

**RESPONSE TO ACORF ON THE TORN BLUE FRINGE: MARINE
CONSERVATION IN NSW (WINN 2008)**

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To assess the science and logic underpinning the claims for more marine parks in NSW made in 'The Torn Blue Fringe' (Winn 2008).

To assess the relevance of the claims for more marine parks to the wise management of the fisheries of NSW.

To identify issues arising from Winn (2008) that may be of particular interest or concern to recreational fishers in NSW.

The assessment will give particular attention to the following eight points:

1. The prominent international agreements that impact Australia's approach to conservation and management of marine resources.
2. The prominent national agreements that impact New South Wales' commitments to marine parks.
3. What has the NSW Government actually already committed to?
4. The reported status of key fish species in NSW and how they will be impacted by marine parks.
5. The appropriateness of marine parks for managing species that may be overfished or threatened.
6. The impact of marine parks on the cost-effective exploitation and management of marine resources in NSW.
7. The real threats to marine resources in NSW and the adequacy and appropriateness of marine parks to address these threats.
8. The accuracy of the claims that marine parks represent the best insurance against climate change.

A report will be provided that addresses the above issues as they arise in the various Chapters of Winn 2008. The report will contain a concluding statement on the value of the arguments given for more marine parks in NSW and how they relate to each of the eight points above.

EXECUTIVE SUMMARY (AS PER THE CONTRACTUAL COMMITMENTS)

1. International, national and State commitments that should impact the wise management of the State's marine resource use and conservation (Objectives 1, 2 and 3 of this Review) have been used selectively or ignored in Winn's Report.
2. Specific commitments to the proper conservation of marine systems that have been ignored or misrepresented by Winn in the advocacy for more marine parks are detailed throughout this Review.
3. NSW is committed to the conservation of marine resources, including to the NRSMPA, but Winn's assertion that these commitments require, or even suggest that NSW needs more marine parks and greater restrictions on fishing within such parks, is in stark contrast to reality. The documents that describe the actual commitments by NSW to marine parks indicate that the activities that should be managed are those that have been identified to be threats, and area restriction should be assessed as the most cost-effective means of management of the threat before it is implemented.
4. Winn's overestimation and overstatement of the effects of fishing strongly suggest bias against fishing at the expense of balanced consideration of the conservation necessary for NSW marine systems (see discussion of Chapter 1.6). Imprecise, and biased, interpretations of the status of the exploited fish species in NSW in Winn's Report highlight, albeit inadvertently, data which actually show how extraordinarily resilient the fish species of NSW are to fishing.
5. More detailed analyses of the data Winn presents show that marine parks are extremely unlikely to be cost-effective tools for the management or conservation of the fish species in NSW (see particularly discussion of Chapter 1.6). Clear demonstration of the effectiveness of each and every existing park for providing protection against properly identified threats is necessary for existing parks and is essential before any consideration is given to advocacy for more parks.
6. A section of Winn's Report is entitled '*Economic Benefits of Sanctuary Zones*', but it provides no data or examples of the costs of establishing and managing sanctuary zones. Cost-benefit analyses that should form the fundamental blocks on which to base a true assessment of economic benefits, are completely absent. The numerous claims of inadequate management of fishing by NSW DPI, e.g. "*Fisheries management in NSW has largely failed*" (page 103), are contrary to the evidence provided.

7. Winn's Report typifies the unjustified bias against fishing by many marine park advocates and how this bias can diminish commitment to properly identifying and addressing the threats to biodiversity and ecosystems. By failing to identify specific impacts it even diminishes commitment to identifying and assessing any problems that might result from some forms of fishing. Threats to coastal biodiversity, other than fishing, such as pollution and introduced species, are initially acknowledged by Winn but their management is either ignored or marginalized in the Report. For example, Winn acknowledges that pollution has been the major contributor in the loss of half of the State's seagrasses, yet what he proposes is to have more fishing closures. It appears that a preoccupation with restricting fishing has over-ridden consideration of the real threats by Winn and by the NSW Marine Parks Authority. Winn's Report draws attention to the failure by the Government to meet its commitments to proper marine conservation, particularly in estuaries.
8. Winn's claim that marine parks in NSW will provide resilience against the negative effects of climate change is not supported by any credible evidence. In fact, based on the information given by Winn, it is difficult to imagine a management system that offers less protection against climate change than marine parks as they are managed in NSW. Furthermore, as the current parks are acknowledged by their managers (Marine Parks Authority 2008) to not address the key known threats, such as pollution in its many forms and introduced species, it is absolutely wishful (possibly the result of biased advocacy?) to assert that marine parks in NSW offer effective resilience against the major threats that may be exacerbated by climate change.

In conclusion, *The Torn Blue Fringe* (Winn 2008) is written from the perspective of an advocate for more marine parks and as such it misrepresents or selectively ignores much of the scientific and policy literature on the needs for marine conservation and marine parks in NSW. By so doing it actually draws attention to the failure by the NSW Marine Parks Authority to cost-effectively address the properly identified threats. The overestimation of the impacts of fishing and the associated advocacy for further restriction on fishing appears to have been used to create a distraction from identifying and managing the real threats to NSW marine ecosystems, fisheries resources and biodiversity.

PART 1

PREFACE

The first three lines of Winn (2008) reveal much about this document. It is a report written on behalf of the National Parks Association of NSW which claims to document the “*state of marine conservation in NSW, as well as critiquing the effectiveness of NSW commercial and recreational fisheries management*”. The Report is stated to be “*written from the perspective of a conservation advocacy organisation*”. What follows in the Report demonstrates advocacy for the marine parks industry, but apparently at the expense of balanced, well researched support for protection of NSW coastal waters against the properly identified threats.

The Preface continues with general statements that old approaches to fisheries management and marine conservation have failed and that new approaches in the form of marine sanctuaries are urgently needed to protect our oceans and estuaries. This type of unsubstantiated generalisation is the basis of a great deal of the misinformation that characterises the whole of Winn’s Report. No evidence is given that traditional fisheries management has in fact failed more often than it has succeeded. Nor is any evidence given of how marine parks as implemented in NSW represent a solution to any fisheries problem. The data given or referenced in this report, when considered in proper context, show that the assertion that failure of NSW fisheries management supports the case for more marine parks is, on several counts, completely wrong.

The serious misrepresentation of the status of NSW fish resources, the lack of identified threats posed by fishing, and the gross understatement of the threats to NSW coastal ecosystems from activities other than fishing, represent fundamental and damning flaws in the underlying advocacy for unjustified action against fishing, which forms the basis of the Report.

Basic flaws in concepts, or distortion of their applicability in the cause of advocacy for marine parks, are evident in virtually every paragraph of the Preface. Examples from each paragraph on the first page alone of the Preface of Winn (2008) include:

- It is not true that *“there is no consensus for a definition of successful fisheries management”*; Ecologically Sustainable Development (ESD) is the agreed consensus of Australian governments and their fisheries management agencies for successful fisheries management
- It has been decades since *“fisheries scientists . . . strive simply to maximise yield while ignoring biological interactions”*. The tremendous achievements of minimizing the impact of unwanted by-catch in prawn trawl fisheries, and the ongoing work of DPI fisheries scientists to ameliorate the continuing negative impacts of coastal development on fish nursery habitats, are but two outstanding examples in NSW
- The statement that *“with respect to the management of ecosystems, marine sanctuaries are the most conservative and precautionary approach”* is in most situations, simply untrue, while in many others it advocates inappropriate action. The mere declaration of an area as a ‘sanctuary’ does not in itself provide any conservation or precautionary benefit. It is the provision of true protection against properly identified threats that is of benefit to conservation. Marine sanctuaries as declared and managed in NSW do not represent adequate conservation of ecosystems against threats such as pollution, particularly when pollution originates from outside the sanctuary zone, as is usually the case. Furthermore, having the *“most conservative and precautionary approach”* is not in keeping with Australia’s mandated policy for natural resource management, ESD, where a balanced approach is required (Commonwealth of Australia 1992b). In any case, just establishing sanctuary zones, which constitute a fraction of the total system is not **the most** conservative and precautionary approach. Preventing the impacts of all human activity in the whole system, including its catchment, is the most conservative and precautionary approach.
- To state that *“any reduction in fished areas due to the establishment of marine protected areas must also be accompanied by a corresponding reduction in overall fishing effort”* demonstrates a most worrying disregard for, or perhaps ignorance of, the fundamental principles of resource conservation and allocation that must underpin ESD. By calling for a reduction in fishing effort, regardless of the impact this might have on subsequent levels of catch, and in the absence of properly identified problems with fishing, this indicates antagonism towards fishing, i.e. the act of people fishing, and not just identified ecological problems associated

with fishing. This negative predisposition to fishing appears to dominate the attitudes that pervade much of the document. One of the basic tenets of the benefits of area closures is that they will benefit the overall stock and biodiversity in general: Winn (2008) itself contains numerous statements claiming that fisheries will benefit from having sanctuary zones (e.g. on page 34). If sanctuaries do actually benefit stocks in total, and not just those inside the sanctuary, then total catches are supposed to go up, not down. Therefore, if the goal is the social one of conserving and sharing resources, as is the case for most management of recreational fisheries, and not the economic one of increasing catch per unit effort, a sustainable increase in effort should be one of the anticipated outcomes. It must also not be assumed that fisheries will benefit from having sanctuary, no-take zones: in Tasmania for example, it has been shown that this is demonstrably not the case (Buxton *et al.* 2004). Further, a reduction in fishing effort is not necessarily consistent with maintaining an optimal ecologically sustainable total catch, nor can it be assumed that fishing always reduces biodiversity. There is, in fact some evidence to show that well managed fisheries can result in greater biodiversity than when fishing is restricted or where there are poorly managed or over-exploited fisheries (Asch and Collie 2008), i.e that intermediate levels of disturbance increase diversity as predicted by the Intermediate Disturbance Hypothesis (Dial and Roughgarden 1998). There is no cost-effective gain for biodiversity, including that of the target species, from decreasing effort when excess effort is not the problem. To advocate reduction in fishing effort outside sanctuaries as well as stopping it completely inside sanctuaries appears nothing more than an illogical and unjustified claim to restrict fishing. This is clearly advocacy **against fishing**, not **for conservation**.

