

Hon Colin Barnett  
Premier; Minister for State Development; Science  
1 Parliament Place  
WEST PERTH WA 6005

Cc: Hon Albert Jacob, Minister for the Environment

16/06/2014

**Re: Roebuck Bay Marine Park and Marine Sanctuary Zone**

Dear Premier,

We, the undersigned Australian scientists, welcome the State Government's decision to create a marine park at Roebuck Bay.

The protection of Roebuck Bay will be an important addition to the State's marine park estate. Roebuck Bay's red sandy beaches, mangroves and tidal creeks are of high conservation value<sup>(1)</sup>. Its relatively shallow, warm waters serve as a critical nursery, breeding and feeding ground for Australia's iconic and endemic snubfin dolphins, dugongs and several species of turtle; as well as economically, recreationally and culturally important species including blue and king threadfin salmon and mud crabs<sup>(1,2)</sup>. With a large tidal range, the Bay contains extensive mudflats that are internationally recognised for their productivity and diversity<sup>(1)</sup>. These mudflats not only support marine species which inhabit the bay, they also provide critical foraging habitat for as many as 150,000 migratory birds; for this reason Roebuck Bay was declared a Ramsar site in 1990<sup>(1,3,4)</sup>.

Imperative to delivering outcomes for this outstanding biodiversity is the inclusion of a significant area of highly protected no-take marine reserve within the marine park<sup>(5)</sup>. There is clear scientific evidence that no-take reserves are important for biodiversity conservation, generating greater biodiversity outcomes than partially protected general use zones where fishing remains permitted<sup>(6)</sup>.

There is now extensive evidence that the size, density and numbers of fish and a range of other species increase within marine sanctuaries<sup>(5-12)</sup>. Whilst these benefits would likely accrue across a range of species, there are also particular species within Roebuck Bay that could be expected to benefit. These include culturally and recreationally important species such as mud crabs and threadfin salmon<sup>(1,2)</sup>. Data on fish parasites and genetics have shown that threadfin salmon have relatively limited movements and it is therefore likely that numbers and size will accumulate within a marine sanctuary<sup>(13-17)</sup>. Adult mud crabs have also shown limited alongshore movement (< 2km), with further evidence of recovery of population numbers and size within existing marine sanctuaries in Northern Australia that could be replicated in Roebuck Bay<sup>(18-24)</sup>.

A marine sanctuary could also contribute to sustainable recreational and cultural fishing, with larger breeding fish within the sanctuary producing recruitment and spill-over into surrounding waters<sup>(6-8, 14-15, 25)</sup>. Marine sanctuaries have also been shown to provide fisheries benefits for mud crabs in Northern Australia<sup>(24)</sup>.

At < 200 individuals, the population of snubfin dolphins within Roebuck Bay is small by conservation standards, and vulnerable to anthropogenic threats and environmental change<sup>(26)</sup>. Furthermore, recent research suggests a degree of genetic isolation of Roebuck Bay snubfin dolphins, with very low levels of movement between Roebuck Bay and an adjacent population<sup>(27)</sup>.

Persistence of the Roebuck Bay snubfin dolphins depends on adequately protecting them within the Bay, therefore, the planning of a marine protected area should seek to minimise anthropogenic threats to this vulnerable population<sup>(26)</sup>. Entanglement in gillnets represents one of the greatest threats to small cetaceans, contributing to the decline of several species of inshore dolphins<sup>(28-30)</sup>, and represents a considerable threat to snubfin dolphins<sup>(29)</sup>. Research from the Banks Peninsula marine protected areas in NZ shows that MPAs can be used to effectively manage the risks posed by gillnets to small coastal dolphins<sup>(29)</sup>. In addition, studies within marine sanctuaries in coastal tropical environments have suggested an increase in population size of fish from families recorded to be a part of snubfin diets<sup>(32-34)</sup>.

Research has also indicated larval dispersal extends beyond sanctuary limits for these species<sup>(35-37)</sup>, meaning a sanctuary could contribute to the resilience of populations of small fish that make up the snubfin diet. Thus, a marine park with appropriate and permanent restrictions on fishing gear types and a marine sanctuary would increase the resilience of the Roebuck Bay snubfin population.

Marine sanctuaries with minimal human impacts are also an important tool for managers and researchers to understand changes over time<sup>(38,39)</sup>. There is a paucity of marine sanctuary zones within dynamic, tidally-driven systems, and the Roebuck Bay marine park represents a unique opportunity to study the effects and potential benefits of no-take management zones in such an environment. Highly protected sanctuary zones help us understand the ecological impacts of fishing and help us interpret long-term changes, such as those driven by ocean warming and coastal development<sup>(40,41)</sup>.

