How does it affect wildlife?

- ~700 species interact (from plankton to top predators)
- It works in two ways:
  - Ingestion (+ chemical contamination)
  - Entanglement

What are the outcomes?

- **Significant effects at an individual level**
  - toxins in animal tissues
  - Disruption of feeding
  - Increased energetic costs

175+ pieces of plastic in one bird
26 grams (~5-8% total weight)

- **Population level consequences**
  - reduced migratory ability
  - increased mortality
  - lower reproduction
  - reduced population numbers

Plastic Impacts

- Environmental
- Aesthetic
- Cultural
- Commercial/economic

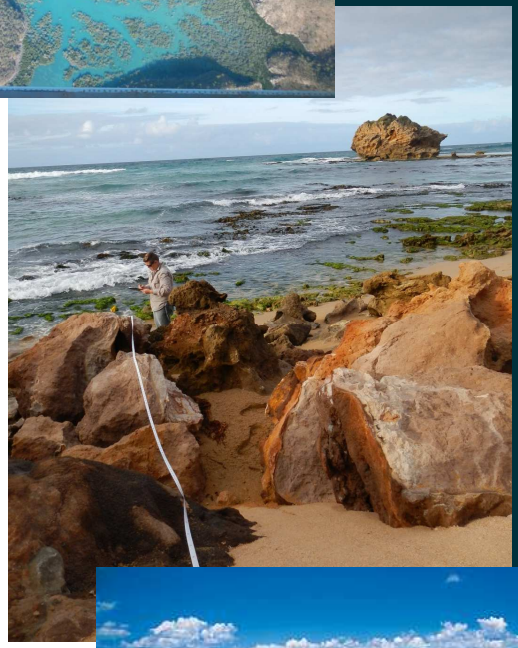
Pervasive

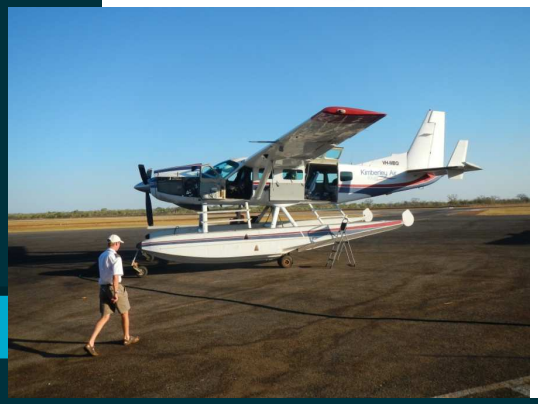
Plastics in fur seal scats in sub-Antarctic– likely via fish prey

