Valuation methods and evidence for ecosystem services from kelp forests

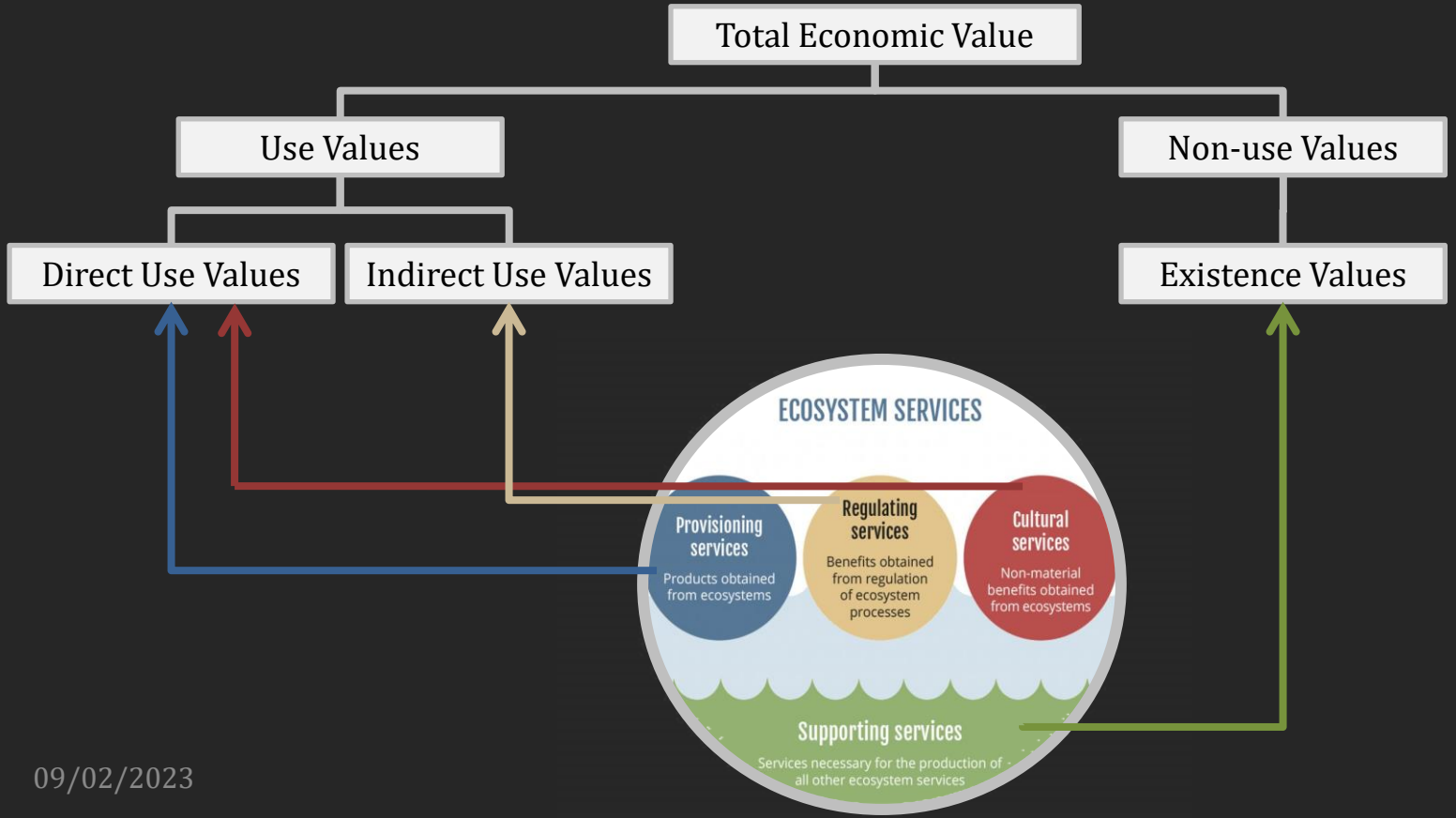
Johanna Zimmerhackel
Thomas Wernberg, Karen Filbee-Dexter
Michael Burton, Abbie Rogers

Global Ecosystem Service Assessment of Kelp Forests

Aim: develop a global synthesis of the benefits that kelp forests provide to people around the world using an ecosystem services approach.