There are clear benefits provided by marine sanctuaries for the protection of biodiversity which are not produced by other marine park zonings. Increasingly, benefits are also being documented for fisheries in surrounding waters<sup>(42)</sup>. A well designed marine sanctuary of adequate size within the Roebuck Bay marine park, accompanied by a suitable monitoring program, can be expected to provide significant benefits to the protection of biodiversity, and also make a contribution to the preservation of species important to tourism, such as snubfin dolphins, and to recreational fishing in the long term.

Yours Sincerely,

UNDERSIGNED SCIENTISTS



**Associate Professor  
Lars Bejder**  
Research Leader,  
Murdoch University Cetacean  
Research Unit (MUCRU)



**Professor Jessica Meeuwig**  
Director,  
Centre for Marine Futures, UWA

**Professor Hugh Possingham**



**Professor David Booth**  
Professor of Marine Ecology  
President,  
Australian Coral Reef Society  
Course Director  
BSc (Marine Biology)  
Director, Centre for  
Environmental Sustainability



**Professor Bob Hickey**  
Department of Geography  
Central Washington University



**Dr Joshua N. Smith**  
Postdoctoral Research Fellow  
Murdoch University  
Cetacean Research Unit



**Dr Mike van Keulen**

Senior Lecturer in Plant  
Sciences and Marine Biology  
Director - Coral Bay Research  
Station, Murdoch University



**Dr Sora M. Estrella**

School of Natural Sciences  
Edith Cowan University



**Mr. Simon Allen**

BSc (Hons), MSc,  
(PhD candidate,  
Murdoch University)



**Mr. Alexander Brown**

BSc (Hons), MRes  
(Phd candidate,  
Murdoch University)



**Mandy Soymonoff**

Warden  
Broome Bird Observatory



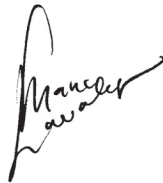
**Danny Rogers**

Chair of the scientific  
committee of the Australasian  
Wader Studies Group



**Gayan Gunaratne**

Researcher  
The University  
of Western Australia



**Marc Lavaleye**

Netherlands Institute  
for Sea Research



**Grant Pearson**

Associate  
Bennelongia Consultants

**Dr Deanne Bird**

**Chris Hassel**

**Dr Deb Thielle**



**Tanya Compton**

Royal Netherlands Institute  
for Sea Research



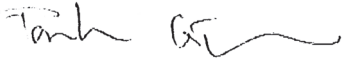
**Tegan Davies**

PhD Student  
University of Western Australia



**Alexandra Rouillard**


PhD Student  
University of Western Australia



**Pauline Grierson**  
Associate Professor  
University of Western Australia



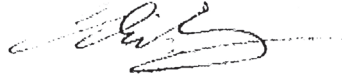
**Caroline Mather**  
PhD Student  
University of Western Australia