- The statements that “NPA supports a different framework for decision-making” than fisheries that “*produce maximum allowable fish catches*” is, unless it can be demonstrated that the Government has erred in setting maximum allowable catches at levels that are not ecologically sustainable, to advocate action that is contrary to the stated objective of ESD by the Australian and NSW Governments. In a country that already imports in excess of 70% of the fish we consume, in a State where inter-state ‘imports’ bring this figure to approximately 90% and at a time when the public are being told to eat more fish for health reasons, restriction

of catches to less than the maximum ecologically sustainable level should only be contemplated when it follows the provision of robust assessments that demonstrate that the optimum catch is less than the maximum sustainable. If the Government determined allowable catch is inconsistent with ESD, i.e. according to the best available science, not sustainable, then this should be clearly demonstrated then taken up with Government before support is given for alternative management strategies.

- It is true that *“some of the most vocal critics of marine sanctuaries come from fishers, who are fearful that their activities will be curtailed by marine sanctuaries”*. In NSW fishers should be critical. Sanctuaries in this State are acknowledged by the Government to be fishing closures which do not provide protection against other already identified threats to aquatic resources, such as pollution and introduced species (Marine Parks Authority 2008). Furthermore, Winn (2008) provides fishers with even greater incentive to be vocally opposed to more marine parks, as just two paragraphs before the above mentioned quote, is the completely unjustified call for not only more sanctuaries but also for *“a corresponding reduction in overall fishing effort”* outside sanctuaries.
- The next statement, that *“NPA believes that it is totally unprofessional for scientists to form an attachment to an industry to the point where they are prepared to become its advocate”*, is bewildering. There is nothing wrong with scientists, or anybody else, being advocates for a cause. What is wrong is when scientists ignore or abuse the basic principles of science, such as structured enquiry and accurate and precise recording of data and information, or by the referencing of information they know is not the most appropriate in the cause of their advocacy. If Winn believes it is wrong for scientists to be involved in advocacy then it must be assumed that, as it is stated to be from the perspective of an advocacy organisation, *“The Torn Blue Fringe”* (Winn 2008) is not scientific. Therefore, it should not be considered as contributing to the scientific debate on the conservation of biodiversity and the management of NSW fisheries. It must, by its own acknowledgement, be regarded as nothing more than unscientific advocacy on behalf of the NPA.

The second page of Winn’s Preface is dominated by generalisations in keeping with advocacy for reductions in fishing in areas that are proposed to be declared as

‘sanctuaries’. It is extremely important that no mention is made of the non-fishing threats to NSW coastal ecosystems, or of the costs of providing protection against such threats, or even the costs of excluding fishing.

The claim that there is “*polarity between marine resource exploitation advocates and marine conservation advocates*”(Winn 2008), is not substantiated. It clearly implies, incorrectly, that advocates of marine resource use are not advocates of conservation. The real emerging ‘*polarity*’ appears to be between those who advocate true protection of the States aquatic ecosystems against the properly identified threats and those who advocate that more fishing closures will miraculously represent appropriate and adequate conservation of the State’s marine ecosystems, regardless of what the threats might be.

CHAPTER 1. INTRODUCTION, BUILDING RESILIENCE

The Introduction to the whole of Part 1 of Winn (2008) begins by providing numerous, largely unsubstantiated, general statements on global losses of fish and biodiversity. Most of the key statements that are referenced cite Worm *et al.* 2006. Unfortunately Winn’s reference list does not include a paper by Worm *et al.* in 2006. However, the well known paper that appears to be the one being cited (Worm *et al.*, 2006, Science 314: 787-790) espouses completely improbable scenarios, including total collapse of all of the world’s fisheries by 2048. This paper has been discredited by leading fisheries scientists for grossly over-exaggerating the impacts of fishing (see for example Hilborn 2007).

Changes that can result if reef areas are truly protected, particularly ones that have been seriously physically damaged or overfished, are incorrectly projected in Winn (2008) to be applicable to all fishing closures. The example that is generalised by Winn for all sanctuaries (Halpern 2003), acknowledges that it actually is based on data only from reef areas. Estuaries, ocean beaches or sandy off-shore areas were not included in the analyses. Even more importantly, Halpern (2003) does not differentiate between areas that were closed as a result of overfishing or destructive practices in that specific area from those that were closed in areas of already well managed fisheries. These figures are therefore, not directly relevant to marine parks

in NSW. It is also interesting that Halpern is an author on the Worm *et al.* 2006 paper that has been shown to over-exaggerate the potential impacts of fishing.

Attributes of species-rich and species-poor communities are confused by Winn. For example, it is claimed that *“fisheries are collapsing at a higher rate in species poor ecosystems”* and NSW is considered by Winn to be particularly vulnerable. Yet Winn also states that the NSW coastal zone has *“rich fish and invertebrate faunas”*; Sydney Harbour alone is stated to have almost 600 species of finfish which, by comparison, is stated to be three times as many species of finfish as have been *“described from the marine waters surrounding the British Isles”*. If NSW has rich species diversity and Winn believes species poor ecosystems are the most vulnerable, how does Winn reach the conclusion that NSW is particularly vulnerable? In any case, as discussed in Section 1.1 *Global warming*, there is no general consensus that greater productivity (and indeed biodiversity) does in fact infer an increased level of resistance and stability (Ridder 2008).

It is simply a leap of faith for Winn (2008) to conclude that *“the lack of meaningful stock assessments undertaken for most fished populations”* supports the assumption that *“no-take marine sanctuaries are a logical necessity to provide a buffer against stock collapse and biodiversity decline”*. The data presented in Section 1.6 *Fishing*, of Winn’s Report actually show that the risk of stock collapse due to fishing in NSW is extremely minimal. Available knowledge actually shows that the best buffer against fishing practices that might cause a risk of stock collapse is management that is based on identification of precisely which fishing gear causes problems and in which area. Management can then be tailored to the requirements for each species or fishery. Non-specific closures to all types of fishing are not the solution to the identified threats to fish stocks or biodiversity and they have not been shown to represent effective or efficient fisheries management in NSW. They are certainly not a *‘logical necessity’*.

The concluding comment that the current marine parks in NSW *“account for only a fraction of what is required”* (Winn 2008) is made without a single piece of evidence of benefit from the areas that have already been closed to fishing, let alone evidence

that these areas are not already enough. Even more concerning is that there is no description of why more parks, that are in effect fishing closures, are required. Neither the real threats to fish and other biodiversity, nor proof of damage from fisheries to the sustainability of fish stocks or underlying ecosystems, have been properly identified. In fact the available evidence from estuaries at least, is that there is extremely little discernable impact from most forms of fishing in NSW waters. Without accurate identification of what current marine parks in NSW provide protection against, and in the absence of any assessed cost-effective benefits from these parks, it is not logical to conclude that more are required.

The basic concept that more marine parks are necessary to build resilience is refuted by even the data given in Winn (2008). NSW fish species are clearly extraordinarily resilient to fishing (see the discussion of Section 1.6 *Fishing*). Very few fish species have been overfished even though fishing effort operated for many years at levels more than twice those currently in existence. NSW estuaries are already extraordinarily resilient. This is demonstrated not only by the fact that none of the target fish species are overfished but also by the remarkable recovery our estuaries make to the devastating fish kills that occur far too frequently in many of them. Fishing is clearly not a threat to continued resilience. But there must be a limit to the ability of these estuaries and other inshore ecosystems to recover from the effects of continuous pollution, such as from heavy metals and pesticides, and from episodic devastation, for example from releases of deoxygenated and acidic water resulting from floodgates and weirs on feeder streams. Winn (2008) even reports, *“at least half of the State’s estuarine seagrass has been lost over recent decades. Most of the loss is due to eutrophication of estuarine waters . . . ”*. Pollution is clearly an enormous threat, as is the spread of introduced species and coastal developments (such as marinas, wharves, shipping terminals and airport runways etc.) as documented in NSW and Victoria (see discussion of Chapter 4.1.2). None of these well documented threats will be addressed by more fishing closures masqueraded as ‘marine protected areas’. Winn’s advocacy for ‘*building resilience*’ against fishing appears to have resulted in his losing sight of the need for proper conservation of our marine systems.

1.1 Global Warming

Winn's (2008) opening argument that marine systems in Australia have smaller levels of productivity and may therefore "*not be as resilient to stress and disturbance as more productive systems*", is unsubstantiated. There is no general consensus that greater productivity (and indeed biodiversity) does in fact infer some increased level of resistance and stability (Ridder 2008) and does so in all habitats or systems. Furthermore, potential effects of climate change on marine and estuarine systems are, to date, not well understood in Australia. Indeed, this is recognised in the publication (Hobday *et al.* 2006) continually cited by Winn in this section. There is not even consensus that climate change will bring "warming" to NSW and that the effects will all be bad. Moreover, it has not been, nor indeed can it be, proven that even well designed and managed marine parks will provide adequate resilience of all systems to climate change. Current concerns for the loss of the Great Barrier Reef to climate change, even though it is encompassed in Australia's biggest and most expensive marine park, is a case in point.

The statement that "*fishing stress has decreased the resilience of populations and communities to impacts such as climate changes . . .*" (Winn 2008), is similarly unsubstantiated, and as discussed for *Section 1.6 Fishing*, extremely unlikely to be able to be demonstrated, at least for estuaries in NSW. The extent to which fishing increases the vulnerability of systems to other stressors depends on what impact or stress the fishing in question may have or cause and for which species and habitats. This fundamental issue is, unhelpfully, not considered in Winn (2008).

