Challenges for marine conservation planning

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OR: The world according to Hugh – as spoken by Eddie

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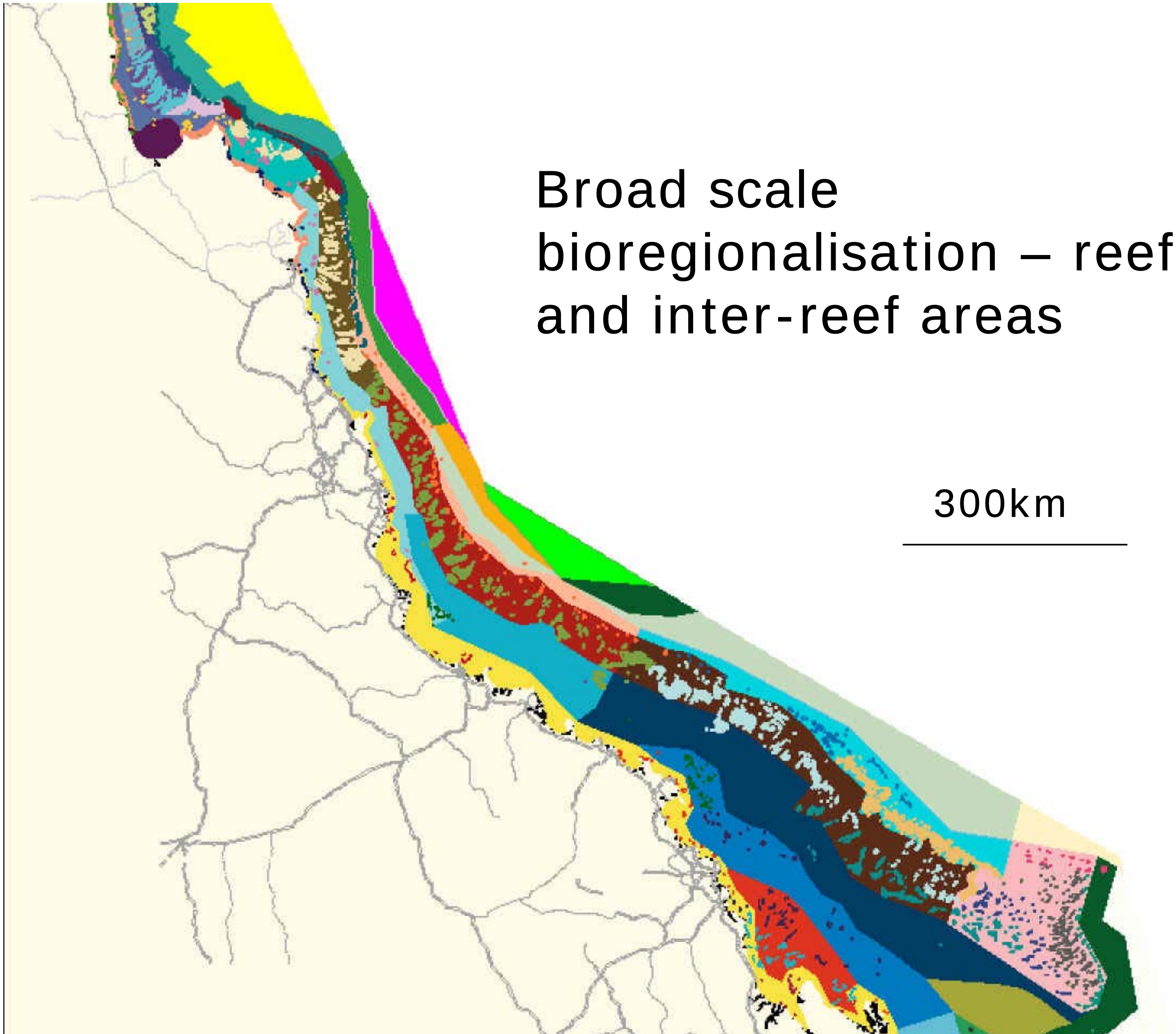
The GBR story – state of the art?

In the 1990s the process of rezoning the GBR started with view to expanding green zones from 4.7%. After several years of devising biological principles with ecologists they decide to talk to conservation planners!

