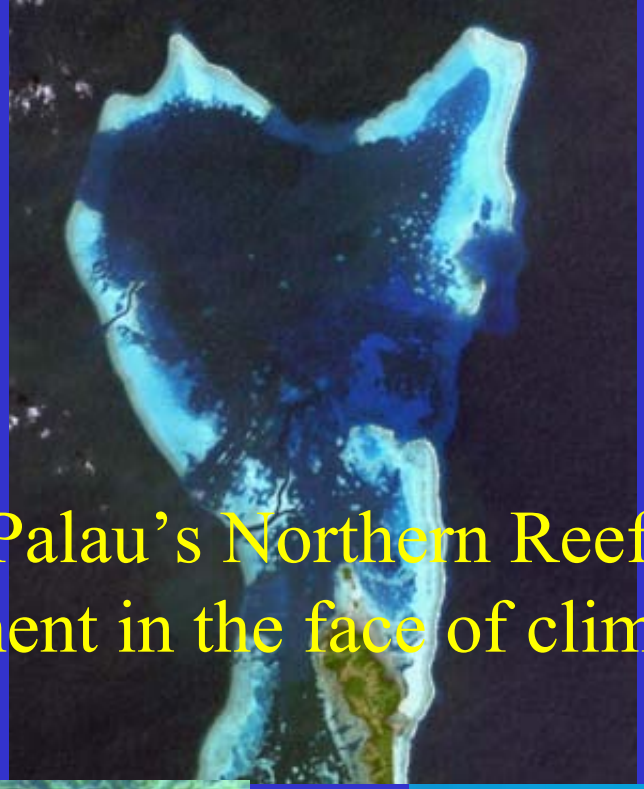
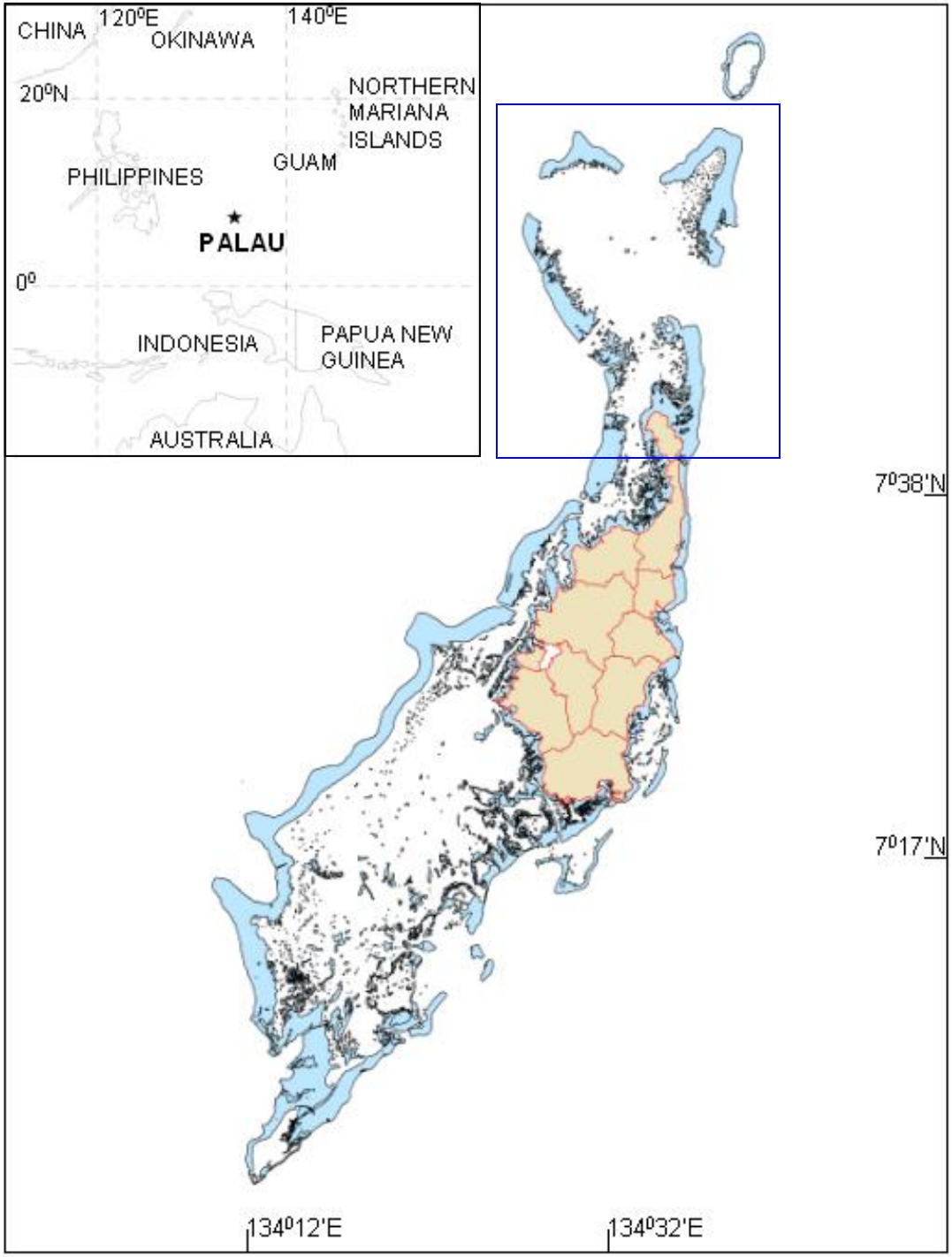


Palau's Northern Reefs: Management in the face of climate change

Y. Golbuu, R. van Woesik, Northern Reefs Management Planning Team, Northern Reefs Climate Adaptation Team


CHINA
120°E
OKINAWA
140°E
20°N
NORTHERN
MARIANA
ISLANDS
GUAM
PHILIPPINES
PALAU
0°
INDONESIA
PAPUA NEW
GUINEA
AUSTRALIA
7°38'N
7°17'N
134°12'E
134°32'E

1998 bleaching event

Bleaching was widespread and variable

Acropora species had the highest mortality

Offshore reefs were hit the hardest

Affected corals down to 90 ft.