Some habitats may be quite resilient to some fishing activities, such as trawling, while others are not. For example, Underwood (2007) could not detect any impacts on benthic biota of prawn trawling in the Clarence River, while other habitats, such as rocky reefs, may show multiple, major effects from fish trawling (Kearney 2008b). If resilience to climate change is to be provided by a system of marine parks (which is extremely doubtful in itself), then at the very least, the proposed system of marine parks needs to address the properly identified threats to the stability of biodiversity. If a system of marine parks is to ameliorate so-called 'fishing stress[ors]', then the boundaries and zoning of such parks must be based on sound identification of

which fishery poses a threat and where. If, as anticipated, climate change alters the distribution of assemblages (e.g. Soto 2001), then areas of fishing closures or gear restrictions that were in place before any shifts in distribution will probably need to be changed. The current system of marine parks and those proposed by Winn (2008), will not likely represent appropriate boundaries or management measures to accommodate changes to distributions that may result from climate change. In fact, it is possible that even the bioregions that underpin the outer boundaries of existing NSW marine parks will need to be reassessed if climate change does have significant impact on the distribution of marine assemblages.

Winn (2008) predominantly cites the work of Hobday *et al.* (2006) to support his statements that the Eastern Central domain is very vulnerable to climate change. Hobday *et al.* (2006) ranks Australia's marine domains based on several stressors (in five dimensions: biological, regional, climate change, fishing stress and other anthropogenic) that may render them 'vulnerable'. As Winn (2008) states, the biodiversity of the Eastern Central domain ranked 'most vulnerable' (i.e. total number of threatened, endangered and protected species and their uniqueness). The region was also ranked 'most vulnerable' to climate change (i.e. changes in sea surface temperature, subsurface temperature, etc.). The region was not, however, listed as very vulnerable to fishing, nor to other anthropogenic impacts. The logical conclusion from this component of Hobday *et al.* 2006, is that, contrary to Winn's assertions, marine parks, that are in effect fishing closures, will have very little benefit for protecting this area against the effects of climate change.

Another important, but overlooked, point here is that marine systems, unlike terrestrial systems, can move. This highlights the problems associated with applying principles and strategies for conservation (i.e. protected areas) developed for terrestrial systems to marine systems; ecological dynamics and the abiotic and biotic processes which control such dynamics are fundamentally different (Carr *et al.* 2003). Accepting generalised strategies without a proper understanding of the issues (i.e. identification of all threats and how marine parks might or might not protect against them) is wasteful, distracting and indeed negligent.

The concluding statement that “*there is growing consensus that marine sanctuaries are the best way of recovering marine ecosystems and building resilience to minimise some of the worst impacts of climate change*” is completely unsubstantiated. The statement is not supported by Hobday *et al.* (2006) nor Harley *et al.* (2006) as cited by Winn. The statement also, again, draws attention to the imprecise use of the term ‘sanctuaries’ and its implication that that declaring an area as a sanctuary provides protection against all potential and existing threats. This is a common problem exhibited by many advocates of marine parks in NSW. It is a particular problem in Winn (2008) and Marine Parks Authority (2008) because sanctuaries are not described to be any more than fishing closures, and as such, provide no deliberate protection against other threats, of which there are many and varied.

Chapter 1.2 International Recommendations and Commitments to Marine Protected Areas

Throughout this Chapter, Winn (2008) attempts to demonstrate that Australia is committed to establishing more marine parks than are currently proclaimed. Whilst selected ‘recommendations’ made by international agencies such as the IUCN, FAO, and UNEP are given, key obligations of Australia towards MPAs are not properly presented.

Australia’s over-arching international commitment to the conservation of marine biodiversity, through the Convention on Biological Diversity is to “*conserve **and sustainably use biological diversity***” (emphasis added) (IUCN 1993). Following this Convention, Australia committed, through the Environment Protection and Biodiversity Conservation (EPBC) ACT, to “*promote ecologically sustainable development through the **conservation and ecologically sustainable use of natural resources** [and] **protect ecosystems by means that include the establishment and management of reserves . . .***” (emphasis added) (EPBC 1999). The establishment of a National Representative System of Marine Protected Areas (NRSMPA; ANZECC TFMPA 1999a) is in response to the last objective of the EPBC Act (1999) quoted above. Australia’s Oceans Policy (1998) promises to “*ensure the establishment of a representative system of marine **protected areas***” (emphasis added) and to “*promote diverse, strong and sustainable marine industries [and] provide increased certainty and*

longterm security for all marine users". There are three points that need to be stressed. First, the commitment to the protection of marine biodiversity is paralleled by the commitment to sustainable use of marine resources. Winn (2008) has omitted proper acknowledgement of Australia's obligations to ecologically sustainable development which were collectively made by signing the Convention on Biological Diversity (IUCN 1993) and ratifying the National Strategy for Ecologically Sustainable Development (1992b) and the National Strategy for the Conservation of Australia's Biological Diversity (1996). Second, the representative system to which Australia is committed is of 'protected' areas. The key commitment here is that the areas actually be 'protected', explicitly against all properly identified and significant threats (IUCN 1993). Third, the system of marine reserves is explicitly only one of the measures to be used to conserve and sustainably use natural resources (EPBC 1999).

Australia is indeed committed to establish a system of 'representative' networks of marine protected areas (Environment Australia 1998). As stated in Winn (2008), the subsidiary body on scientific, technical and technological advice to the Convention on Biological Diversity recommended to "*provide effective protection for at least 10% of each habitat type globally [and] a longer-term target of including 20-30% of each habitat type in effectively managed marine and coastal protected areas*" (UNEP 2003). The two key issues here are the commitment to provide 'effective protection', which has been agreed to be explicitly against all significant threats (IUCN 1993), and that the commitment to provide protection does not necessitate closures to fishing (see also discussion of Section 2.2 *NSW Marine Protected Area Macro Gap Analysis* and Chapter 3. *Review of existing NSW Marine Protected Areas*).

1.3. Government Commitments, Agreements and Considerations

In this section Winn interprets the commitments made by the Government of New South Wales only in so far as they are consistent with advocacy for more marine parks. By signing the Intergovernmental Agreement on the Environment, the NSW Government agreed that "*a representative system of protected areas encompassing terrestrial, **freshwater**, estuarine and marine environments*" (emphasis added) is important for conservation (Commonwealth of Australia 1992a). It is obliged under this agreement to "*ensuring that measures adopted **should be cost-effective and not be***

disproportionate to the significance of the environmental problems” (emphasis added) (Commonwealth of Australia 1992a). There are several key commitments in the above statements that are completely overlooked by Winn (2008). First, the agreement that freshwater environments should be protected is not the subject of marine parks, but it is a matter of conservation importance that arguably should be given more urgency in NSW than even estuarine or marine environments. This is emphasized by the final statement quoted above, that the management measures taken should (not) be (dis)proportionate to the significance of the environmental problems. The freshwater ecosystems of NSW are in a dire situation. This is openly acknowledged by all Australian governments in relation to the Murray Darling system, but also highlighted by the grossly disproportionate number of species of freshwater fish in the numerous categories of threatened or endangered. Even though the number of species in our freshwater systems is many times less than that in our marine and estuarine environments, 75% of the 56 fish species in Australia that are classified from critically endangered to vulnerable are fresh water species (The Conservation Status of Australian Fishes; ASFB 2001¹). If the NSW Government adheres to its commitment to adopt measures in proportion to the significance of the problem, its first priority should be the protection of freshwater environments ahead of the declaration of marine parks. Second, the Government is obliged to ensure marine parks and other conservation measures, are cost-effective. The Government has far from met this obligation even for existing marine parks. No consideration should therefore be given to more parks until the cost-effectiveness of existing parks is demonstrated. Third, the commitment to ensure that management measures are proportionate to the environmental problems requires, at an absolute minimum, the identification of all significant environmental problems with estuarine and marine environments, i.e. proper identification of the significant impacts. This must be followed by cost-effective assessment of how each is being ameliorated by the system of marine parks or other conservation or resource allocation mechanisms.

Most of the relevant documents that cover the legislation and obligations by the NSW government are cited in Winn (2008). The discussion provided about these

¹ http://www.asfb.org.au/research/tscr/tf_constat2001.htm

documents, in so far as they relate to marine parks however, centres on Winn's advocacy for NSW to adopt 'IUCN Category 1a sanctuaries' for all NSW marine parks. Although, through the National Strategy for the Conservation of Biological Diversity the NSW Government is committed to establishing a "*comprehensive, adequate and representative [CAR] system of protected areas*" (Commonwealth of Australia 1996), no mention is made in this commitment that to fulfil the CAR system, marine protected areas must be IUCN Category 1a (Commonwealth of Australia 1996; see also ANZECC TFMPA 1996b).

The IUCN acknowledges a number of classifications for protected areas (Dudley 1994) which Australia has adopted. Australia's Ocean Policy states that "*the NRSMPA brings together biodiversity conservation and human activities, incorporating multiple-use and ecologically sustainable development principles*" (Environment Australia 1998). Under the Strategic Plan of Action for the NRSPMA it is acknowledged that "*each MPA: can be classified into one or more of the six IUCN protected area management categories . . . reflecting the values and objectives of the MPA*" and that "*the MPA may incorporate areas ranging from highly protected areas to sustainable multiple-use areas accommodating a wide spectrum of human activities*" (ANZECC TFMPA 1999a). Clearly, categorisation of protected areas should be based on properly identified and annotated objectives for the proposed or existing area, which logically should be based on understanding the threats to that system. Winn's advocacy for all NSW MPAs to be declared as IUCN Category 1a, is not matched by any NSW Government, national or international commitment to do so (see discussion of Section 2.2 *NSW Marine Protected Area Macro Gap Analysis* and Chapter 3. *Review of existing NSW Marine Protected Areas*).