Broad scale bioregionalisation – reefs and inter-reef areas



…30 reef bioregions and 40 non-reef bioregions…

Solving the problem

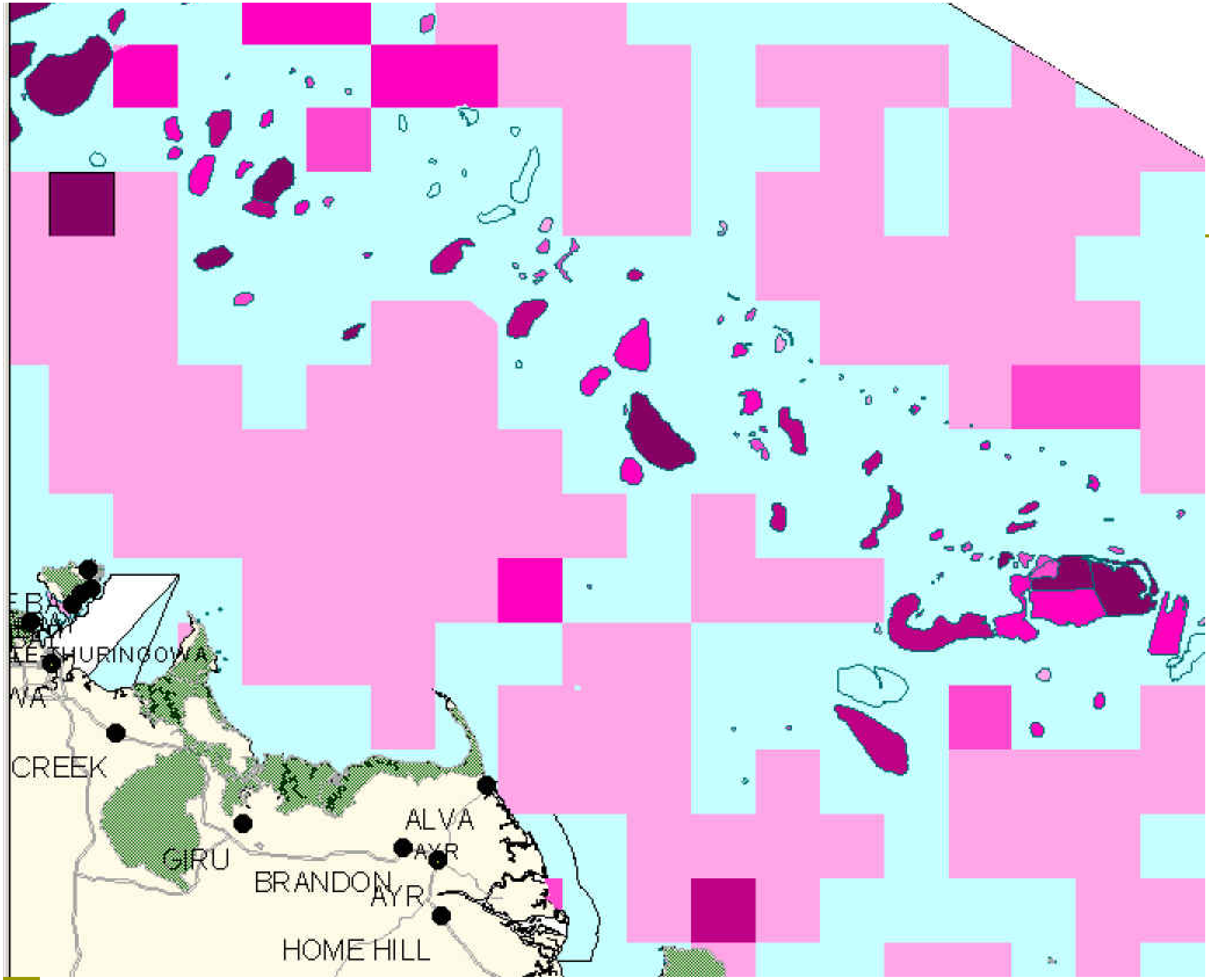
- 17000 planning units
- MARXAN – see web site
- Objective – meet all targets and piss off as few a people as possible

Outcome – all good?