Corals near estuaries survived better than those farther from land

After 1998 bleaching

Northwest slopes: 77% immediate decrease in coral cover, but now (2009), good recovery with 50-70% cover, mainly *Acropora*

Northeast slopes: little change

Patch reefs: no data before 1998, but western patch reefs have high coral cover in 2009, although northeast patch reefs show little recovery

Thermal stress is dependent on…

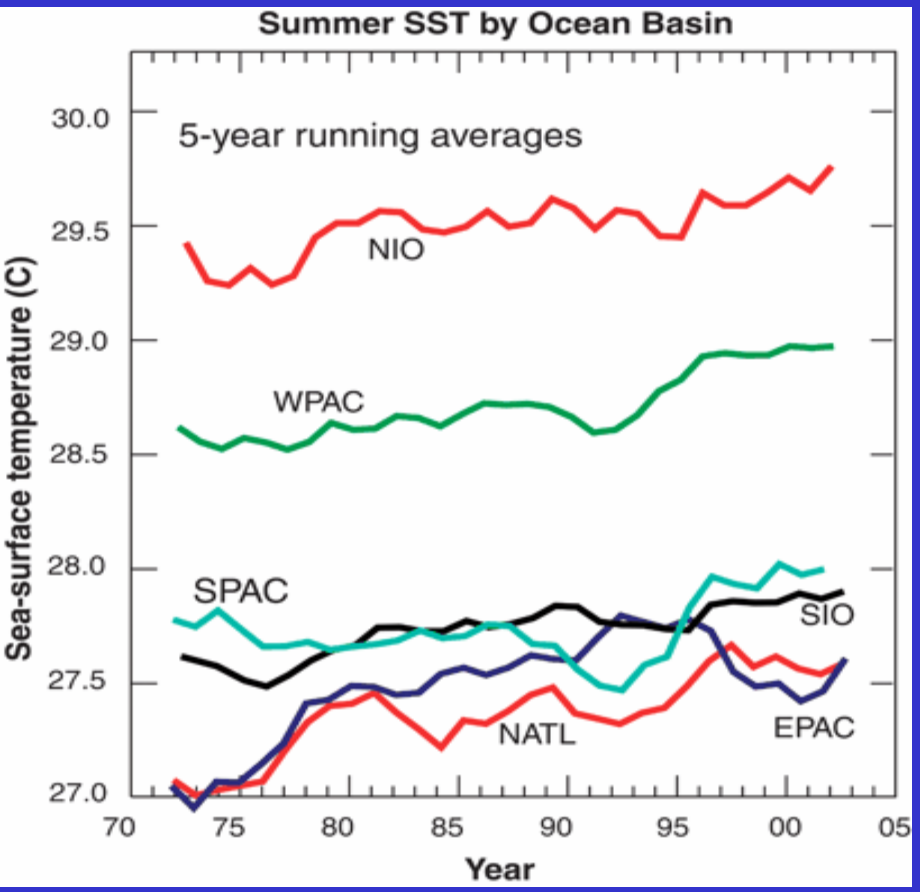
- Species
- Size of colony
- Depth
- Locality….
- …