1.4 Economic Benefits of Sanctuary Zones

This Chapter of Winn (2008) begins with general statements on the accepted importance of biodiversity and healthy ecosystems. Nobody seriously questions the importance of biodiversity and healthy ecosystems; it is how to protect them that is the issue. What follows in this Chapter of Winn's Report is a completely inadequately supported assertion that marine 'sanctuaries' are the most appropriate mechanism for conserving or protecting biodiversity and ecosystem function. The

arguments that are given to support this assertion are completely negated by the failure to acknowledge that appropriate protection requires proper identification of the significant threats and appropriate action against each threat. The assumption throughout that fishing is the real threat, and the only one for which management is actually needed, is simply wrong, and arguments based on it must lead to illogical conclusions. This fundamental flaw is exacerbated by repeated confusion and misrepresentation of terms such as ‘change’ and ‘benefit’, and the failure to provide true economic evaluation of asserted changes or benefits. For example, the changes in catch rates of fish species that may result from restricting fishing effort must not be confused with the benefits that may result when damaged resources are actually protected from the known causes of such damage. Nor should the benefit of recovery as a result of eliminating or reducing destructive fishing practices, be assumed to be similar to that which will result from closing an area of a well managed fishery to all fishing. The absence of evidence of significant negative impacts from fishing in the estuaries of NSW, together with the failure to identify the real threats to marine resources and the costs of addressing them, exposes the pretence that this chapter of Winn (2008) represents a true assessment of economic benefits of sanctuary zones, as the unjustified advocacy for marine parks that it clearly is.

This chapter provides the only consideration in Winn (2008) of the economic issues relating to the use of sanctuary zones, yet no data or examples are given of even the costs of establishing and managing sanctuary zones. Cost-benefit analyses, that should form the fundamental blocks on which to base a true assessment of economic benefits, are completely absent. It is noteworthy that Winn (2008) does not provide cost-benefit analyses to support the claim for more parks but neither does the NSW Marine Parks Authority. Failure to provide appropriate assessment of costs and benefits is in breach of this State’s commitment, under the Intergovernmental Agreement on the Environment that ratified international recommendations to establish a national system of marine parks, to ensure that *“there is a proper examination of matters which significantly affect the environment [and] measures adopted should be cost-effective and not be disproportionate to the significance of the environmental problems”* (Commonwealth of Australia 1992a).

Winn (2008) fails to demonstrate any economic benefit to date of sanctuary zones in NSW. This is damning in itself as fishing closures have been in place as sanctuaries or aquatic reserves in many areas for quite some time: in several areas of the Solitary Islands Marine Park they have been in place for 15 years. No evidence, or even sound prediction, is given to engender confidence that future cost-effective benefits are likely. Here it is important to note that the only benefits from marine parks or aquatic reserves that the NSW Marine Parks Authority could only identify in this State up to the time of proclamation of the latest marine park, the Batemans Marine Park (Marine Parks Authority undated), were increases in catch rates of mud crabs in one estuary and red morwong on reefs. Both examples have been shown to not be conservation benefits at all, let alone cost-effective economic benefits. They were merely expected outcomes of resource allocation (Kearney 2007).

True benefits can only be determined when true costs are included in the assessments. Winn (2008) does not even provide data on direct financial costs of declaring or managing the marine parks that are already in place, or of those that are proposed. It does not mention the costs to the many thousands of recreational fishers, particularly the elderly, the very young and the poor, who continue to be disadvantaged by having to cease, or relocate, their fishing effort as a result of the areas that are already closed in sanctuary zones in NSW. Many anglers have been denied access to areas that had been a significant part of their quality of life. The collective costs would likely be many millions of dollars, for no properly assessed benefit to them or anybody else. \$10.7 million compensation was given by the NSW Government to commercial fishers who were displaced from the Batemans Marine Park (Ministerial press release of 13/12/2006) but displaced recreational fishers, many of whom were seriously disadvantaged, got nothing! By not providing any data at all on costs, and not even mentioning the very significant costs to recreational fishers, this whole Section, 1.4 *Economic Benefits of Sanctuary Zones*, is again exposed as evading the data and information that should be provided in any rational debate on the benefits of present or future marine parks in NSW.

1.5 *Threatened Marine Species*

The information given in this section of Winn (2008) actually, apparently inadvertently, provides evidence that the system of marine parks in NSW is largely irrelevant to the management of the species considered threatened. Winn argues later in the paper that sanctuaries will play a key role in the recovery of grey nurse sharks, but no evidence is given to support such a supposition (see discussion of *Section 3.5 Grey nurse sharks*). As this species, and most of the others listed as threatened, is highly mobile and probably migratory, management measures, such as gear modification and changed fishing practices that address threats over the full range of their distributions are more likely to represent the appropriate management action.

It must also be noted that the assessments that were instrumental in listing the eastern population of this species as critically endangered have been questioned (NSW Administrative Appeals Tribunal N2006/1443, 2007; Lincoln-Smith 2007) and more recent research suggests population levels are actually considerably higher than originally estimated (Bansemer and Bennett 2008b). It has also been suggested that the area of distribution of this species, particularly as juveniles, is probably much greater than that assumed in earlier assessments (Lincoln-Smith 2007). It appears that the management measures that have been put in place across the whole range of distribution of the eastern population of the grey nurse shark, such as a complete prohibition of targeting since 1984, education of the public about the potential vulnerability of grey nurse sharks, and gear modifications that are continuing, are appropriate and likely adequate for recovery. Even if area management of fishing is required for the conservation of grey nurse sharks in NSW it should be targeted at only those gear-types that represent an identified threat to the species (see discussion of *Section 3.5 Grey nurse sharks*).

It may be that area management will prove necessary for the conservation of threatened species that are sedentary and/or have limited spatial dispersal of propagules (i.e. eggs or larvae). If so specific areas and appropriate management would need to be identified on a species-by-species basis. Such areas may also need to be changed with time as existing threats are ameliorated or new threats are

detected. Even if fishing is implicated as a threat to a sedentary species it must not be assumed that restriction of fishing is the only management measure necessary to provide protection. If a threatened species is to be managed to recovery then all significant threats need to be precisely identified and management tailored to address all of them.

The three threatening processes listed in Winn (2008) on page 36 need to be addressed at their source and not by a series of fishing closures whose areas are determined by criteria not related to either the distribution of the species needing protection or the area over which the threat is a factor. In any case marine parks are clearly not the relevant management tool for addressing two of the three identified threats, *"introduction of non-indigenous fish and marine vegetation"* and the *"shark meshing program in NSW waters"*.

It is important to properly identify if any threatened species are actually significantly impacted by angling. No evidence is given to confirm this is the case, although an impact on grey nurse sharks is obviously assumed by Winn (2008) and one appears to exist. It is the extent of that threat and how best to ameliorate it that is in question. A primary purpose of the listing of species as endangered or threatened is so the conservation of each such species can be given specific consideration. If there are instances where angling is truly a threat then these need to be clearly identified, and if possible, quantified. Only then can appropriate management measures be identified for each and every species and for the specific management of whatever form(s) of angling is responsible for that particular threat.

In the absence of specific descriptions of threats to individual species it is folly to assume that a system of marine parks which does not address the known threats to species and ecosystems, and the boundaries for which are based on the current region-wide distribution of biodiversity and not the threats to it, will be effective in the management of threatened species.

1.6 Fishing

This section begins by acknowledging that deteriorating water quality is a serious threat to estuaries. It then makes the seminal, but unsubstantiated, claim that *“collection and fishing practices pose possibly the most serious threats to the health of most marine ecosystems”*. This statement is in itself extremely surprising considering Winn’s statements on page 90 that more than 50% of the seagrasses in NSW have been lost due to pollution. It is then followed by the statement, *“indeed overfishing is considered by some to be the most significant adverse anthropogenic impact today on marine ecosystems”* which is attributed to Pauly *et al.* (2002). The paper referenced as Pauly *et al.* (2002) does not make such a claim. It certainly does not provide even the suggestion that this is true in a situation such as that in NSW. The paper does however, expose the limitations of marine parks for addressing fisheries issues in places like NSW where most of the species are highly migratory, by stating, *“although migrating species would not benefit from the local reduction in fishing mortality caused by an MPA, the MPA would still help some of these species by rebuilding the complexity of their habitat destroyed by trawling, and thus decrease mortality of their juveniles”* (emphasis added) (Pauly *et al.* 2002). Thus, based on the conclusions of the paper Winn has selected to support his case, Pauly *et al.* (2002), MPAs will not benefit most of the species fished in NSW. Furthermore, addressing the harmful effects of trawling where they occur is, in the opinion of the authors of the report Winn cites, of more direct benefit for migratory species, which dominate in NSW, than that which would result from having MPAs.

The claim by Winn (2008), that NSW estuaries are generally in good condition and not particularly vulnerable to degradation from pollution, is made in apparent disregard of the many known negative impacts of pollution. For example, the frequent and devastating fish kills in the State’s northern rivers and dioxins and heavy metals in several estuaries, particularly Sydney Harbour and Botany Bay and Winn’s reported (page 90) loss of more than 50% of seagrasses, most of which is due to eutrophication. It is extremely difficult to explain why anybody claiming to be an advocate for conservation of NSW estuaries would attempt to downplay the importance of the continuing devastation of our estuaries by the obvious threats,

such as pollution in its many forms. It appears that Winn's advocacy for more marine parks that restrict fishing overrides any concern for proper conservation!

The second paragraph claims that *"many fish stocks in NSW have, over the last 50-100 years, been significantly 'fished down'"*. 'Fishing down' is then defined as occurring *"when a stock has been driven to a state of low recruitment, and therefore low production . . ."*. These statements are remarkably incorrect for two fundamental reasons. First, the term 'fishing down' has accepted use in fisheries management as a description of the reduction in the exploited stock that occurs when an underexploited stock is harvested. All stocks that are fished at all are 'fished down' to at least some extent. In well managed fisheries stocks are usually deliberately 'fished down' to the level which sustains the maximum, or optimum, long-term sustainable yield without negatively impacting recruitment (it is argued that density dependent factors result in the productivity of fish populations being higher at levels below the unfished population size: see for example Beverton and Holt 1957). Virtually every well managed fish population is in a state of having been 'fished down' but not *"to a state of low recruitment, and therefore low production"*. Second, even the data presented in the Winn (2008) show that there are remarkably few species (in fact none of the species taken primarily in the Estuary General Fishery shown in Figure 4 on page 43) in NSW managed fisheries listed as overfished in any way, let alone *"driven to a state of low recruitment and therefore low production"*. In fact the only species fished primarily in fisheries managed by NSW that has been reported to be 'fished down' to a level where low recruitment has even been suggested, are mullet and eastern sea garfish. Even for these species there are doubts about the cause of the reduction in the populations and whether recruitment has actually been impaired. The likely causes of the decline in these, and the other 'overfished' species, are discussed below.