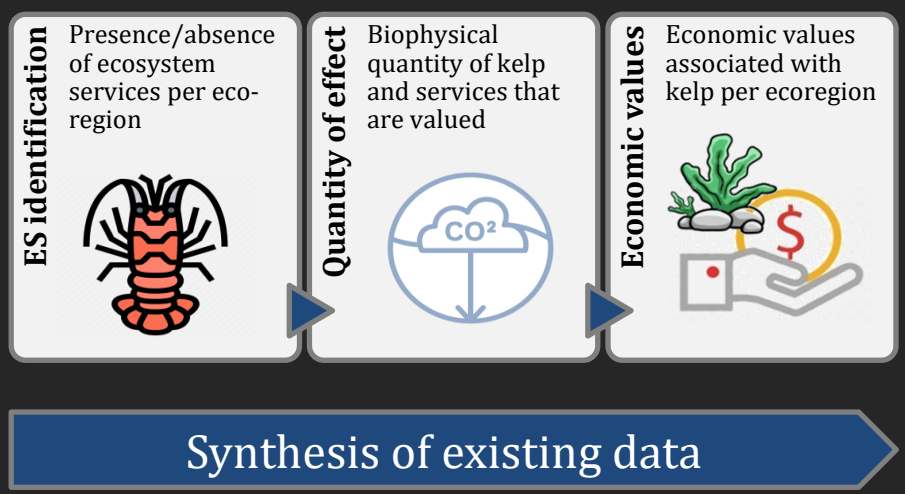
- 25 regional leads + local experts
- 6 continents
- 78 ecoregions with kelp habitat

Total Economic Value of Ecosystem Services



Economic Valuation approach

5 Steps of economic valuation for ecosystem services



Attribution of Values

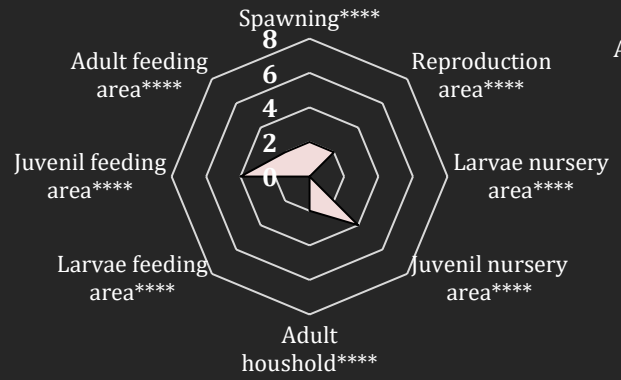
Counterfactual case: Value that is lost or gained because the quantity of the resource changes

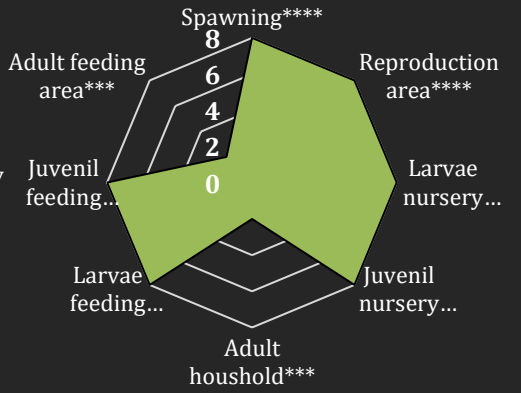
Direct Use Values

- Extractive activities
  - Commercial fisheries
  - Recreational fisheries
- Non-extractive activities
  - recreation and tourism activities
- Attribution factor
  - Habitat Dependency Index (HDI)

Gadus morhua

Lithodes santolla





Cristina Piñeiro-Corbeira, session 9

Indirect Use Values

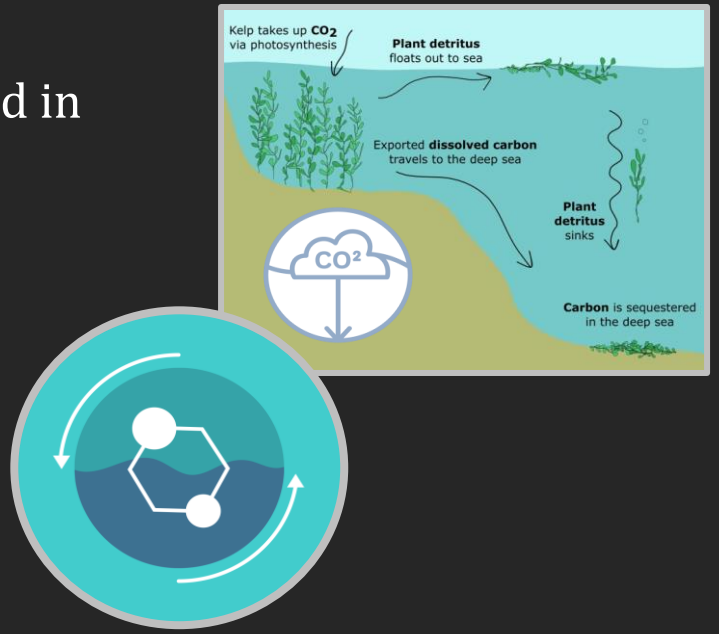
Value: Prevention or mitigation of a problem by maintaining ecological processes