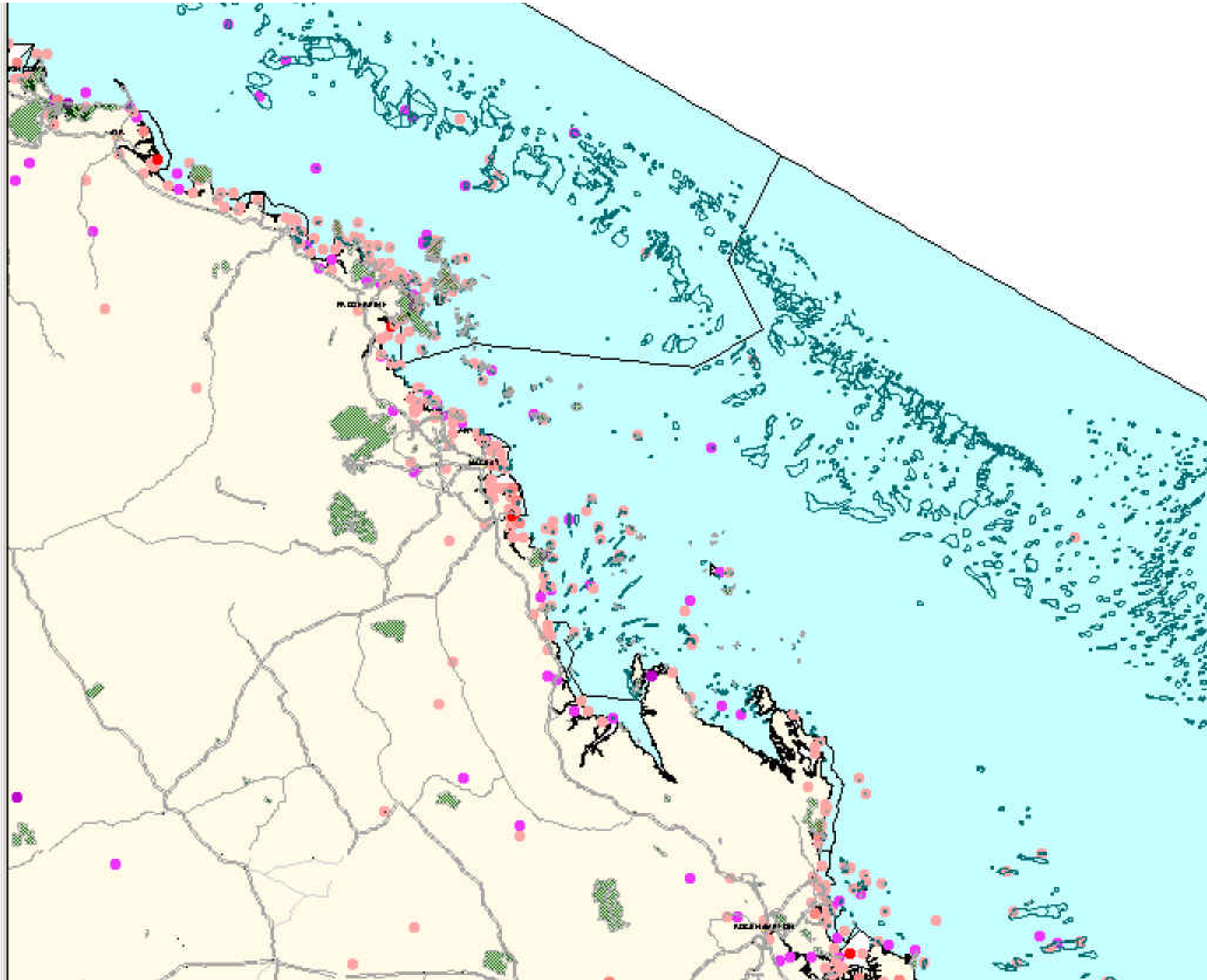
- Target of 20% for every bioregions, and some special feature targets (e.g. dugong feeding areas)
- 33% of the entire system set aside as non-take zones and all targets essentially met
- Arguably the biggest application of systematic conservation planning principles and software that has been fully implemented
- Is everything perfect? Here we raise just a handful of issues

Issue 1: The reluctance to include, and complexity of, socio-economic data

- The agency and many scientists were reluctant to include socioeconomic data.
- Explaining to people that one must simultaneously use biological and socio-economic data is a major challenge
- Getting good socioeconomic data is a major challenge also (*Richardson et al 2006; Stewart et al 2005*)
- What do you do with it when you get it?