What follows in this Section of Winn (2008) is several paragraphs which describe over-capacity in NSW commercial fisheries. There has indeed been excess capacity and active effort, and it continues to be above optimum. Importantly, it was much worse until the last decade. Active commercial fishing effort in NSW decreased considerably in the period from 1984 to 1997 and has halved again in the last decade (DPI Fisheries Statistics in press). In spite of the decades of excessive fishing

pressure however, there are extremely few fish species that have actually been overfished in NSW managed fisheries. This provides a compelling testimony to the natural resilience of these species to fishing. Even the seriously excessive fishing effort of previous decades caused no overfishing of estuarine species to the point of *“low recruitment and therefore low productivity”*. This is the more remarkable when the damage from pollution and other negative impacts of human development to breeding and nursery areas for these species is noted; see for example the statement on page 90 of Winn (2008): *“at least half of the State’s estuarine seagrass has been lost over recent decades. Most of the loss is due to eutrophication of estuarine waters . . . ”*.

Winn (2008) then includes a series of general statements about the lack of information on the impact of the Estuary General Fishery on estuarine ecosystems, mostly referenced to a 2001 DPI Environmental Impact Statement. This is somewhat surprising considering that the data on species targeted in the Estuary General Fishery given in Winn (2008) show that not one of the primary species in this fishery is even growth overfished (note that eastern king prawns and school prawns are taken by minor gear types, such as set pocket nets and scissor nets in the Estuary General Fishery). Furthermore, the most recent assessment of the impacts on benthic biota of trawling in an estuary in NSW showed that no impact could be detected (Underwood 2007). Although prawn trawling is not part of the Estuary General Fishery, trawling in all its forms has been the fishing practice most demonized by marine parks advocates in NSW (see discussion in Kearney 2008a). Thus it would appear that the statement, *“the overall impact of the Estuary General Fishery on the environment is largely unknown”* (referenced to DPI 2001) is an outdated interpretation which gives an incorrectly negative impression of the real impact of this fishery. In 2009 the impact of this fishery plus the considerable angling effort in these same estuaries is comparatively well documented to be minimal.

Reference to the Ocean Fish Trawl Fishery draws attention to the plight of gemfish and other secondary species taken in this fishery. There is no doubt gemfish have been seriously overfished off NSW, but before marine parks in NSW are considered to be even a possible solution several points need to be taken into account.

- The NSW Ocean Fish Trawl Fishery operates in different areas to those of the Commonwealth managed trawl fishery which was responsible for the great bulk of the catch of gemfish and other species that are assessed as overfished.
- Both the State and Commonwealth fish trawl fisheries have been inadequately managed, to the extent that fish trawling in south eastern Australia is under consideration as a key threatening process.

There is little doubt both these fisheries require far more stringent management to facilitate the recovery of gemfish and other species and much greater reduction of ancillary damage to benthic habitats. This management will be most effective, however, if it is specific to the problems that have been caused by fish trawling on hard bottoms over the full area of distribution of this trawling, not just in areas that might be included in marine parks. This one fishery requires urgent management to cost-effectively deal with the well known problems which it causes. Not only are the problems well known, so to is the solution: considerable additional restriction of fish trawling, at least over hard bottoms. Declaration of marine parks, parts of which restrict all forms of fishing in areas that have been chosen for reasons other than amelioration of impacts on gemfish and other trawled species or habitats, will not solve the problem of fish trawling for gemfish or other overfished species, let alone represent the most effective and efficient way of doing so. Marine parks are therefore, a blunt and inappropriate instrument for the management of this fishery and the species taken in it. To suggest that marine parks represent a solution to the problems with these species actually distracts attention from the urgency of specific fisheries management for them.

The reason for Winn's (2008) reference to the rock lobster fishery being fully fished is unclear: it is most appropriate that this resource is fully utilized (the species is classified as 'fully fished'), particularly noting its social significance to the seafood consuming public of NSW. It is the accepted goal of fisheries management to have species 'fully fished', but not overfished. The claim that silver trevally is a bycatch of this fishery is equally puzzling.

One of the sections of Winn (2008) that is most note-worthy for anglers begins on page 42 with the listing of the nine species targeted by commercial fishers that are assessed as overfished. This listing is taken from official DPI assessments, which are the appropriate ones to use as the baseline for consideration of the status of exploited fish species in NSW. Comment on just what the 'overfished' classification means for current and future fisheries management is however, necessary. The comments below are based largely on interpretations of the most recent data and assessments as published by NSW DPI (Scandol *et al.* 2008) and discussions with relevant fisheries researchers in NSW DPI.

The first two of the nine species are prawns; school prawns and eastern king prawns, that are taken in both estuary and ocean fisheries. The current management strategy is to allow juveniles of both species to be harvested by both commercial and recreational fishers in estuaries where they can be very selectively accessed by anglers with simple and inexpensive gear. Catching the species as juveniles often results in a catch composition that includes smaller individuals than would result in the maximum yield-per-recruit. In this case, however, allowing the catch of juveniles is a deliberate management strategy that produces the optimum amenity for the people of NSW, while still not threatening subsequent recruitment, and therefore the wellbeing of the species. Therefore, the classification as growth overfished is little more than public acknowledgement by DPI that a management decision has been made to optimise the social return to the people of NSW from the harvesting of these species, rather than pursuing the maximum possible weight of total catch. These two prawn species are well managed, at least to the extent that there is no apparent danger from over-exploitation. However, the continuing and even increasing negative impacts of destruction of juvenile habitats in many estuaries in NSW, such as the reported loss of more than 50% of seagrasses referenced by Winn (2008) on page 90, and the ongoing influence of pollution in many other forms, must take a toll on populations of these species. This will, in the absence of appropriate and adequate management, eventually have noticeable negative impact on catches and catch rates. If the real causes are not acknowledged the species will, as a result, almost certainly be described by the ill-informed as 'overfished'.

These two prawn species are very good examples of why the listing of a species as 'growth overfished' is normally an indication of an economic management issue (resource allocation) rather than a conservation problem.

Sea garfish catches have declined rather dramatically since the early 1990s to levels more in keeping with those up to about 1980 (Scandol *et al.* 2008). The catch data are consistent with an assertion that overfishing has occurred, and it may well have. The relevant data are certainly indicative of a decline in relative abundance, at least in so far as this can be confirmed by commercial catch and effort data. The available data are insufficient however, to definitely attribute this decline to fishing. The possibility, that the drop in relative abundance is due to disease such as that which reduced pilchard populations in the same area by 70% at about the same time, cannot be ruled out. Nor can the possibility that a drop in abundance or change in the distribution of this species was associated with the pronounced recovery over the same time period, from long-term, low levels, of the stocks of one of the major coastal predator species, Australian salmon. It is also not possible to discount negative impact on the distribution and possibly subsequent abundance, of this species from human water-born activities other than fishing. This species lives in the surface few centimetres of inshore waters and is easily dispersed by most forms of aquatic craft such as surf-boards, power boats, jet skis and wind-surfers. With the development of surfing in northern NSW and southern Queensland since the 1950s, sea garfish progressively ceased to inhabit several of the historically most important commercial fishing sites in these areas, and probably throughout many other areas of NSW near-shore waters. What impact this displacement may have had on the abundance of this species is unknown.

Scandol *et al.* (2008) reported that appropriate size composition data on garfish have only been collected since about 2000, and the last couple of years have seen good recruitment, but the majority of fish have not persisted in the fishery beyond the first year. It is also reported by Scandol *et al.* (2008) that a recent increase in the allowable mesh size in this fishery has been beneficial. Future appropriate management is likely to be related to gear modifications and seasonal restrictions, but the possibility that selected spawning sites may need protection from all human activity, including

but not restricted to fishing, should not be ruled out. As the species is currently only fished over a fraction of its total distribution, if the reported declines are indeed due to fishing then this implies it is at least highly mobile and possibly migratory (if it were not it is most unlikely it could be overfished by fishing in only the areas of the current commercial fishery which covers a relatively small part of its area of distribution). It is extremely unlikely the permanent closure of parts of its distribution, such as is represented by the NSW system of marine parks, would represent effective management for the conservation of this species, particularly if closing areas to fishing does not represent protection of key areas, such as spawning grounds, from all major threats.

Silver trevally is listed as 'growth overfished' with the bulk of catches and most probably, unreported incidental kill, coming from fish-trawl fisheries. Catches have been relatively stable in recent years and there is no indication of problems with recruitment (Scandol *et al.* 2008). There is little doubt that the appropriate management for the recovery of this species would be in the form of effort controls on fish trawling over the whole distribution of the species, coupled with appropriate bag and size limits for recreational fishers. Area closures, particularly ones not based on the specific distribution of this species, are most unlikely to represent the most appropriate management.

Yellowtail kingfish is a highly migratory, largely pelagic species that is particularly vulnerable to surface traps. It appears to have been overharvested in the early 1990s, apparently predominantly by trapping, resulting in declining catches up to the late 1990s. Catches have tended to be variable, but marginally higher since the banning of trapping in 1996. There is no indication of recruitment problems and there is even a suggestion of an increase in the number of medium sized fish in recent years (Scandol *et al.* 2008). Anglers have reported particularly good catches in 2008/09 in central NSW (Steffe, A. NSW DPI Fisheries, pers. com. Jan. 2009). Area closures are seldom appropriate or adequate management for highly migratory species and it appears extremely unlikely closures, such as marine parks in NSW, that are not designed specifically for this species would represent either adequate or efficient management.