Carbon sequestration:

- Quantity of carbon exported and sequestered in the deep sea
- Price of carbon

Nutrient cycling:

- Quantity of nitrogen removed
  - from areas with excess nutrients → local
  - at peak times → seasonal
  - problem prevention → unknown
- Avoided abatement costs



Non-use Values

Existence values:

- Value people hold for the existence of kelp habitat

Discrete Choice Experiments:

- General publics preferences for conservation measures

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Full length article

Investigating public preferences for the management of native and invasive species in the context of kelp restoration

Isobella M. Grover [a], Mark S. Tocock [a], Dugald R. Tinch [a,b], Darla Hatton MacDonald [a,b,*]

[a] Tasmanian School of Business & Economics, University of Tasmania, Private MailBag 84, Sandy Bay, TAS 7001, Australia
[b] Centre for Marine Socioecology, University of Tasmania, TAS 7001, Australia

Marginal Value Approach

- Sum of all Values = Total Economic Value
- 100 % loss of kelp forests
  - Value currently associated with kelp forests vs. ‘the value’ of kelp forests
- Dynamic change of values as resource availability changes
  - Diminishing marginal return
  - Unpredictable thresholds

Source: www.nbcnews.com

Tricky Services

- Services that lack biophysical data
  - Regulating services (e.g. water clarity, coastal erosion)
- Values that (existing) economic methods cannot quantify
  - Cultural services (e.g. learning and inspiration, spiritual experiences)
  - Indigenous values
  - Intrinsic values

Conclusions

- Economic value of ecosystem services valuable tool to
  - increase awareness among the general public and decision makers on the costs and benefits of environmental change
  - influence policy towards more sustainable decisions
  - improve social acceptance of conservation measures
- However:
  - Appropriate value attribution
  - Marginal values approach
  - Not all inclusive, should be put into a wider context

Thank you!

Questions?

Dr. Johanna S. Zimmerhackel
Centre for Environmental Economics and Policy
School of Biological Sciences
University of Western Australia

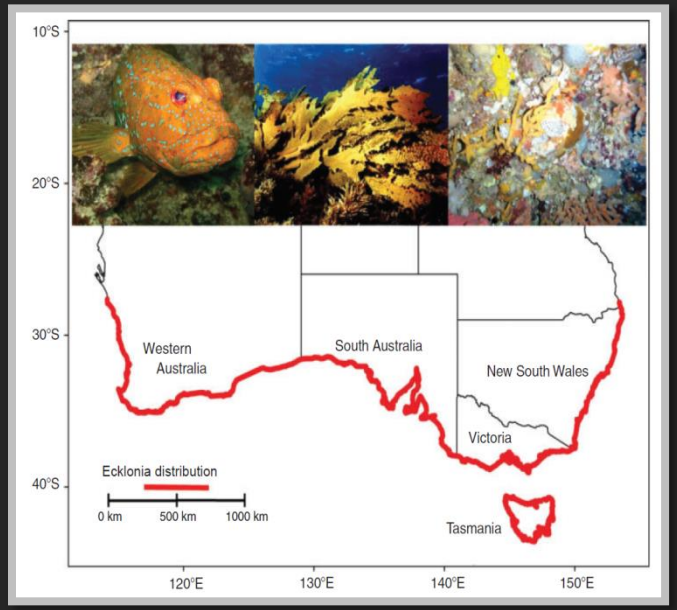
E-mail: johanna.zimmerhackel@uwa.edu.au

Total economic value

Total economic value of a 20% loss of GSR ecosystem services over 20 years (million AUD)

Ecosystem Service	Discount rate 3%	7%	10%
Provisioning Services			
Commercial fisheries	$67.7	$65.2	$63.4
Regulating Services			
Carbon sequestration	$77.1	$74.2	$72.2
Nutrient cycling	$13,219.8	$12,725.6	$12,378.5
Cultural Services			
Recreational fisheries	$3,400.8	$3,273.6	$3,184.4
Diving and snorkelling	$821.6	$790.9	$769.4
Other recreation	$3,743.3	$3,603.4	$3,505.1
Supporting Services			
Existence value for kelp ecosystem	$9,172.7	$8,829.8	$8,589.0
Total	**$30,503.0**	**$29,362.7**	**$28,561.9**

