

Shark Bay World Heritage

Unique values
at risk from Climate Change!

Marine Park, Marine Nature Reserve
and Terrestrial National Parks

Em Prof Di Walker

School of Plant Biology, Oceans Institute, UWA

Deputy Chair Australian WH Advisory Committee

Member Shark Bay WH Advisory Committee

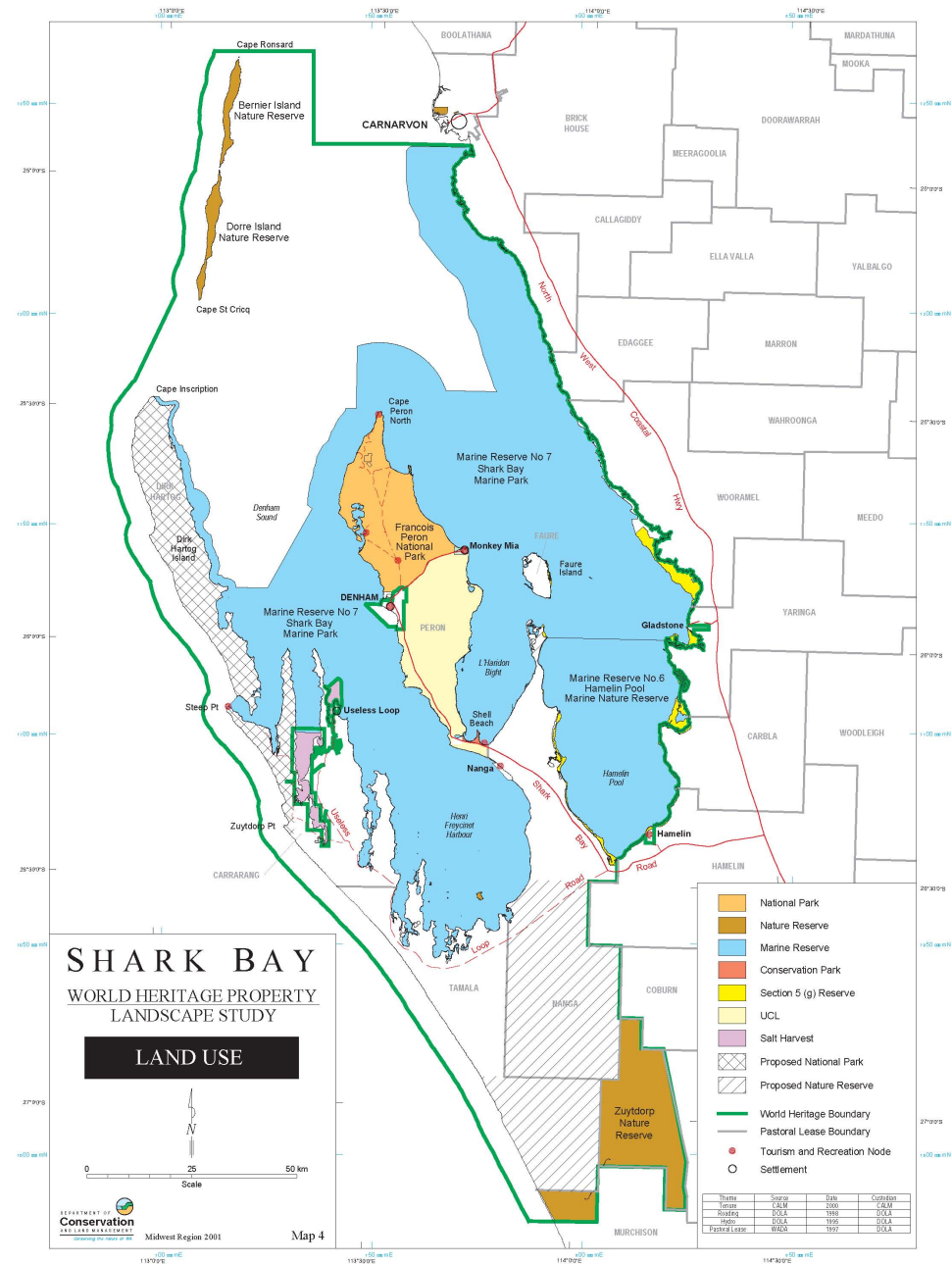


Outline

- Shark Bay as a unique World Heritage Property
 - World Heritage criteria for which it was listed
 - Links between values and climate
-
- Issues and opportunities
 - Risks of inaction