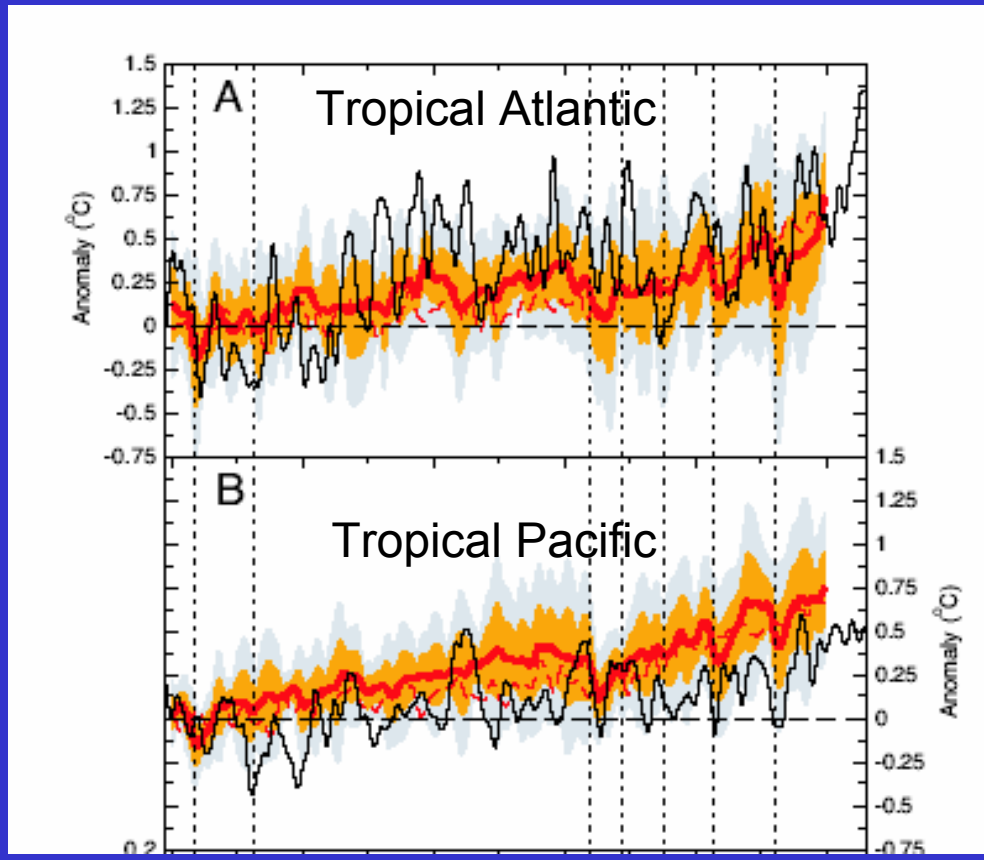
Old & New

Rapid recovery

Water temperature rise !

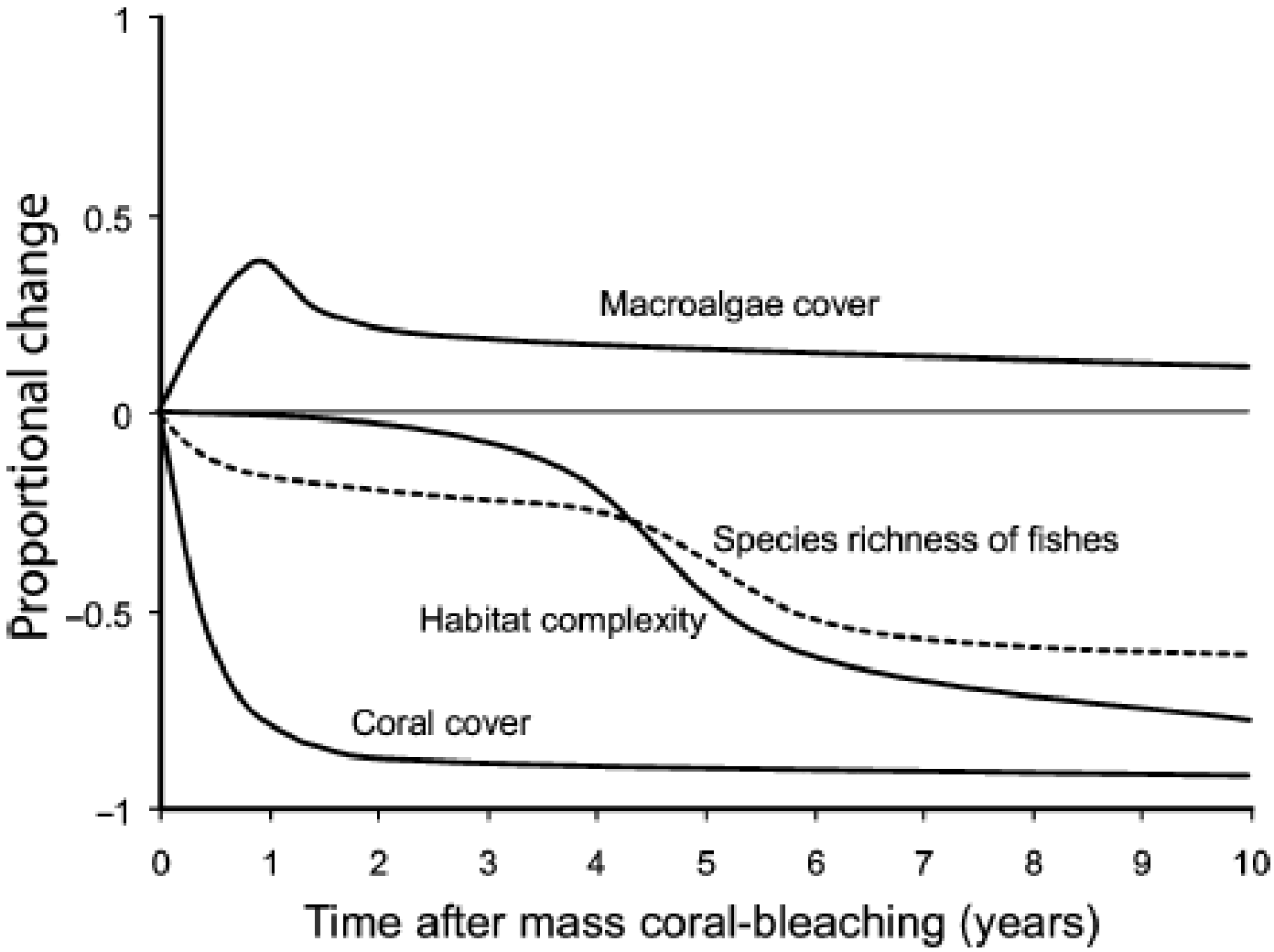
Last 30 years –
average increase of 0.5°C





