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**A glaring omission in Australia's marine conservation planning**

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## A glaring omission in Australia's marine conservation planning

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3 The recent paper by Barr and Possingham [1] demonstrates that Australia's  
4 National Representative System of Marine Protected Areas (NRSMPA) is clearly  
5 not representative. The authors propose reasons for why the Australian  
6 Government has decided on a non-representative and non-quantitative approach  
7 to management plans for conserving Australia's marine biodiversity. The  
8 authors identify that the Christmas Island Province and the Cocos (Keeling)  
9 Islands Province have the least (<1%) protection of the 85 marine bioregions  
10 (Figure 6, [1]), but do not discuss why these provinces have been neglected by  
11 the Australian Government.  
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15 The two provinces are located in the tropical eastern Indian Ocean and  
16 collectively this area is referred to as the Sunda Province [2,3]. The reason why  
17 the Christmas and Cocos provinces have the least protection is because they  
18 have been omitted from the NRSMPA planning process (compare Figure 1 and 2  
19 in [1]). This begs the question as to why these two provinces are not part of the  
20 Australian Government's management plans for conserving marine biodiversity.  
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24 The marine bioregions and provinces identified in the NRSMPA planning process  
25 were determined from data on species richness and composition of shallow  
26 water fishes (0 to 200 m depth)[2,3]. The shallow water fish communities of  
27 Christmas and Cocos Islands are species rich compared to the rest of Australia  
28 (>800 species in total, [4-6], Hobbs et al. unpublished data) and have a globally  
29 unique composition because they lie on the Indo-Pacific biogeographic border  
30 [7]. This includes the greatest number of hybrid reef fishes in the world [8] and  
31 more than 50 fish species not found anywhere else in Australian waters [5,6].  
32 These islands have numerous endemic fishes [5,9], with Christmas Island ranked  
33 seventh in the world for the number of endemic coral reef fishes per area of  
34 habitat [10]. The Cocos Islands has some the world's highest densities of  
35 vulnerable fishes [11,12], while Christmas Island is one of only two Australian  
36 locations that have known whale shark aggregations [13]. Therefore, based on  
37 the metric (fishes) used to define marine bioregions, the Christmas and Cocos  
38 provinces should have been among the first protected by the NRSMPA.  
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44 Although the marine environment of the Christmas and Cocos provinces has  
45 received little research, it is still evident that its unique and rich marine  
46 biodiversity is not limited to fishes. For example, limited surveys have identified  
47 more than 600 mollusc species and over 200 crustacean species from shallow  
48 waters (<20 m) at the Cocos Islands [14, 15]. Christmas Island has an  
49 extraordinary unique community of crabs, with a high proportion of endemic  
50 species that are continually being discovered [16]. Furthermore, the island has  
51 the greatest diversity of land crabs in the world and these crabs are the keystone  
52 species of the terrestrial ecosystem [16]. This system is entirely reliant on the  
53 survival of land crab offspring during the marine larval phase. The anchialine  
54 fauna of Christmas Island is also of international significance [17]. Both  
55 Christmas and Cocos are internationally renowned as some of the most  
56 important seabird rookeries in the Indian Ocean, including several endemic  
57 species. The unusual characteristics and formation of the abyssal plain and  
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1 seamounts in the deep waters (>4000 m) surrounding the islands are not  
2 present in other bioregions, and are likely to support unique and diverse  
3 biological communities [18]. The Cocos Islands are considered Australia's only  
4 true coral atoll [19] and no other Australian island has the karst network of  
5 underwater caves that are present at Christmas Island. By any metric, the Cocos  