NSW DPI considers mullet to be significantly growth overfished with concerns about possible recruitment overfishing (Scandol *et al.* 2008). There is no doubt that commercial landings have declined in recent years but it is difficult to distinguish the impact of the greatly increased recreational catch on the decline in the commercial fishery. It is also not possible to eliminate disease and kills or impairment of juveniles from pollution, or habitat destruction, as causes of the apparent decline. The species appears to be in need of additional research and management. If further fishing restrictions are necessary, because of the highly mobile nature of the species and the wide distribution and great variety of habitats used by its different life stages, these will have the greatest chance of being effective if based on catch reductions and size limits across its whole distribution. Perhaps area and seasonal management in locations and times that are specifically selected for the different life-history stages of this species and the gears which impact those stages will prove appropriate. If the declines are not due to fishing appropriate management plans will need to be initiated based on the specific identified problems. In either case, marine parks that are not based on addressing identified threats and are not designed to deal specifically with this species will not be adequate to facilitate recovery in this species. They will certainly not represent the most effective or efficient management response.

Snapper is considered to be 'growth overfished' in NSW and catches have declined considerably since about 1980. The species is highly mobile at several stages of its life cycle and spawns over wide areas. It is likely that spawning success in Queensland is a significant contributor to subsequent recruitment in NSW. Additional management across the full distribution of the species appears necessary and appropriate to avoid threats to recruitment and to reduce growth overfishing.

Gemfish and redfish are two species that have been seriously overfished in fish-trawl fisheries. As discussed above, stricter management of fish-trawling across the full distribution of the species and habitats negatively impacted by this fishery is urgently required. Because of the migratory nature of gemfish in particular, non-specific closures to fishing of only parts of their distribution will not constitute an

efficient solution to the problem. Furthermore, because the species is only taken in numbers by targeted fishing with specifically designed or deployed gear, a general ban on all forms of fishing, in the form of areas closures to all fishing in marine parks, will not represent effective or efficient management.

The graphical presentation by category of fishery (Winn 2008, pages 42-44) actually confirms that overfishing that threatens the conservation of species (recruitment overfishing) is only a serious issue in the fish trawl fishery (the fish component of the 'Ocean Trawl Fishery') and possibly for mullet and eastern sea garfish. There are several species that are trawled and also taken in other fisheries and are thus represented more than once in the graphs presented by Winn (2008), for example gemfish and silver trevally. The status of these and the other species listed as overfished in any way, is discussed above. It is important to note however, that not a single primary species in the Estuary General Fishery is listed as overfished (note earlier comments on the minor catches of eastern king prawns and school prawns in this fishery and comments on their 'overfished' status). In fact for this fishery the majority of species are classified as only moderately fished (Winn 2008, Figure 4 page 43). In a State with such a shortage of fish for human consumption and a commitment to Ecologically Sustainable Development (e.g. Commonwealth of Australia 1992b), this represents a case for more commercial estuarine fishing. It certainly counters calls for additional non-specific restrictions on all forms of fishing, such as are included in proposals for more marine parks.

The discussion on the supposed severe impacts of trawling on pages 44 and 45 (Winn 2008) provides a classic example of how less than complete information, or incorrect interpretation of available information, can be used to misrepresent the impacts of fishing and the management action that is necessary to manage fisheries. It is claimed that *"little assessment on the effects of bottom trawling on benthic ecosystems has been undertaken in NSW"* (Winn 2008). This statement overlooks a benchmark study by one of Australia's leading quantitative marine scientists, Professor Tony Underwood. In 2007, he reported a study done to identify potential effects of trawling on estuarine ecosystems in the NSW estuary which has approximately half of the total NSW estuarine trawling effort, the Clarence River (Underwood 2007).

Underwood concluded that even after exhaustive efforts the analyses failed to find any impacts at all on benthic biota due to trawling. That is, trawling in the Clarence River of NSW has no detectable impact on the biodiversity that would be expected to bear the brunt of its impact. Presumably unaware of this relevant study, Winn (2008) refers instead to two studies on the effects on trawling in tropical shelf areas in north eastern Australia. These two studies are then cited to suggest that, *“in some areas the standard demersal trawl reduced benthos . . . density by 15.5%. . . on each tow”* and *“the amount of the least resilient benthic fauna removed each year in trawl grounds is likely to be more than 80%”*. The use of information from tropical northern Australia as opposed to that specifically relevant to NSW indicates the problem of using largely irrelevant and misleading information that occurs throughout much of Winn (2008). When the data on fish trawling in oceanic areas of northern Australia are actually compared to that of Underwood (2007) from prawn trawling in estuaries in NSW, the danger of using inappropriate or irrelevant information is immediately apparent. It is also apparent that it is extremely unwise to generalise the impacts of even relatively similar fishing gear used in different systems. The management of fishing must be considered specifically for each gear type and independently for each type of area in which it is used.

It is also noteworthy that Winn (2008) acknowledges that NSW DPI will initiate management such that *“75% of all State waters located south of Barrenjoey Point will be closed to all trawling”* and that these areas will be mapped in consultation with industry. Surely the fishery specific closure of 75% of waters to trawling is far more effective management for this gear-type than would likely result from the non-specific closure of areas under the NSW system of MPAs that is not designed to manage trawl fishing?

The first real consideration of recreational fishing in Winn (2008) is given on page 45. The numbers of anglers and a significant total catch are used to conclude, *“this indicates a strong contribution to pressures on resources from recreational fishers”*. This is followed by the unsubstantiated claim that output controls (bag and size limits) on recreational fishers are difficult to monitor and enforce and therefore, marine sanctuaries provide one of the few available means of managing the problem. In the

absence of data on the cost and effectiveness of using size and bag limits that are specific for each species, compared to the costs of using MPAs that are non-specific bans on all types of fishing, such a statement should not be accepted. It must also be noted that there are very few, if any, species in NSW for which angling represents a real threat to their sustainability. Furthermore, the ancillary effects of angling on associated biodiversity and ecosystems are minimal; Winn (2008) has not described any. Mulloway is the only species for which recruitment overfishing is identified in the data provided in Winn (2008) as even likely and for which angling is the dominant harvest method. All cases of overfishing identified in Winn (2008) would be much more efficiently addressed on a species by species, or even gear type by area, basis than by general area closures, such as in so called 'sanctuary zones' that have been declared without first identifying problems and assessing possible solutions.

The discussions that follow in Winn (2008) on changes in size composition and growth rates in fished populations fail to differentiate between changes that inevitably occur in fished populations, including those that are extremely well managed to produce maximum or optimum sustainable yields, and those that may occur in seriously depleted populations. The assessments of NSW fish species discussed above are confirmation that NSW has very few problems with populations that have been seriously depleted by fishing. Furthermore, it is not logical to progress from the examples given by Winn (2008) to the unsubstantiated conclusion that marine parks, as implemented in NSW, represent an appropriate solution to any fisheries management problem. In fact, when the real problems are aligned with the most effective solutions it is immediately apparent that the NSW system of marine parks is not appropriate for the conservation of the fish species exploited in NSW and will likely make little, if any, worthwhile contribution to the wise management of their exploitation.

Perhaps the best example of this lack of relationship between the management of fishing in NSW and the conclusion that more MPAs are essential is given on page 47 (Winn 2008): "*nevertheless, without adequate assessments and appropriate catch limits, some NSW fisheries resources are exposed to collapse through overfishing. In such a situation, the*

public interest would dictate a precautionary approach". Many resources anywhere in the world could be exposed to collapse to some extent if there are not adequate assessments of identified threats and appropriate catch limits. Even the data given in Winn (2008) show that NSW has very few problems with overfishing and resource collapses. Where a serious risk might be identified, a precautionary approach is indeed required. Such an approach should be based on appropriate assessments, including risk-weighted, cost benefit analyses of the various options for addressing the properly identified problem. Subsequent selection of the management option that best addresses the specific issue would then be possible. In NSW the appropriate analyses will invariably identify specific gear restrictions and/or catch or effort limits, not area closures that have been predetermined based on factors not directly related to the problem that needs addressing. There is absolutely nothing precautionary about banning all fishing when the real threat is not fishing in any form. In fact, advocating marine parks as a generalised solution diminishes the pressure to properly identify the real threats and then implement appropriate and adequate management.

CHAPTER 2. METHODOLOGY

In this chapter Winn describes the *"methods and criteria used by NPA for the selection of marine protected areas . . . to critique the existing marine protected area system and show the overall progress toward a comprehensive, adequate and representative system"*. Whilst loosely describing what methods were used, such as the 'Integrated Marine and Coastal Regionalisation of Australia (IMCRA)' and 'Macro Gap Analysis', there is little specific description of how and why candidate sites were chosen or why the methods that were used are appropriate. It is most noteworthy that the methods chosen by Winn (2008) **selectively** support advocacy for more marine parks. They are not aligned with holistic consideration of the nationally and internationally accepted guidelines for the establishment and management of marine parks, such as the need to identify adverse impacts on biodiversity for the area of each park. NSW commitments under these guidelines have been outlined in the discussion of Sections 1.2 *International Recommendations and Commitments to Marine Protected Areas*, 1.3 *Government Commitments, Agreements and Considerations* and their implications are

again reviewed in discussion of Chapter 3 *Review of existing NSW Marine Protected Areas*.

Chapter 2.1 *Integrated Marine and Coastal Regionalisation of Australia (IMCRA)*

A description of the bioregions of NSW is given (page 49), and the dominance of these regions by areas under Commonwealth jurisdiction is noted, yet Winn (2008) does not provide meaningful discussion of how the responsibilities for conservation of representative areas in each has been divided between Commonwealth and State jurisdictions. Presumably, as the Commonwealth controls the majority of the area it accepts the bulk of the responsibility for conservation in these regions, including meeting Australia's international commitments, but this is not discussed by Winn.