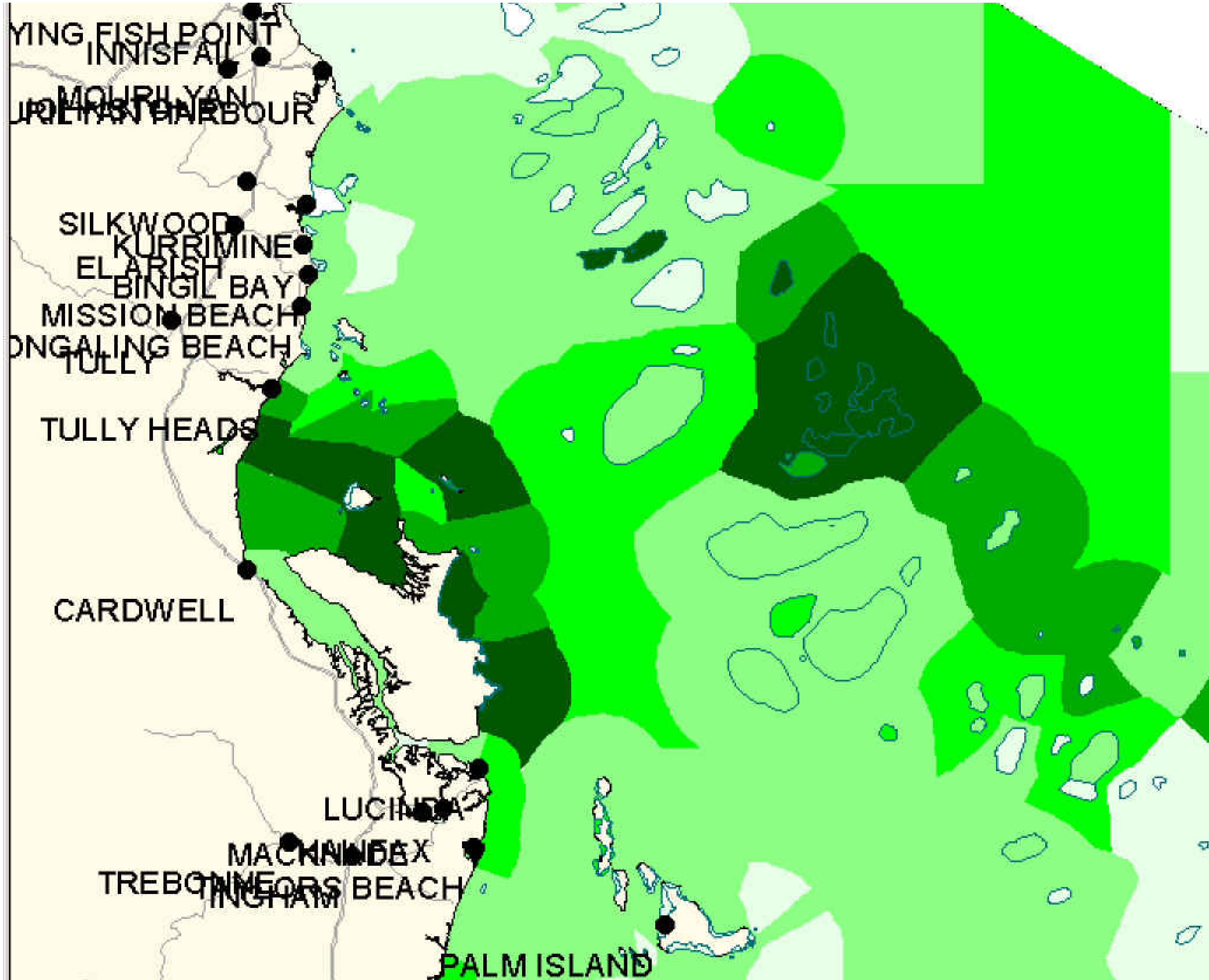
…Commercial fishing values…



…Recreational fishing sites…

If we have disparate sorts of data how can they be integrated

- A major challenge when using socioeconomic data is integrating disparate costs and benefits.
- For example how should we integrate the fishing cost data with the “submissions for green zones” ?



…Submissions – for green zones…

If we have disparate sorts of data how can they be integrated

- A major challenge when using socioeconomic data is integrating disparate costs and benefits.
- For example how should we integrate the fishing cost data with the “submissions for green zones” ?
- Is a submission for a green zone a negative cost? How much is that negative cost worth in $?

Many challenges re socioeconomics

- Possibly the biggest challenges are not in integrating more ecology but in effectively integrating socioeconomic data
- MARZONE will help – eg. we can set targets for fishing zones, but some trade-off issues are complex and subjective
- Some of the best conservation dollars will be spent collecting good socio-economic data

Issue 2 - Connectivity

- The most frequently asked question with respect to GBR rezoning, and Marxan is: how did it incorporate connectivity?
- Short answer – it didn't (except for clumping)
- Long answer, Marxan can create "connected" systems using the boundary lengths between planning units and thinking of them as a measure of connection
- BUT every marine organism shows different connectivity patterns so for what few species should I try to maximise connectivity, while ignoring the others?

Is connectivity an objective?