6 and Christmas provinces would be among the most unique marine bioregions in  
7 Australia and throughout the Indo-Pacific and their protection should be a  
8 NRSMPA priority.  
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11 Greater protection of the unique marine biodiversity of the Christmas and Cocos  
12 provinces is also warranted given the lack of existing protection (<1%) and the  
13 range of impacts that are threatening this biodiversity. Coral bleaching, disease  
14 and crown-of-thorns starfish have significantly affected corals reefs in the  
15 Christmas and Cocos provinces [20,21] and this habitat loss has resulted in the  
16 local extinction of at least one fish species [6]. At Christmas Island, more than 63  
17 marine species are at risk and listed under the Environmental Protection and  
18 Biodiversity Conservation (EPBC) Act [22] because they require additional  
19 protective management. Despite numerous listed species, there is no protection  
20 from impacts such as the 2012 grounding of the MV *Tycoon*, where a poor  
21 management response (due to a lack of planning, action and resources) resulted  
22 in hundreds of tonnes of oil, diesel and phosphate being spilt onto coral reefs for  
23 months. Furthermore, continued phosphate-rich sedimentation from local  
24 mining operations goes unregulated. At the Cocos Islands, there are limited  
25 fishing regulations and no active compliance and thus overfishing has pushed  
26 several species (including those listed by the IUCN as "Vulnerable") to the brink  
27 of local extinction (e.g. coral trout and giant clam: [11]). In addition, a history of  
28 mass die-off events has resulted in mortality to millions of marine organisms  
29 [23,24]. Furthermore, the isolation of Christmas and Cocos Islands reduces  
30 resilience because populations with limited connectivity will be slower to  
31 recover from impacts, compared to mainland bioregions [25].  
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38 An increasing threat to the marine biodiversity of the Cocos and Christmas  
39 provinces is the illegal arrival of foreign boats. In the last 4 years more than 500  
40 vessels carrying asylum seekers have entered Australian waters without  
41 permission with a large proportion arriving off Christmas Island and to a lesser  
42 extent the Cocos Islands. These vessels are brought in close to shore, are often  
43 tied up to moorings, and at least five have run aground on Christmas or Cocos.  
44 The unregulated entry of these decrepit vessels poses a high risk of introducing  
45 marine pests and diseases. Given that introduced species and diseases have  
46 devastated terrestrial biodiversity at Christmas Island, causing numerous  
47 extinctions [17], the lack of protection against these threats poses a significant  
48 risk to the region's unique marine biodiversity.  
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53 The multitude of governance arrangements in the Christmas and Cocos  
54 provinces may make it difficult to plan and implement marine reserve  
55 protection, however it increases the risk of biodiversity loss. Following an  
56 investigation into the extinction crisis occurring in the terrestrial environment at  
57 Christmas Island, a government-assigned expert working group identified that  
58 both the level and complexity of governance arrangements was a major  
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1 hindrance to management actions aimed at conserving biodiversity [17]. The  
2 expert group made a high priority recommendation that environmental  
3 governance be changed to a single authority. The Australian Government  
4 rejected this recommendation. Successful management of a marine protected  
5 area across multiple governmental jurisdictions is necessary to avoid  
6 biodiversity loss, and is possible, as exemplified by the Great Barrier Reef [1].  
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9 If protecting the unique marine biodiversity of the Christmas and Cocos  
10 provinces is not a priority then biodiversity loss will occur due to conflicting  
11 priorities. For example, the arrival of asylum seekers and their confinement at  
12 the Christmas Island Immigration Detention Centre is a very contentious issue  
13 that has received much media attention and featured heavily in recent federal  
14 elections. To build and operate the Detention Centre the Australian Government  
15 has circumvented the EPBC Act thereby avoiding its own legal environmental  
16 obligations that were established to protect biodiversity. This has had numerous  
17 negative impacts on the Island's biodiversity, including impacts to many  
18 vulnerable species that are protected under the EPBC Act [16,22]. Therefore,  
19 failing to include the Christmas and Cocos provinces in the NRSMPA places the  
20 region's unique biodiversity at risk from the government's other priorities.  
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25 The primary goal of the NRSMPA was to develop a "comprehensive, adequate  
26 and representative system of MPAs" that will protect Australia's marine  
27 biodiversity. However, the Christmas and Cocos provinces represent a glaring  
28 contradiction to this policy in that they are among the most unique and  
29 threatened marine bioregions in Australia, yet receive no protection from the  
30 NRSMPA. The lack of protection appears to be because of difficulties with  
31 existing governance arrangements and/or other political priorities. Both of these  
32 reasons have already caused population declines and extinctions in the  
33 terrestrial environment of this bioregion [17]. The exclusion of the Christmas  
34 and Cocos provinces from the NRSMPA represents a clear failure by the  
35 Australian Government to conserve marine biodiversity in this bioregion. The  
36 Australian Government must urgently reconsider the lack of protection within  
37 the Christmas and Cocos provinces otherwise marine biodiversity in this region  
38 may be irrevocably impacted. The evidence presented here concurs with Barr  
39 and Possingham [1] that the NRSMPA is not an example of a representative  
40 system, does not provide an adequate level of protection for the biodiversity in  
41 each marine bioregion, and will tarnish the Australian Government's  
42 international reputation as a world-leader in marine biodiversity protection.  
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