Winn's statement that "*marine protected areas within all bioregions are a prerequisite for protection of biodiversity*" referenced to Roberts *et al.* (2003), is typical misrepresentation of the importance of marine protected areas for the protection of biodiversity. Until potential threats in each proposed area are properly identified and alternative conservation and management strategies assessed accordingly, it is impossible to determine what the prerequisites for effective protection of each area will be, but they will most likely not be the same for each. There will certainly be many areas where fishing closures masqueraded as marine protected areas will not provide meaningful conservation of biodiversity, let alone be a prerequisite.

2.2 *NSW Marine Protected Area Macro Gap Analysis*

This section aims to describe a "*reserve gap analysis to prioritise poorly-protected bioregions and to evaluate the comprehensiveness and representativeness of the existing marine protected area system in conserving adequate samples of each marine ecosystem...*". There is, however, little detailed methodology of such 'analysis', nor is it clear what 'macro gap analysis', as applied here, does, or what it will achieve. It appears this is not an analysis *per se*, but a review of the area of current MPAs in NSW and their status within the IUCN Category framework in an attempt to support a claim that the current system of protected areas is inadequate. Underpinning this so-called analysis is the incorrect assumption that there is a singular and direct relationship between the size of a protected area/sanctuary and its adequacy to maintain

ecological functions and processes. Whilst the size of a proposed area may be important, there are many other factors which contribute to the adequacy of a marine protected area, e.g. shape, populations dynamics of species (dispersal patterns, spawning sites, migratory ranges), heterogeneity of the system, the nature of the threats, the nature and management of adjacent or surrounding areas and the level of compliance with management directions, which can have potential impacts for the area itself. Winn's call for bigger parks is also made without any cost-benefit analysis at all, let alone one which adequately considers the relationship between cost, effectiveness and size. Such analyses are a requirement for all of Australia's marine parks (see discussion of "*Chapter 3 Review of Existing NSW Marine Protected Areas*").

There are indeed commitments to assess the "*contribution of marine protected areas to the conservation of biological diversity*" (Environment Australia 1998). This can only be appropriately done however, if it is based on proper identification of the threats and proper assessment of the alternatives for protecting against these threats. These absolutely fundamental issues are completely overlooked in Winn (2008).

As discussed in comments on Chapter 1.2 *International Recommendations and Commitments to Marine Protected Areas*, Winn (2008) has set criteria of a minimum of "20% to 30% of each habitat and ecosystem in marine sanctuaries by 2020 and a minimum 10% by 2011". This, he states, is based on recommendations made by the Subsidiary Body on Scientific, Technical and Technological Advice to the Convention on Biological Diversity (UNEP 2003). That report does not, however, state that any target must be wholly, or indeed even partly, Category 1a. The key issue is that "*effective protection*" be provided (UNEP 2003). Winn (2008) unjustifiably considers effective protection as IUCN Category 1a, regardless of what the threats to the area are and whether or not they are being addressed as a result of the classification the area is given. UNEP (2003) states that "*effective protection in this context refers to **either: (i) representative areas where extractive uses are excluded and other human pressures minimized; or (ii) areas where threats are managed for the purposes of biodiversity conservation and/or sustainable use***" (emphasis added). Therefore, the UNEP recommendation could be completely met by having 20% or more of the areas

managed for sustainable use, including sustainable fishing in all its forms. There is no mandated requirement to exclude fishing from anywhere. Furthermore, the more than 30% (as reported in Winn 2008) of NSW waters already proclaimed as marine parks, coupled with the fact that NSW fisheries are demonstrably managed for 'sustainable use', more than meets this State's requirement for areas proclaimed as MPAs.

The IUCN does recommend that "*at least a proportion of protected areas should be in the more strictly protected categories i.e. I–IV*" (Dudley 1994). No particular proportion for any of the categories is prescribed. Moreover, no specific restriction on fishing is mandated within any category of the IUCN nor part of the UNEP recommendations (Dudley 1994).

UNEP defines Category 1a to be areas which "*are strictly protected areas set aside to protect biodiversity and also possibly ecological/geomorphological features, where human visitation, use and impacts are strictly controlled and limited to ensure protection of the conservation values*", which does not imply closures to fishing unless it has been properly identified to be a significant negative impact. The NSW Government has committed to fulfil obligations to be part of the NRSMPA and as such MPAs can be "*classified into one or more of the six IUCN Protected Area Management Categories*" (ANZECC TFMPA 1998). Once again management of activities (and levels of protection) are required to be based on identifying and understanding threats to each habitat and the assemblages within it, rather than the unjustified advocacy for more fishing closures.

Winn (2008) states further that the rationale for his target of 20% comes from fisheries modelling that determines the need to maintain stocks at or above 20% of their unfished biomass. Some fisheries models have been used to suggest that the spawning biomass of species should not be allowed to go below 20% of virgin; others have suggested figures closer to 40%. The Australian Fisheries Management Authority normally sets a target of not less than 40% and a limit of not lower than 20% for the wise management of the species under its jurisdiction. The translation by Winn (2008) of conserving 20% of the biomass into closing 20% of the area to fishing,

however, is illogical. It contradicts the basic principles of fisheries assessments and totally disregards the biological attributes of the fish species in NSW which this proposal purports to manage. As Winn (2008) has applied his target across the board, it is, as discussed below, irrational.

The great majority of the fish species exploited in NSW are highly migratory, or at least highly mobile. For those that are migratory virtually 100% of the population could be harvested outside the 20% of the area of the distribution of the species that might be closed in an MPA. Therefore the closure of 20% might offer no protection at all. For mobile species that are not migratory, a 20% area closure might prevent the capture of some of the species, but it may not be enough to represent adequate conservation of the species.

A separate critical factor to note here is, that even in the unlikely event that closing 20% of the distribution of one species did represent conservation of sufficient spawning biomass to ensure sustainability of the population at optimum levels, the area that would need to be closed would most likely not be the same for any two species. Approximately 90 species are listed in the summary of key species in the Status of Fisheries Resources in NSW (Scandol *et al.* 2008). It is impossible that closing the same 20% of NSW waters to all fishing would represent efficient and effective management for all of these species. To suggest it would represent wise management of these resources in keeping with Australia's commitment to ESD is to completely misrepresent reality.

If area management is to be continued to be used as a tool in the management of NSW fisheries resources it needs to be tailored precisely for each species and for each problem faced by that species. Indeed, determination of how much of the spawning biomass of each species to protect to adequately, comprehensively and representatively conserve biodiversity of even the target species is much more complex and difficult than merely closing part of the area of distribution to fishing. As such it must be based on scientific rigour, not the advocacy process described by Winn (2008).

As stated in Winn (2008), there is indeed a lack of data and insufficient information about the systems/habitats/assemblages that are in need of immediate conservation (i.e. those that are more vulnerable). Winn's statement that *"a great deal more mapping and data collection must be undertaken to determine fine scale gaps in the marine protected area system. Data collection . . . must become the focus of responsible government agencies before a comprehensive, adequate, representative and effective marine reserve system can be completed"*, is, inadvertently, demonstrating that, in the absence of that information, this is certainly not the time to declare more parks! It must also be noted that the declaration of fishing closures disrupts valuable time series of catch and effort data within and adjacent to areas that are closed.

2.3 Methods and Criteria

This section purports to describe the 'methods and criteria' used to identify candidate areas for inclusion in the representative system of MPAs in NSW. Winn (2008) lists the CAR principles which are the basis for this system as part of the NRSMPA (ANZECC TFMPA 1999a, 1999b) and states that the guidelines for the NRSMPA were used as a basis for his recommendations. Unfortunately, these criteria as outlined in the Guidelines for establishing the National Representative System of Marine Protected Areas (ANZECC TFMPA 1998) are equally vague. Winn (2008) describes additional criteria, such as 'spatial data of biodiversity surrogates', 'rarity', 'vulnerability' and 'functional connectivity'. These terms can be used ambiguously but moreover are not easily quantified. Winn (2008) has not defined these terms nor described how they were quantified to select candidate areas, which is typical of the imprecision and lack of necessary rigour in his approach.

It is of concern that Winn (2008) has not included any description of how the suitability and success of the potential MPAs can be measured. This may be a result of the ineffectual description of how they were chosen, but, as it is asserted, it implies that advocacy for more parks does not require assessment of whether or not they achieve objectives. In contrast, the Strategic Plan of Action for the NRSMPA (ANZECC TFMPA 1999a) asserts that development of *"performance indicators, which are quantitative or qualitative measures"* is a critical part of the process for the declaration and management of the NRSMPA. This vital component of meeting the

commitment to assessing cost-effectiveness of MPAs (Commonwealth of Australia 1992a) has been completely neglected by Winn (2008).

It is incredibly important that relevant data are gathered in appropriate ways to determine whether a protected area is effectively achieving its aims. In order to rigorously do so, clearly defined goals about what the reserve is for, i.e. what risks and threats are being removed or reduced for which species, habitats or assemblages, must be translated into defined hypotheses and explicit predictions. Appropriate sampling and experimental designs must be formulated which include quantitative targets or appropriate reference areas (for example those described to measure impacts in Underwood 1991, 1992). Given the expertise required for such data collection, the lack of any attempt by Winn (2008) to provide serious consideration of how the efficacy of his proposed system will be examined is concerning (see also discussion of what is required in Underwood and Chapman 2002).

CHAPTER 3. REVIEW OF EXISTING NSW MARINE PROTECTED AREAS

This Chapter of Winn (2008) aims to review the types of zoning, and inferred protection, currently given to marine, estuarine and intertidal areas in NSW and to describe the current proportion/area in each category (e.g. Aquatic Reserves, Marine Parks, Intertidal Protected Areas). This so-called 'review' is corrupted by a number of unjustified or incorrect, assumptions, including that there should be 20% - 30% of all waters in IUCN Category 1a protected areas (see discussion of Section 2.2 *NSW Marine Protected Area Macro Gap Analysis*). Other incorrect assumptions include that a direct relationship exists between the size of a protected area and its efficacy. As stated in discussion of *Section 2.2 NSW Marine Protected Area Macro Gap Analysis*, and elsewhere in this Report, it is illogical to assess the adequacy of the existing situation based solely on the size or proportion of areas and to disregard rigorous identification of the threats in proposed areas, knowledge of the ways in which assemblages respond to those threats, and how MPAs plan to remediate them.

