species in Antarctica avoid competition for food?

4. What are the main predators of pygoscelid penguins and what are some hunting methods used by these predators?

5. Why are some penguins increasing and other decreasing in the Antarctic Peninsula?