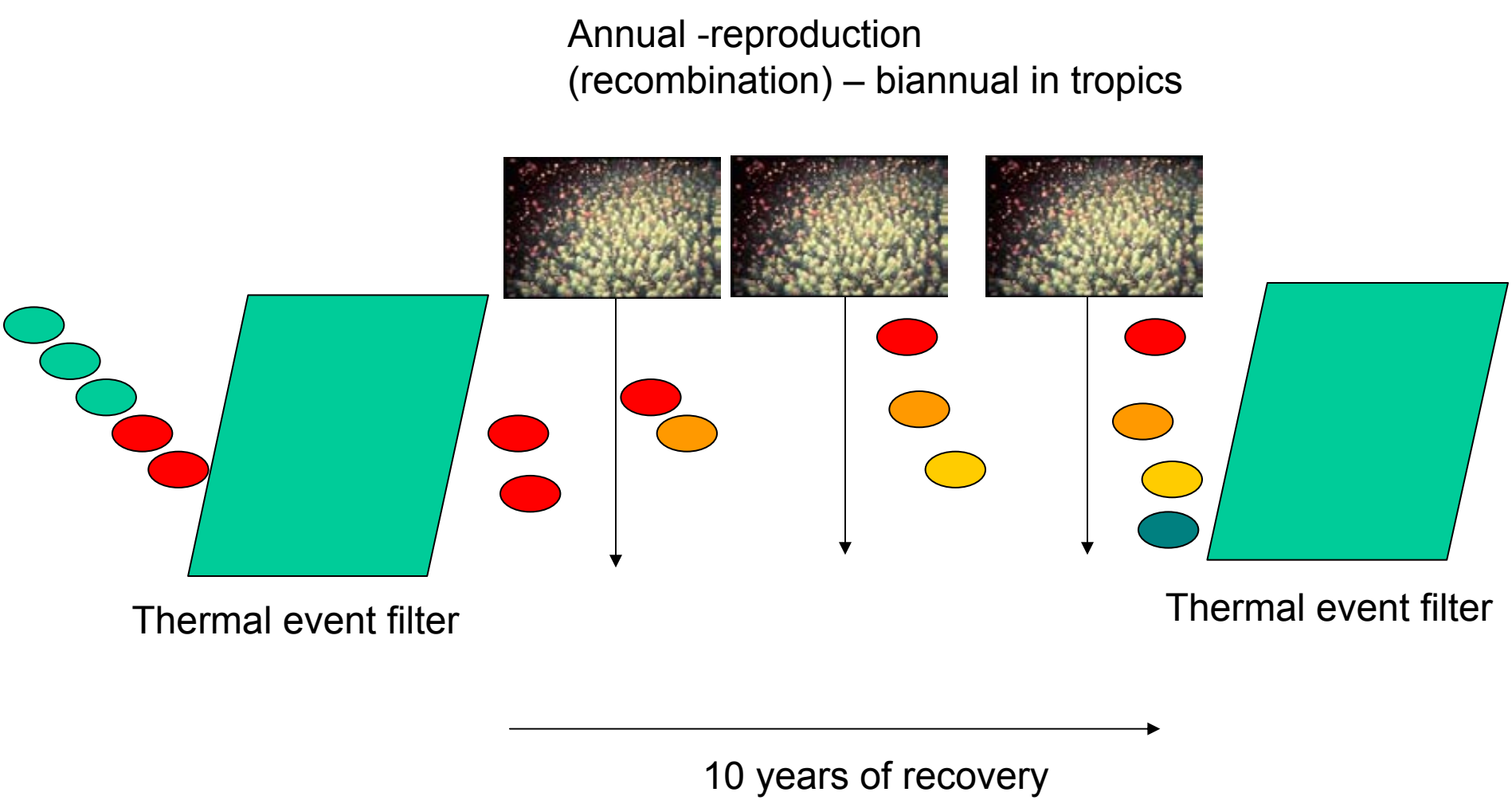
Webster et al 2005. Science

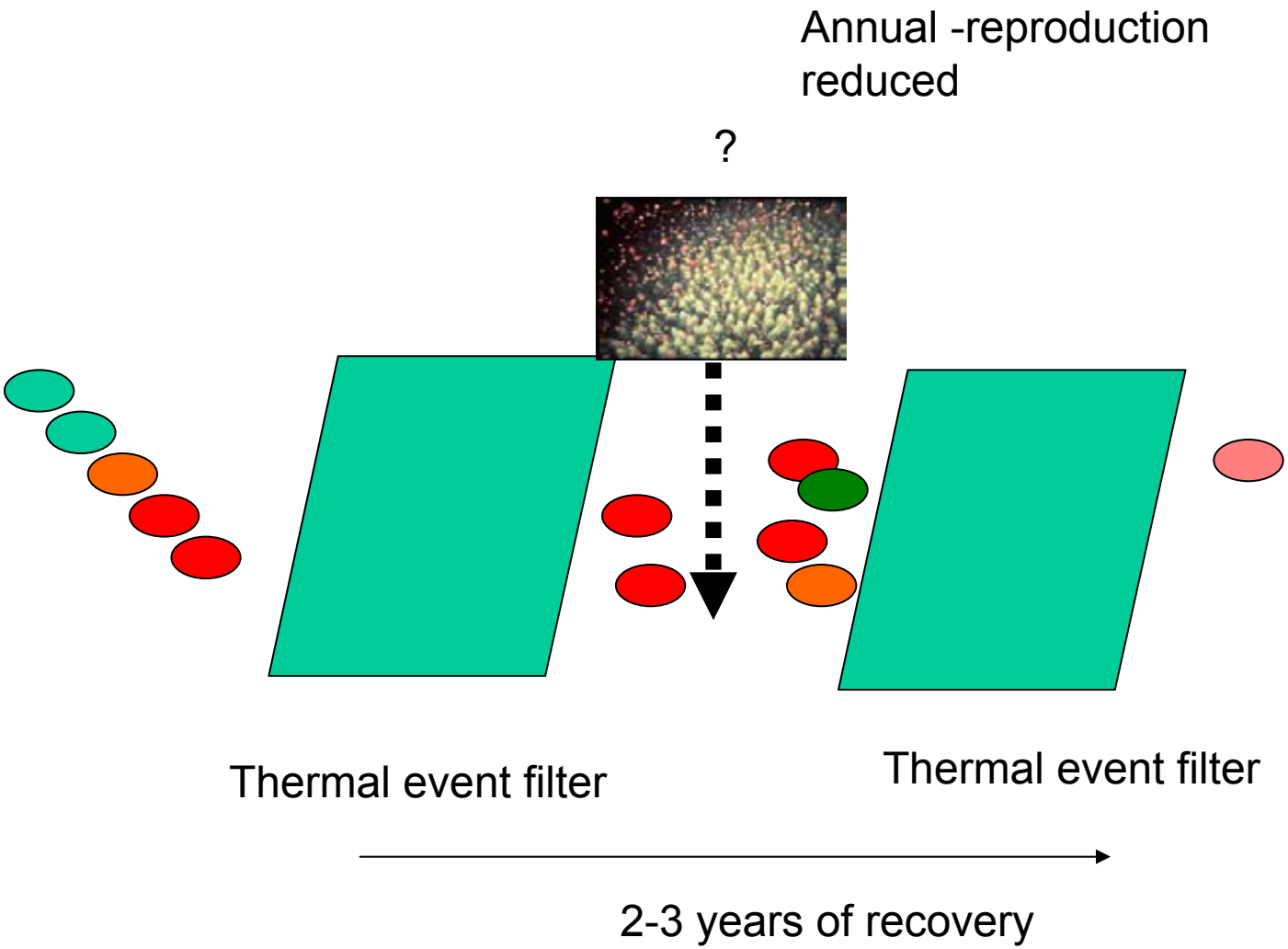
Santer et al 2006. PNAS 103: 13905-13910