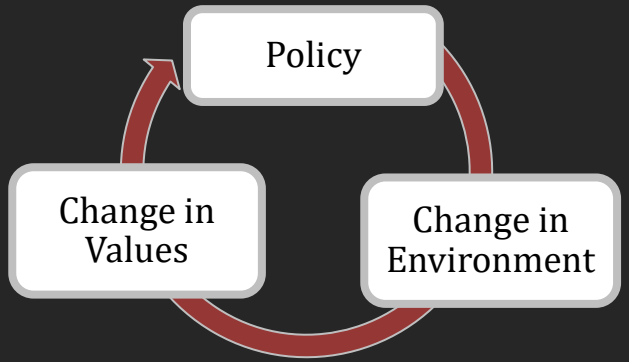
Great Southern Reef



Source: Eger et al. 2022. Report to the National Environmental Science Program, UNSW

Future Projection

- Business as usual vs policy scenarios
  - Climate change mitigation
  - Restoration programs



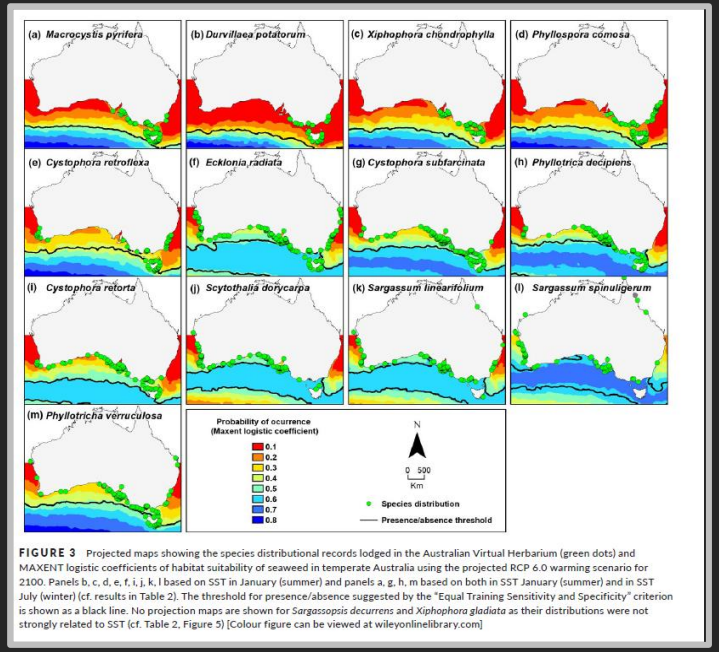


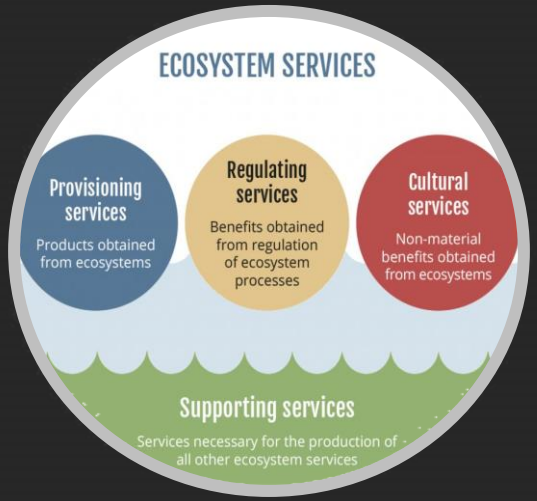
FIGURE 3 Projected maps showing the species distributional records lodged in the Australian Virtual Herbarium (green dots) and MAXENT logistic coefficients of habitat suitability of seaweed in temperate Australia using the projected RCP 6.0 warming scenario for 2100. Panels b, c, d, e, f, i, j, k, l based on SST in January (summer) and panels a, g, h, m based on both in SST January (summer) and in SST July (winter) (cf. results in Table 2). The threshold for presence/absence suggested by the "Equal Training Sensitivity and Specificity" criterion is shown as a black line. No projection maps are shown for *Sargassopsis decurrens* and *Xiphophora gladiata* as their distributions were not strongly related to SST (cf. Table 2, Figure 5) [Colour figure can be viewed at wileyonlinelibrary.com]

Source: Martinez et al 2018. Diversity and distributions

Work in Progress

- Carbon sequestration: 6.67 ± 5.35 bn US$/year
- Nutrient cycling: in progress
- Other regulating services: Biophysical quantity

- Commercial fisheries: 4.19 ± 0.41 bn US$/year
- Direct kelp harvest: 0.38 ± 0.01 bn US$/year
- Other provisioning services: 63.5 ± 8.8 million US$/year



- Tourism and recreation: in progress
- Other cultural services: Biophysical quantity

- Biodiversity: in progress
- Other supporting services: Biophysical quantity