**Dr Alison O'Donnell**  
University of Western Australia




**Dr G Sigrzepek**  
University of Western Australia



**Professor  
Catherine Lovelock**  
University of Queensland



**Andre Siebers**  
PhD Student  
University of Western Australia



**Douglas Ford**  
PhD Student  
University of Western Australia

## References

1. RBWG. 2014. Roebuck Bay Working Group website. [www.roebuckbay.org.au](http://www.roebuckbay.org.au) accessed May 2014.
2. Pember, M. B., Newman, S. J., Hesp, S. A., Young, G. C., Skepper, C. L., Hall, N. G., & Potter, I. C. (2005). Biological parameters for managing the fisheries for blue and king threadfin salmons, estuary rockcod, Malabar grouper and mangrove jack in north-western Australia.
3. Tulp, I., & Degoeij, P. (1994). Evaluating wader habitats in Roebuck Bay (north-western Australia) as a springboard for northbound migration in waders, with a focus on Great Knots. *Emu*, 94(2), 78-95.
4. Netherlands Institute for Sea Research (1999). *Intertidal sediments and benthic animals of Roebuck Bay Western Australia: report of the Roebuck Bay intertidal benthic mapping programme, June 1997 (ROEBIM-97)*(3).
5. Lester, S. E., & Halpern, B. S. (2008). Biological responses in marine no-take reserves versus partially protected areas. *Marine Ecology Progress Series*, 367, 49-56.
6. Lester, S. E., Halpern, B. S., Grorud-Colvert, K., Lubchenco, J., Ruttenberg, B. I., Gaines, S. D., Airame, S. and Warner, R. R. (2009). Biological effects within no-take marine reserves: a global synthesis. *Marine Ecology Progress Series*, 384(2), 33-46.
7. Halpern, B. S., & Warner, R. R. (2002). Marine reserves have rapid and lasting effects. *Ecology letters*, 5(3), 361-366.
8. Roberts, C. (2012). Marine ecology: reserves do have a key role in fisheries. *Current Biology*, 22(11), R444-R446.
9. Green, A. L., Fernandes, L., Almany, G., Abesamis, R., McLeod, E., Aliño, P. M., ... & Pressey, R. L. (2014). Designing Marine Reserves for Fisheries Management, Biodiversity Conservation, and Climate Change Adaptation. *Coastal Management*, 42(2), 143-159.
10. Harrison, H. B., Williamson, D. H., Evans, R. D., Almany, G. R., Thorrold, S. R., Russ, G. R., ... & Jones, G. P. (2012). Larval export from marine reserves and the recruitment benefit for fish and fisheries. *Current Biology*, 22(11), 1023-1028.
11. Murray, S. N., Ambrose, R. F., Bohnsack, J. A., Botsford, L. W., Carr, M. H., Davis, G. E., ... & Yoklavich, M. M. (1999). No-take reserve networks: sustaining fishery populations and marine ecosystems. *Fisheries*, 24(11), 11-25.
12. Gaines, S. D., White, C., Carr, M. H., & Palumbi, S. R. (2010). Designing marine reserve networks for both conservation and fisheries management. *Proceedings of the National Academy of Sciences*, 107(43), 18286-18293.
13. Palumbi, S. R. (2003). Population genetics, demographic connectivity, and the design of marine reserves. *Ecological applications*, 13(sp1), 146-158.
14. Sumpton, W. D., Sawynok, B., & Carstens, N. (2004). Localised movement of snapper (*Pagrus auratus*, Sparidae) in a large subtropical marine embayment. *Marine and Freshwater Research*, 54(8), 923-930.
15. Kramer, D. L., & Chapman, M. R. (1999). Implications of fish home range size and relocation for marine reserve function. *Environmental biology of Fishes*, 55(1-2), 65-79.
16. Horne, J. B., Momigliano, P., Welch, D. J., Newman, S. J., & van Herwerden, L. (2011). Limited ecological population connectivity suggests low demands on self-recruitment in a tropical inshore marine fish (*Eleutheronema tetradactylum*: Polynemidae). *Molecular ecology*, 20(11), 2291-2306.
17. Moore, B. R., Stapley, J., Allsop, Q., Newman, S. J., Ballagh, A., Welch, D. J., & Lester, R. J. (2011). Stock structure of blue threadfin *Eleutheronema tetradactylum* across northern Australia, as indicated by parasites. *Journal of fish biology*, 78(3), 923-936.