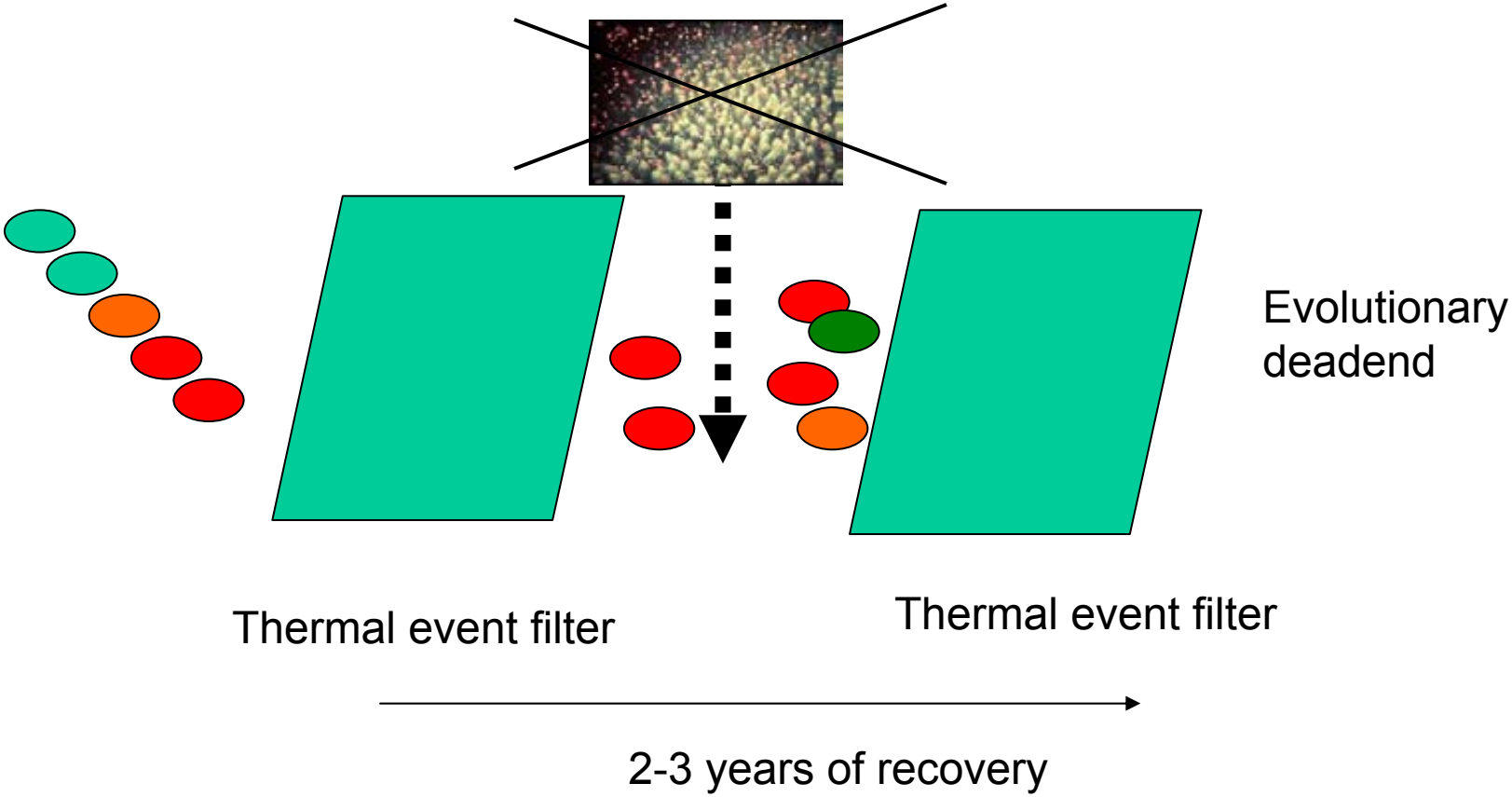


Munday et al 2008. Fish & Fisheries 9: 261-285

Adaptation involves ***differential-reproductive rates*** on different individuals within populations.


Annual -reproduction
(recombination) – biannual in tropics
Thermal event filter
Thermal event filter
10 years of recovery


Annual -reproduction reduced
?
Thermal event filter
Thermal event filter
2-3 years of recovery


Evolutionary deadend
Thermal event filter
Thermal event filter
2-3 years of recovery

MENGELLAKL DECLARATION

Ngarchelong's Road Map
Towards Effective Management of the Northern Reefs

Political and traditional leaders and community members