To respond to a problem, you need information

Coastal debris surveys

175+ survey sites
580 transects





Hardesty et al. in press

Citizen science coastal surveys

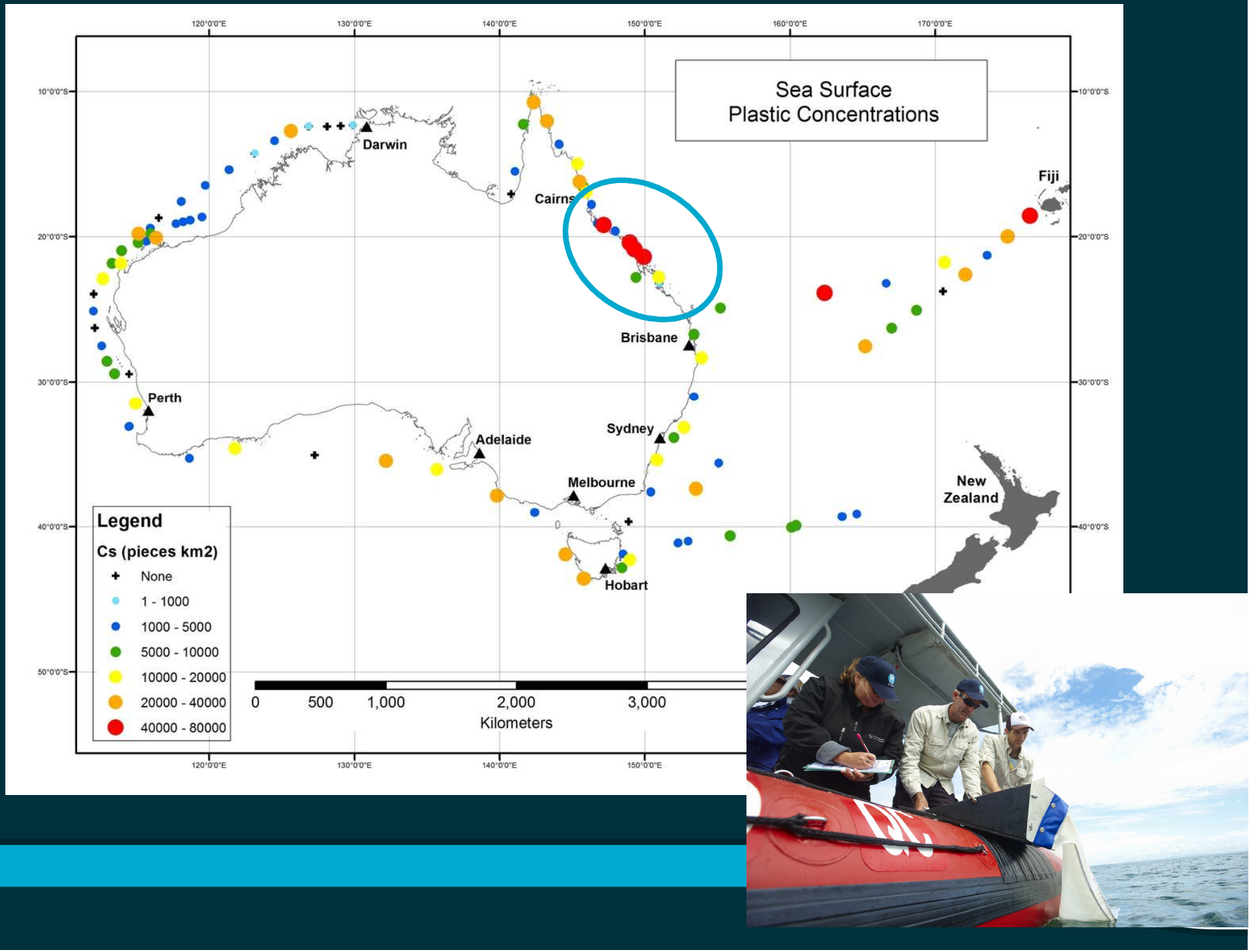
~7,000 students

50+ class/school programs

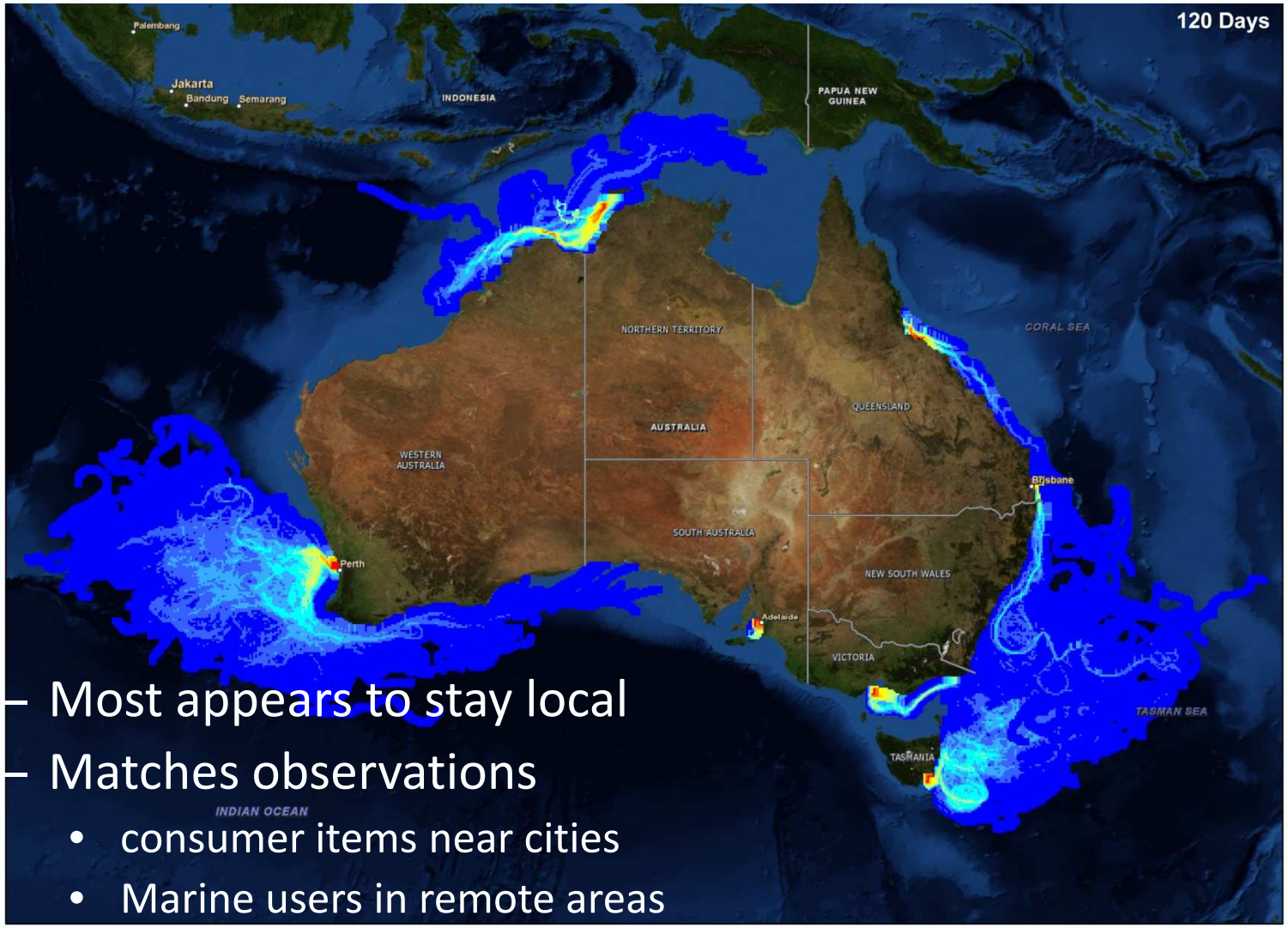
Online database/curriculum materials

van der Velde et al. in press

15 Intensive field-based science educator trips


Sea Surface
Plastic Concentrations
Darwin
Cairns
Brisbane
Perth
Adelaide
Sydney
Melbourne
Hobart
Fiji
New
Zealand
Legend
Cs (pieces km2)
None
1 - 1000
1000 - 5000
5000 - 10000
10000 - 20000
20000 - 40000
40000 - 80000
0
500
1,000
2,000
3,000
Kilometers
120°0'0"E
130°0'0"E
140°0'0"E
150°0'0"E
160°0'0"E
170°0'0"E
10°0'0"S
20°0'0"S
30°0'0"S
40°0'0"S
50°0'0"S

Coastal litter near cities



- Most appears to stay local
- Matches observations
  - consumer items near cities
  - Marine users in remote areas

Roadmap

Overview of Australia's national MD program

Approaches we are taking to:

Risk Analysis

Understand exposure

1a. Seabirds & ingestion

2b. Turtles & entanglement (won't show)

Translate exposure into impact

2a. Measuring fitness effects on seabirds

2b. Expert elicitation and waste

1a. Exposure, risk and ingestion by seabirds

Steps in the analysis:

1. Use encounter rates to estimate exposure

2. Validate based on observed rates of ingestion in literature

3. Predict areas of high risk

Estimating debris encounter rates

- Used a global model of drift – based on tracking oceanic drifters
- Exponential increase in release since 1950s (Plastics Europe)
- Proportional to coastal pop.