Land (and sea) use



Shark Bay at listing

- Semi-arid to arid climate - hot dry summers and mild winters
- Evaporation exceeds rainfall by a factor of 10
 - Mean annual precipitation ranges from 200 mm in the east to 400 mm in the far southwest
 - Mean annual evaporation ranges from 2000 mm in the west to 3000 mm in the east
- As a result, Shark Bay has a strong salinity gradient from marine (35 ppt) to hypersaline (70 ppt) in Hamelin Pool



Shark Bay is a unique environment

one of only 30 places on the World Heritage List of 1073 (total), 206 (natural), plus 35 (mixed), to satisfy all 4 natural criteria

Shark Bay was inscribed on the World Heritage List in December 1991 on the basis of its natural values "maintained in perpetuity"



Which means?

*Management is governed by state and federal government re
Except

*Australian World Heritage properties are “matters of national
Environment Protection and Biodiversity Conservation Act 1999

*Any development or action that impacts WH values
referred to the Australian Govt. for assessment and



Values?

» WHP all have
Outstanding
Universal Values



Outstanding examples representing the major stages of the earth's evolutionary history

- Shark Bay contains the most diverse and abundant examples of stromatolitic microbialities in the world. The living cyanobacteria (*Scytonema*) still building stromatolites at Hamelin Pool are similar to the earliest Cyanobacterial life forms which dominated the earth for 3000 million years (3 giga years).



Outstanding examples representing significant ongoing geological processes, biological evolution and human interaction with the natural environment

- Shark Bay's enormous seagrass beds (>4000 km²)
- an impressive example of the role seagrasses play in modifying a whole marine ecosystem.
- directly influence the physics, chemistry, biology and geology of the Bay.



Important and significant habitats where threatened species of animals and plants of outstanding universal value from the point of view of science and conservation, still survive

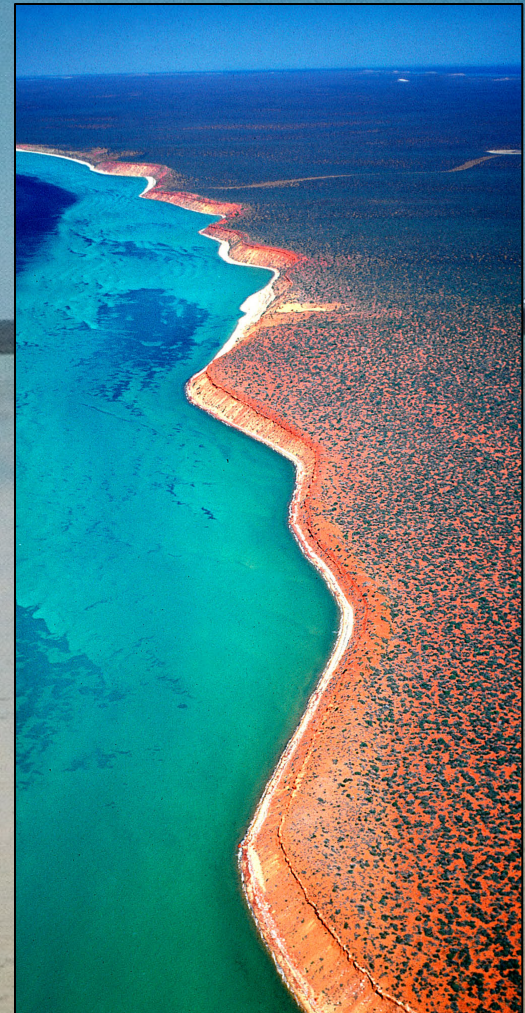
- The peninsulas and islands of Shark Bay provide significant fauna refuge habitats.
- Of Australia's 26 species of mammals threatened with extinction, 5 are found on the Bernier and Dorre Islands Nature Reserve. Though once widespread, 4 of these species now occur naturally **nowhere** else in the wild.
- Shark Bay also has 13 threatened reptile species, 3 rare bird species, on eighth of the world's dugong population and significant loggerhead turtle rookeries.