Develop and implement a management regime for the Northern Reefs

Establishment of the State Planning Team to lead the conservation planning process

Conservation Area Planning

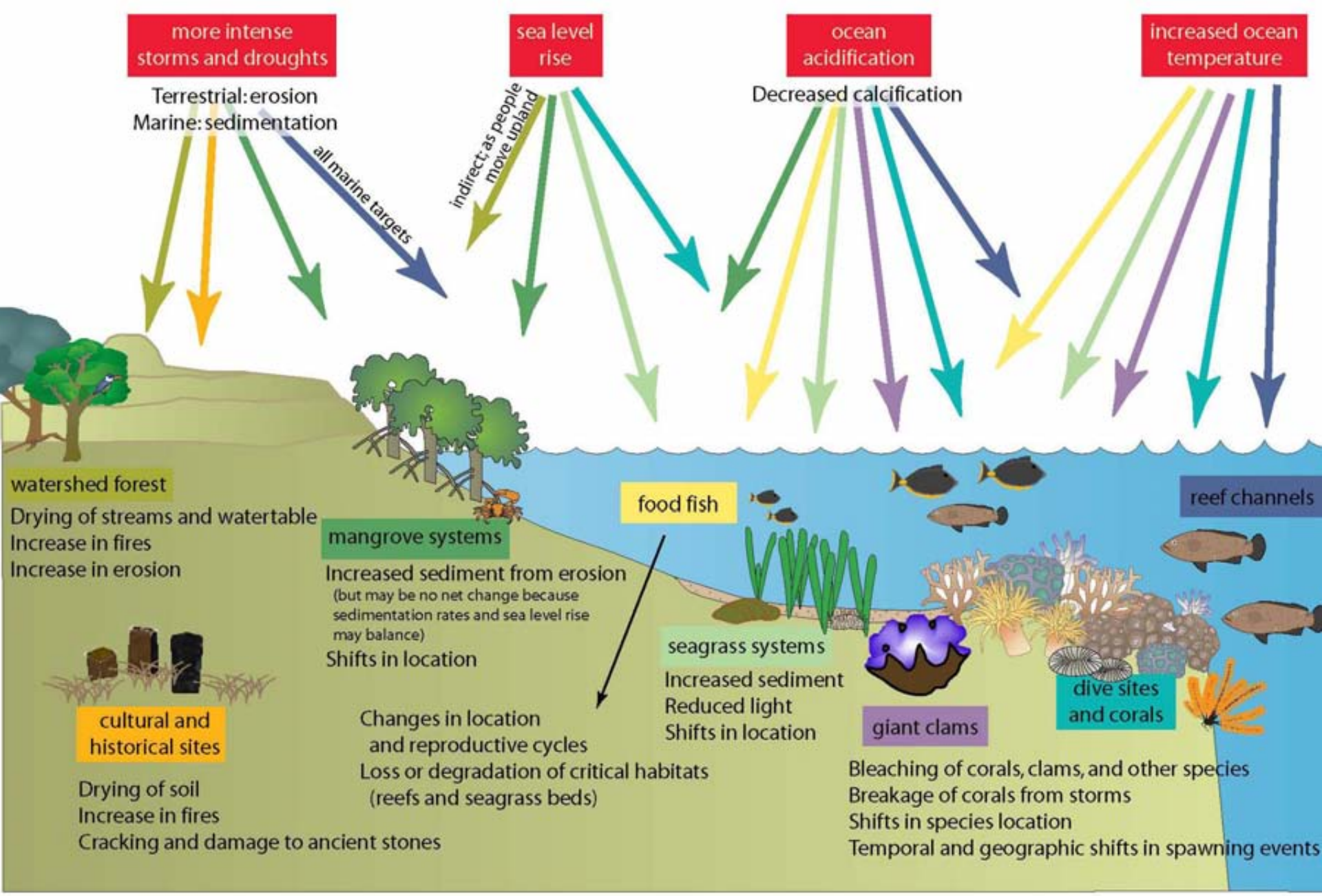
Identify conservation targets

Identify and assess threats

Conduct situation analysis

Develop conservation strategies

Establish measures



Impacts of Climate Change on

Northern Reefs, Palau

Hypotheses of Change

Conservation Target	Climate Factor	Key Ecological Attribute	Hypothesis of Change	Likelihood
Dive sites and corals	Seawater temperature	Species composition/ dominance	Increase in seawater temperature will lead to bleaching events that will reduce the number of corals on reefs	likely