18. Bonine, K. M., Bjorkstedt, E. P., Ewel, K. C., & Palik, M. (2008). Population Characteristics of the Mangrove Crab *Scylla serrata* (Decapoda: Portunidae) in Kosrae, Federated States of Micronesia: Effects of Harvest and Implications for Management 1. *Pacific Science*, 62(1), 1-19.
19. Ewel, K. C. (2008). Mangrove crab (*Scylla serrata*) populations may sometimes be best managed locally. *Journal of sea research*, 59(1), 114-120.
20. Le Vay, L., Ut, V. N., & Walton, M. (2007). Population ecology of the mud crab *Scylla paramamosain* (Estampador) in an estuarine mangrove system; a mark-recapture study. *Marine Biology*, 151(3), 1127-1135.
21. Dumas, P., Jimenez, H., Peignon, C., Wantiez, L., & Adjeroud, M. (2013). Small-scale habitat structure modulates the effects of no-take marine reserves for coral reef macroinvertebrates. *PLoS One*, 8(3)
22. Meynecke, J. O., & Richards, R. G. (2013). A full life cycle and spatially explicit individual-based model for the giant mud crab (*Scylla serrata*): a case study from a marine protected area. *ICES Journal of Marine Science: Journal du Conseil*, fst181.
23. Dumas, P., Léopold, M., Frotté, L., & Peignon, C. (2012). Mud crab ecology encourages sitespecific approaches to fishery management. *Journal of Sea Research*, 67(1), 1-9.
24. Pillans, S., Pillans, R. D., Johnstone, R. W., Kraft, P. G., Haywood, M. D. E., & Possingham, H. P. (2005). Effects of marine reserve protection on the mud crab *Scylla serrata* in a sex-biased fishery in subtropical Australia. *Marine Ecology Progress Series*, 295, 201-213.
25. Russ, G. R., Cheal, A. J., Dolman, A. M., Emslie, M. J., Evans, R. D., Miller, I., ... & Williamson, D. H. (2008). Rapid increase in fish numbers follows creation of world's largest marine reserve network. *Current Biology*, 18(12), R514-R515.
26. Brown, A.M., Bejder, L., Pollock, K.H. & Allen, S.J. (2014). Abundance of coastal dolphins in Roebuck Bay, Western Australia. Report to WWF-Australia. Murdoch University Cetacean Research Unit, Murdoch University, Western Australia, 25pp.
27. Brown, A.M., Kopps, A.M., Allen, S.J., Bejder, L., Littleford-Colquhoun, B., Parra, G.J., Cagnazzi, D., Thiele, D., Palmer, C. & Frère, C. (accepted). Population differentiation and hybridisation of Australian snubfin and Indo-Pacific humpback dolphins in north-western Australia. *PLoS ONE*.
28. Gormley, A. M., Slooten, E., Dawson, S., Barker, R. J., Rayment, W., du Fresne, S., & Bräger, S. (2012). First evidence that marine protected areas can work for marine mammals. *Journal of Applied Ecology*, 49(2), 474-480.
29. Dawson, S.M. & Slooten, E. (1993) Conservation of Hector's dolphins: the case and process which led to establishment of the Banks Peninsula Marine Mammal Sanctuary. *Aquatic Conservation: Marine and Freshwater Ecosystems* 3: 207–221.
30. Smith, B.D., Beasley, I. & Kreb, D., 2003. Marked declines in populations of Irrawaddy dolphins. *Oryx* 37: 401.
31. Reeves, R.R., Jefferson, T.A., Karczmarski, L., Laidre, K., O'Corry-Crowe, G., Rojas-Bracho, L., Secchi, E.R., Slooten, E., Smith, B.D., Wang, J.Y. & Zhou, K. 2008. *Orcaella heinsohni*. In: IUCN 2013. IUCN Red List of Threatened Species. Version 2013.2. www.iucnredlist.org. Downloaded on 19 May 2014.
32. Jennings, S. (2000). Patterns and prediction of population recovery in marine reserves. *Reviews in Fish Biology and Fisheries*, 10(2), 209-231.
33. Parra, G. J., & Jedensjö, M. (2009). Feeding habits of Australian Snubfin (*Orcaella heinsohni*) and Indo-Pacific humpback dolphins (*Sousa chinensis*). *Project Report to the Great Barrier Reef Marine Park Authority, Townsville and Reef & Rainforest Research Centre Limited, Cairns*.
34. Heinsohn, G.E. (1979). *Report to the Great Barrier Reef Marine Park Authority. Biology of small cetaceans in north Queensland waters*. Page(s) 23

35. Patrick, P., & Strydom, N. A. (2008). Composition, abundance, distribution and seasonality of larval fishes in the shallow nearshore of the proposed Greater Addo Marine Reserve, Algoa Bay, South Africa. *Estuarine, Coastal and Shelf Science*, 79(2), 251-262.
36. Mwaluma, J. M., Kaunda-Arara, B., Rasowo, J., Osore, M. K., & Øresland, V. (2011). Seasonality in fish larval assemblage structure within marine reef National Parks in coastal Kenya. *Environmental biology of fishes*, 90(4), 393-404.
37. Rutkowski, T., Schwingel, P. R., Brilha, R. T., & Rodrigues-Ribeiro, M. (2011). Ichthyoplankton of arvoredo biological marine reserve, Santa Catarina, Brazil. *Neotropical Ichthyology*, 9(4), 905- 915.
38. Koldewey, H. J., Curnick, D., Harding, S., Harrison, L. R., & Gollock, M. (2010). Potential benefits to fisheries and biodiversity of the Chagos Archipelago/British Indian Ocean Territory as a notake marine reserve. *Marine pollution bulletin*, 60(11), 1906-1915.
39. Hilborn, R., Stokes, K., Maguire, J. J., Smith, T., Botsford, L. W., Mangel, M., ... & Walters, C. (2004). When can marine reserves improve fisheries management?. *Ocean & Coastal Management*, 47(3), 197-205.
40. Bates, A. E., Barrett, N. S., Stuart-Smith, R. D., Holbrook, N. J., Thompson, P. A., & Edgar, G. J. (2013). Resilience and signatures of tropicalization in protected reef fish communities. *Nature Climate Change*.
41. Micheli, F., Saenz-Arroyo, A., Greenley, A., Vazquez, L., Montes, J. A. E., Rossetto, M., & De Leo, G. A. (2012). Evidence that marine reserves enhance resilience to climatic impacts. *PloS one*, 7(7), e40832.
42. Lauck, T., Clark, C. W., Mangel, M., & Munro, G. R. (1998). Implementing the precautionary principle in fisheries management through marine reserves. *Ecological applications*, 8(sp1), S72- S78.