NB Dolphins are not listed as a WH Value but form part of the integrity of the ecosystem



Containing unique, rare or superlative natural phenomena, formations or features of exceptional natural beauty

- Shark Bay's arid landscape, combined with many peninsulas, islands and bays, creates a great diversity of landscapes and exceptional scenery
- Three climatic zones overlap here.
- The Bay forms a transition zone between two major botanical provinces - the *Eucalyptus* dominated South West and the *Acacia* dominated Eremean.





Stromatolites



Dugong



**Western
Barred
Bandicoot**



Seagrass banks

Risk from climate change

- Values depend on geomorphology and climate
- Any change to water circulation will affect all the values for which Shark Bay is listed!



Threats to values?

» Focus of today is the marine environment where we have lost nearly a quarter of the large seagrass meadows

» Terrestrial World Heritage values are also at risk from climate change effects on

» Fires,

» Floods (pericyclonic activity),

» Introductions



Progress

- » Shark Bay Resources is now much better managed by Mitsui and contributing to research programs
- » The pink snapper recovery in the Western Gulf is unrivalled on a world scale
- » Prawn fishery negotiated management, based on long term research findings has provided win-win scenarios and better outcomes.
- » Relationships between the Shire of Shark Bay and DBCA are better, Cheryl Cowell's leadership



More progress

- » The purchase of Hamelin Station by Bush Heritage and Faure Island by Australian Wildlife Conservancy means they are being managed in sympathy with Shark Bay's World Heritage values, and bringing private resources to conservation
- » The establishment of National Park Status over former pastoral leases, *e.g.* Dirk Hartog Island, Edel Land, Nanga, as well as Peron Peninsula, has shown resilience in seriously degraded landscapes following stock removal



Outline

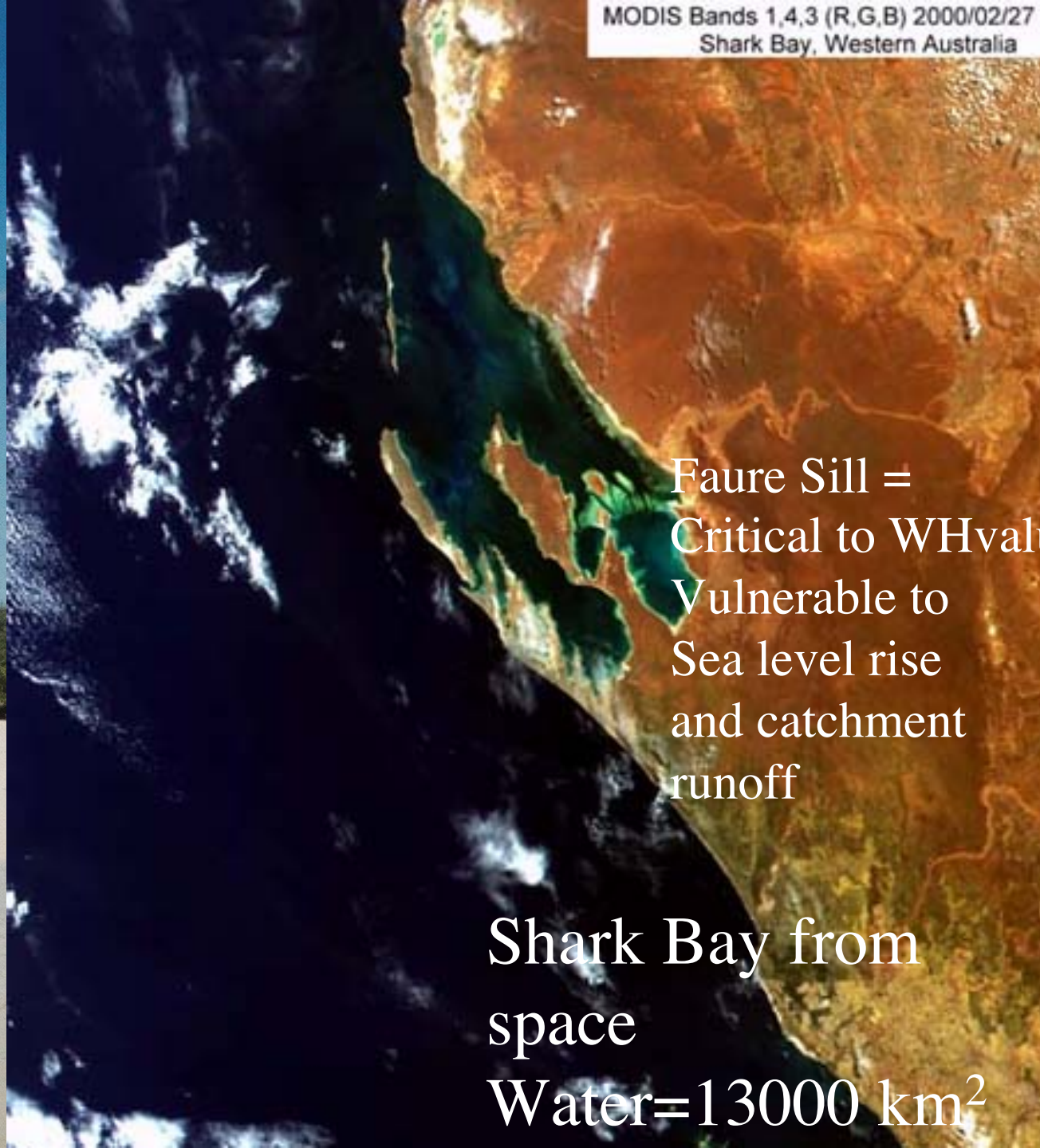
- Shark Bay as a unique World Heritage Property
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- **Risks of inaction?**
 - **Suggested Way Forward?**