Adaptation

Variety of habitats

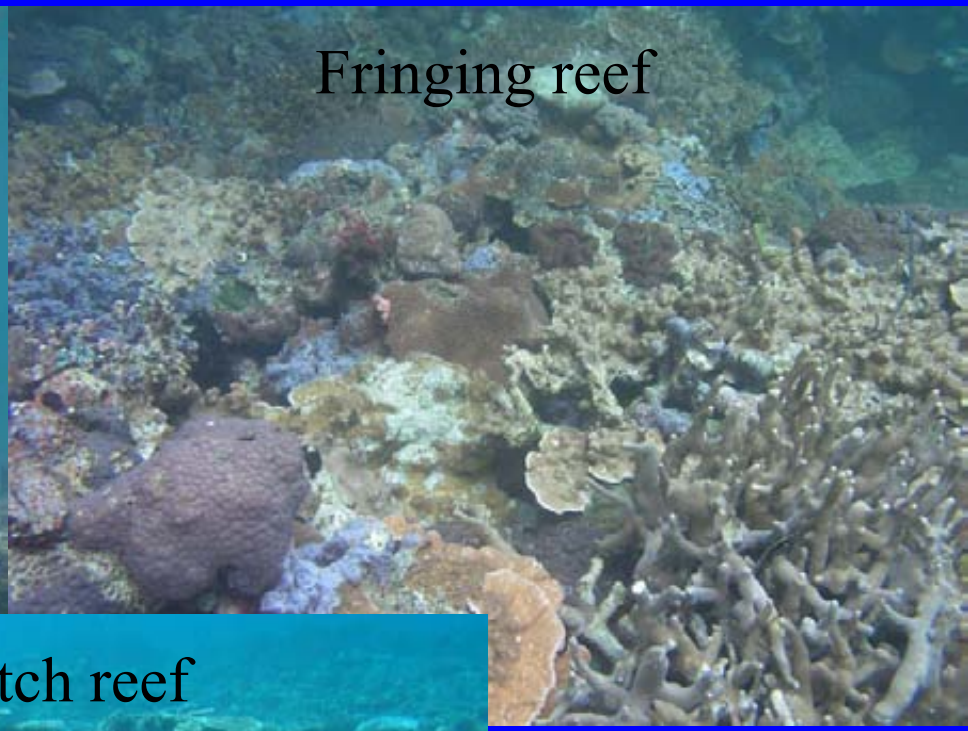
Replication

Reproduction (size and habitats)

Connectivity

Almany et al, 2009; Heller and Zavaleta, 2009 ; McLeod et al, 2009

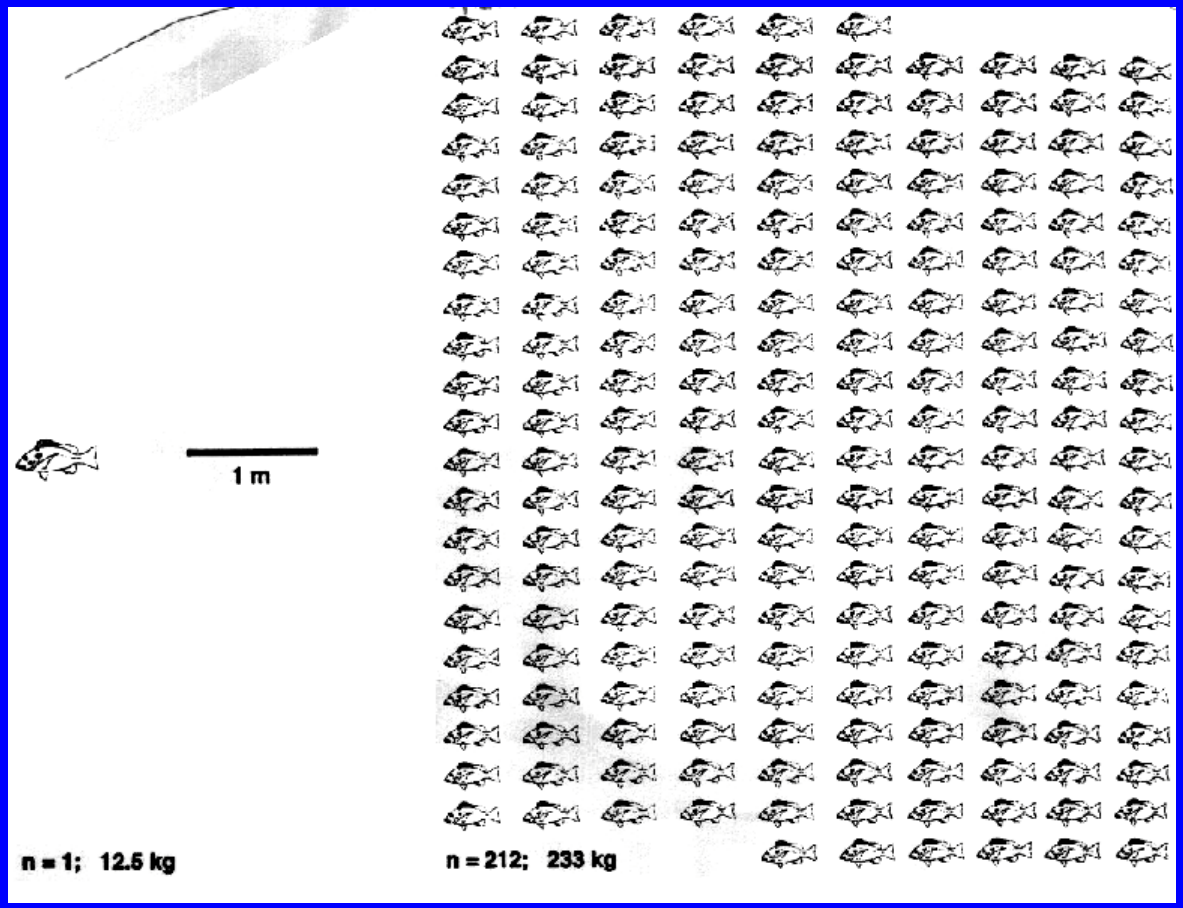
Habitats do not all respond the same way