- I do not think connectivity is an objective in its own right. Short and long-term species viability plus the flow of ecosystem materials and services are valid objectives
- The objective is Adequacy - lets try to put the "A" back in CARE, it is not connectivity
- Not a trivial task and a point we could discuss for several days – and it is nearly beer o'clock

Issue 3 – I haven't got enough data

- Grow up and stop complaining – nobody has enough data!
- Even if you have no biological data at all, use remote sensed biophysical data:
  - Bathymetry classes (eg. 0-5m, 5-20m, ...)
  - Bottom type (mud, reef, sand, ...)
  - Current speed
  - Productivity (chlorophyll)
- Classify and conserve 5% of every combination for least cost. That is a good insurance policy. Talk to Hedley about surrogates.
- Have beer – maybe it will help

Lab papers on marine reserve design

- Tuck, G.N. and Possingham, H. P. 2000. Marine protected areas for spatially structured stock*.* ***Marine Ecology Progress Series* 192**:89-101*.*
- Possingham, H. P. Ball, I. R. and Andelman, S. 2000. Mathematical methods for identifying representative reserve networks. Pages 291-306 in ***Quantitative methods for conservation biology***. Ferson, S. and Burgman, M. (eds). Springer-Verlag, New York
- Hixon, M.A., Boersma, P.D., Hunter, M.L., Micheli, F., Norse, E., Possingham, H.P. and Snelgrove, P.V.R. 2001. Oceans at risk: **research priorities** in marine conservation biology. Chapter X in Orians, G. and Soule, M. Research priorities for conservation biology. Island Press, California.
- Leslie, H., Ruckelshaus, R., Ball, I. R., Andelman, S. and Possingham, H.P. 2003. Using **siting algorithms** in the design of marine reserve networks ***Ecological Applications* 13**:S185-S198.
- Allison, G.W., Gaines, S.D., Lubchenco, J. and Possingham, H.P. 2003. Ensuring persistence of marine reserves: **catastrophes** requiring adopting an insurance factor. ***Ecological Applications* 13**:S8-S24.
- Gerber, L.R., Botsford, L.W., Hastings, A., Possinghgam, H.P., Gaines, S.D., Palumbi, S.R. and Andelman, S. 2003. Population models for marine reserve design: a retrospective and prospective synthesis. ***Ecological Applications* 13**:S47-S64
- Stewart, R. R., T. Noyce, and H. P. Possingham. 2003. **Opportunity cost** of ad hoc marine reserve design decisions: an example from South Australia. ***Marine Ecology Progress Series* 253**:1-16.
- Stewart, R. R. and H. P. Possingham (2005) Efficiency, **costs and trade-offs** in marine reserve system design. ***Environmental Modeling and Assessment*** 10:203-213

More lab papers on marine reserve design

- Halpern, B. S., H. M. Regan, H. P. Possingham and M. A. McCarthy (2006) Accounting for **uncertainty** in marine reserve design. ***Ecology Letters*** 9:2-11
- Richardson, E. A., M. J. Kaiser, G. Edwards-Jones, and H. P. Possingham (2006) Sensitivity of marine-reserve design to the spatial resolution of **socioeconomic data**. ***Conservation Biology*** 20:1191-1201
- Bode, M., L. Bode, and P. R. Armsworth (2006) Larval dispersal reveals regional **sources and sinks** in the Great Barrier Reef. ***Marine Ecology Progress Series*** 308:17/25
- Banks, S. A., G. A. Skilleter and H. P. Possingham (2005) **Intertidal habitat** conservation: identifying conservation targets in the absence of detailed biological information. Aquatic Conservation: ***Marine and Freshwater Ecosystems*** 15:271-288
- Gerber, L. R., M. Beger, M. A. McCarthy and H. P. Possingham (2005) A theory for **optimal monitoring of marine reserves**. ***Ecology Letters*** 8:829-837
- Fernandes, L., J. Day, A. Lewis, S. Slegers, B. Kerrigan, D. Breen, D. Cameron, B. Jago, J. Hall, D. Lowe, J. Innes, J. Tanzer, V. Chadwick, L. Thompson, K. Gorman, M. Simmons, B. Barnett, K. Sampson, G. De'ath, B. Mapstone, H. Marsh, H. P. Possingham, I. Ball, T. Ward, K. Dobbs, J. Aumend, D. Slater and K. Stapleton (2005) Establishing Representative No-Take Areas in the **Great Barrier Reef**: Large-Scale Implementation of Theory on Marine Protected Areas. ***Conservation Biology*** 19:1733-1744
- Pandolfi, J. M., J. B. C. Jackson, N. Baron, R. H. Bradbury, H. M. Guzman, T. P. Hughes, C. V. Kappel, F. Micheli, J. C. Ogden, H. P. Possingham and E. Sala (2005) Are U.S. coral reefs on the **slippery slope to slime**? ***Science*** 307:1725-1726

Thank you