Extras



An example



Faure Sill =
Critical to WHval
Vulnerable to
Sea level rise
and catchment
runoff

Shark Bay from
space
Water=13000 km²

Gaps for Shark Bay

- Five years ago, the committees considered that there were gaps in process information, such as for the Wooramel River catchment
- What are the consequences of the Faure Sill being breached? There needs to be likelihood and consequences framework detailing what the response would be and what is currently in place.



Gaps for Shark Bay

- The Committees reflected that Shark Bay is one of the best places in Australia to measure climate change and effects. It has

the northern/southern boundary of many marine and terrestrial ecosystems. Most other World Heritage properties can only measure one or two aspects.



Findings (and Recommendations) from the 2010 MPRA 10 year Audit of Shark Bay Marine Park

- F3. The pastoral lands bordering the marine reserves appear to be, in some places, highly degraded, and

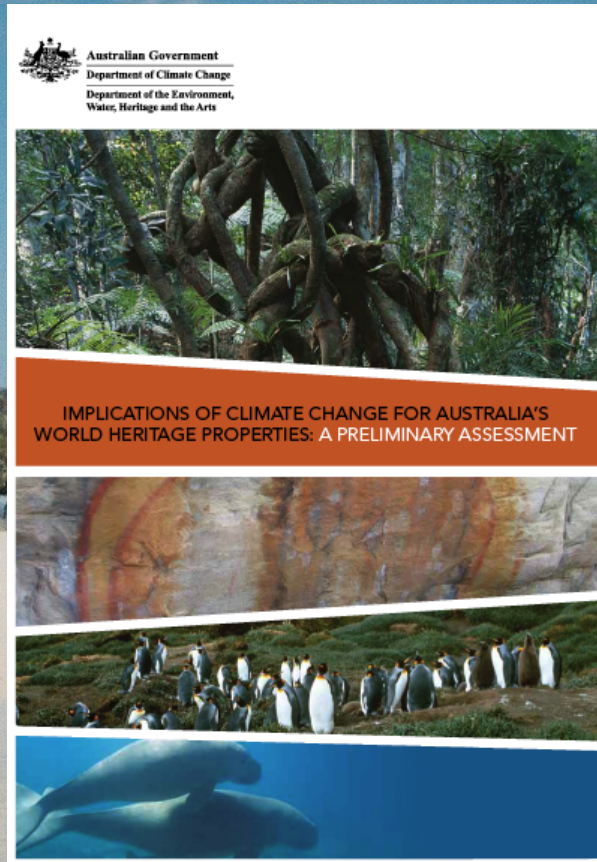
are likely to result in accelerated erosion and increasing impacts on the marine waters of the park and the nature reserve. **The Strategic Plan indicates that the stromatolites are ‘at risk’, even though the majority are contained within WA’s only Marine Nature Reserve and intended for the highest level of protection.**