Size and Habitats

42 cm

65 cm

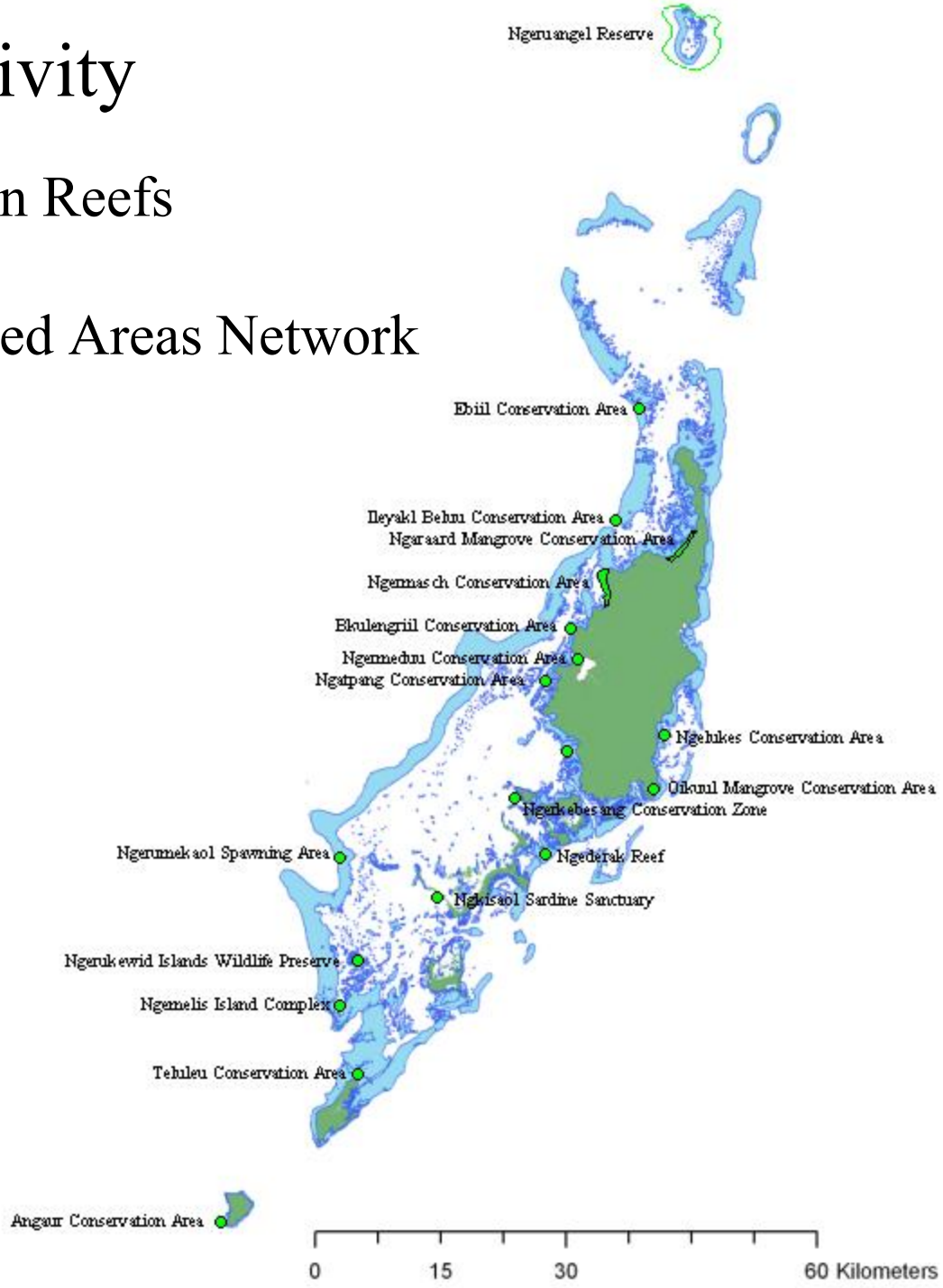


Birkeland C (1997) Life and death of coral reefs.

Connectivity

Whole Northern Reefs

Palau's Protected Areas Network



Acknowledgements

German LifeWeb
Palau Conservation Society
Palau International Coral Reef Center
The Nature Conservancy