(Findings and)Recommendations from the 2010 MPRA 10 year Audit of Shark Bay Marine Park

- *R3. Control catchment impacts: there is an urgent and pressing need for integrated management arrangements for the near shore and upper catchments to reduce the erosional impacts and indirect impacts on the reserves. This should be established in conjunction with the NRM bodies of the region, be properly reflected in the management plan discussed in R1, and directly involve the Pastoral Lands Boards and local government.*



Reports saying “Climate Change threats to WH Values” needs addressed



Executive summary

Australia's biological diversity is already under stress from human impacts particularly caused by land use change, hydrological change, soil salinisation, invasive species and changes to fire regimes. Climate change is an additional stress. It includes stresses such as higher temperatures, changed water and fire regimes, more extreme weather events, and salt water inundation into freshwater coastal wetlands, including those that are World Heritage listed.



Shark Bay,
Western Australia

- Higher sea water temperatures
 - Sea level rise
 - Increased carbon dioxide (CO₂) concentrations
 - More frequent severe droughts, which affect conditions on land
 - Ocean acidification
 - More intense storms and cyclone activity
- Alteration of seagrass habitats (changed salinity and more frequent storms)
 - The impact of raised temperatures and increased CO₂ is uncertain; higher levels may increase primary production of biomass
 - Changed relationships between sharks and other marine species as a result of changes to the Leeuwin Current
 - Attributes such as raised temperatures, storms and increased CO₂ levels will affect particular habitats (such as those occupied by reptiles and terrestrial mammals)
 - Increased sea temperatures may favour a southern movement of tropical marine life
 - Increased temperatures would appear likely to increase the frequency and effectiveness of predation by the tiger shark

There are uncertainties about the effect of climate change on currents along the continental shelf and fish stocks, in particular the Leeuwin Current.

There is significant access to and commercial use of Shark Bay and its environs (including minerals extraction; prawn fishing; and ecotourism centred on migratory whales, turtles and dugong). Pressure from those activities is likely to increase with, for example, ecotourism becoming more intensive if climate change trends increase and if consumers believe that their window to 'see the dugong before they disappear forever' is closing.

Reports saying “Climate Change threats to WH Values” needs addressed: Both state and Federal governments

Shark Bay World Heritage Property Strategic Plan 2008–2020



Expected Outcomes

- Improve knowledge and understanding of climate change, its processes and impacts.
- Management practices acknowledge potential impacts of climate change and strategies in place manage change.
- Adequate areas set aside for conservation protection and act as climate refugia.
- Introduced plants and animals controlled and opportunities for vegetation recovery and growth maximised.



Table 5: Threatened Ecological Communities and Ecosystems at Risk in the Shark Bay Area

Community	Status ^a	Threatening Processes
Threatened Ecological Community		
Hypersaline microbial community (Hamelin stromatolite) ⁴	V, P4	Recreation, climate change leading to changes in sea levels, nutrient enrichment



Major Issues

- Potential climate change effects on WH values
 - Need for baseline information on the condition and extent of WH values and potential threats to the integrity of the values.
 - Insufficient resourcing - *of course*
 - Lack of appreciation of the values of the property and their protection
-
- Social research and monitoring to improve management practices and be able to respond to visitor use patterns and demands.
 - Knowledge of perceptions, attitudes and values of local community members to the Property is also needed to determine to level of support for WH.



Findings (and Recommendations) from the DRAFT MPRA 10 year Audit of Shark Bay Marine Park

- **F15. There is a very limited database from which conclusions about the health of the natural ecosystems and their values can be drawn.**

The exceptions to this are data on dugongs, and some information on sharks and dolphins. Inferences about the condition of the Shark Bay ecosystems and species must therefore be drawn from assessments of the presumed significance of risk factors.



(Findings and) Recommendations from the DRAFT MPRA 10 year Audit of Shark Bay Marine Park

- *R15. Short term priorities for research and monitoring should be focussed on providing information to inform reduction of the known threats, while developing medium term assessment and reporting protocols to assess*

the condition of the natural assets at the species, habitat and ecosystem level, including selected physical and ecological processes important for the ongoing maintenance of the values of the marine nature reserve. Also, in the medium term, define specific monitoring and reporting protocols to report on each KPI in the updated management plan.