An underlying criticism by Winn (2008), of the current system of MPAs in NSW throughout this Chapter, is that the system is inadequate because it does not adhere to a target of between 20% and 30% of each habitat and ecosystems being included

within IUCN Category 1a protected areas. The main statement that *“to achieve the target of 20% of all waters in Category 1a sanctuaries, a further 130,000 ha of habitats and ecosystems are required to be established as marine sanctuaries within the NSW marine jurisdiction”* is Winn’s individual wishful advocacy rather than a target which has international or national relevance. Nor is it the result of a substantively argued case (see also discussion of *Sections 1.2 International Recommendations and Commitments to Marine Protected Areas, 1.3 Government Commitments, Agreements and Considerations* and *2.2 NSW Marine Protected Area Macro Gap Analysis*). As such, the content of this Chapter seems largely irrelevant.

In addition, the key document referenced by Winn in support of his target for MPAs in NSW, IUCN 2003 Rec. 22, is not listed in his References. This is one of the many missing references in Winn (2008) that may be critical but was not able to be checked because it was not correctly referenced by Winn. Importantly, Winn states that the recommendations in the missing document were *“subsequently adapted by a technical advisory body to the Convention on Biological Diversity in 2003”*. The major report by this body published by UNEP sets the primary target to *“provide effective protection for at least 10% of each habitat type globally [and] a longer-term target of including 20-30% of each habitat type in effectively managed marine and coastal protected areas”* (UNEP 2003). So clearly, whatever recommendation was made in the missing document was either not as Winn (2008) reported it, or it was adapted by UNEP to the commitment quoted above. Either way it negates Winn’s claim that this percentage of protected areas has to be IUCN Category 1a.

The extreme bias exhibited by Winn (2008) in claiming that NSW is, or even should be, committed to more marine parks with 20-30% Category 1a Sanctuary Zones, is exposed by consideration of what this State’s commitments to *“ensure the establishment of a representative system of marine protected areas”* (Environment Australia 1998) actually are and what steps should be taken to meet them. Just some of those commitments and acknowledged desirable actions are listed below:

1. *“identify processes and categories of activities which have or are likely to have significant adverse impact”* (Article 7 Convention on Biological Diversity, IUCN 1993)

2. *"identify processes that threaten all levels of biodiversity and implement plans to address these processes"* (EPBCA, Commonwealth of Australia 1999)
3. *"ensuring that there is a proper examination of matters which significantly affect the environment"*(Intergovernmental Agreement on the Environment, Commonwealth of Australia 1992a)
4. *"not be disproportionate to the significance of the environmental problems"*
(Intergovernmental Agreement on the Environment, Commonwealth of Australia 1992a)
5. *"the economic, environmental, social and cultural values of ocean resources should be assessed, as should the impacts of proposed uses on those values, before resource allocation decisions are made"*(Australia's Oceans Policy, Environment Australia 1998)
6. *"the kinds of activities that are allowed in a marine protected area depend on the reasons for protecting that area"*(acknowledged on²)
7. *"promote diverse, strong and sustainable marine industries; provide increased certainty and long-term security for all marine users"* (Australia's Oceans Policy, Environment Australia 1998)
8. *"internationally competitive and ecologically sustainable marine industries are essential"*
(Australia's Oceans Policy, Environment Australia 1998)
9. *"improved assessment of the impacts of commercial and recreational activities"*
(Australia's Oceans Policy, Environment Australia 1998)
10. *"any proposed measures must be examined to identify economic and social impacts"*
(Intergovernmental Agreement on the Environment, Commonwealth of Australia 1992a)
11. *"ensuring that measures adopted should be cost-effective"* (Intergovernmental Agreement on the Environment, Commonwealth of Australia 1992a)
12. *"there may be no environmental reason for excluding activities that extract natural resources such as fish or minerals from some types of marine protected area"*
(acknowledged on ³)
13. *"effective protection in this context refers to either: (i) representative areas where extractive uses are excluded and other human pressures minimized; or (ii) areas where*

2 <http://www.environment.gov.au/coasts/mpa/about/index.html>

3 Ibid

threats are managed for the purposes of biodiversity conservation and/or sustainable use"
UNEP (2003).

This is not an exhaustive coverage of NSW commitments under any of its agreements to the establishment of marine parks. Such an assessment would likely require a legal opinion. What is intended here, is to identify those commitments which have obviously been overlooked, or ignored, by Winn (2008).

Not only have these commitments and acknowledgements not been adequately recognised by Winn (2008) , they have not been met by the NSW Marine Parks Authority in the proclamation and declaration of existing marine parks. This failure provides a telling, and damning, commentary on how many of the State's commitments to identifying the threats and implementing management proportional to those threats, that are prerequisites for the establishment and/or ongoing management of existing marine parks, have not been met.

In relation to this State's commitments it must also be noted that almost 35% of NSW waters are currently in established Marine Parks (Winn 2008, page 55). This exceeds the IUCN target of *"effective protection for at least 10% of each habitat type . . . as a step towards a longer-term target of including 20-30% of each habitat type"* (also discussed in Section 2.2 NSW Marine Protected Area Macro Gap Analysis; UNEP 2003). It is also imperative for recreational and commercial fishers to note items 12 and 13 above. It is not a requirement that fishing be excluded from any area of a marine park in order to provide the necessary level of protection. Indeed sound implementation of the other 11 commitments mentioned above would exclude only those activities which were clearly and properly identified as major threats and for which there was an assessed, cost-effective benefit from their exclusion. Here, it is relevant to note that in an assessment of the proposal for new marine parks in Tasmania, it was established that there was no benefit nor need to restrict fishing to still ensure the conservation values of the proposed network (Buxton *et al.* 2006).

Winn (2008) has not attempted cost-benefit analysis of his proposed target, nor of the existing parks. So stating that *"progress toward a system of [CAR] MPAs in NSW has*

proved to be costly” is somewhat incongruous. How the system proposed in Winn (2008) will achieve a more cost-effective outcome is not explained. In an appropriate cost-benefit analysis, it would be expected to first properly identify impacts and putative changes from such impacts and then to quantify how a proposed system of MPAs will ameliorate such changes and at what cost. In the absence of such detail in Winn (2008), it is difficult to give any credence at all to assertions of cost benefits of the proposed system.

The lack of understanding of the costs of relocating fishing effort portrayed in the statement *“a tender for buyouts would prove more appropriate and of much lower cost”* is consistent with the inaccuracies in much of Winn (2008). A tender for buyout can be a useful mechanism for removing part of the commercial fishing effort, and it normally identifies the less efficient and therefore has disproportionately less impact on reducing effective effort. Furthermore, it is seldom a cost-effective mechanism for the removal of all fishing effort, such as was mandated for the trawl fishery in the Batemans Marine Park. Once all participants know that all effort must be bought out and that the Government is the buyer, tendered prices become higher than those determined by mechanisms based on reliable estimates of catch history. The costs of removing those who do not wish to go and refuse to tender, or who submit unrealistic tenders, can then become exorbitant. It is also noteworthy that reliable estimates of catch history enable evaluation of the income of the fishers that are to be displaced and thus provide a mechanism for more fair and equitable compensation. Moreover, Winn’s (2008) approach of removing fishing effort, without having first properly identified the threats and assessing the costs and benefits of ameliorating each, is not only contrary to commitments for sound management, outlined above, but is again selective advocacy against fishing.

Indeed, *“adequate funding must be made available to undertake appropriate scientific evaluation of established marine sanctuaries”* (Winn 2008). But it must not be assumed that this will *“provide Marine Park users with the evidence of the great benefits derived from sanctuaries”* as claimed by Winn. The design of research to assess the effectiveness of marine parks in NSW must be the objective and attempts to design ‘research’ to supposedly justify preconceived ideas, such as that there are great benefits, must not

be tolerated. Detecting real ecological impacts is a complex process and requires a good deal of careful design and scientific rigour (see discussion to Section 2.2 NSW Marine Protected Area Macro Gap Analysis; Underwood 1991, 1992, Underwood and Chapman 2002). Furthermore, the data so far provided by the NSW Marine Parks Authority on the supposed benefits that have been achieved from marine parks in NSW clearly show that the few changes that have been able to be identified were not benefits at all (Kearney 2007)

3.5 Grey Nurse Shark Critical Habitat

Discussion of issues relating to threatened species in general, and including some specific issues relating to grey nurse sharks, has already been provided in *Section 1.5, Threatened Marine Species*. Section 3.5 raises additional issues in relation to the use of MPAs to manage grey nurse sharks. Accordingly, further discussion is provided below.

The conservation of grey nurse sharks in NSW warrants particular consideration because the species is classified as 'critically endangered'. Any species so classified should be the subject of considered scientific research and opinion, especially precise, and preferably validated, monitoring of changes in population size and structure. In the case of grey nurse sharks there is little doubt that the species was seriously impacted over many years by fishing in many forms, including targeting by anglers and spear fishers. In recent years the plight of the species has been recognised and directed management, including education of those most likely to come in contact with the species, has changed public attitudes and subsequently, the level of mortality inflicted on the species. There is no doubt some interaction with fishing still occurs but the actual level of this interaction and its impact on shark populations is not known precisely.

The problem of assessing whether the eastern population is continuing to decline, has stabilised or is increasing is hampered by the lack of reliable estimates of population size, particularly for the years prior to recent restrictive management. Even the estimate of population size off NSW that was pivotal to the classification of this species as critically endangered, has been seriously questioned. The original

population estimate and the disproportionate weight given to a tagging study with less than 30 individuals, have been justifiably questioned (see for example NSW Administrative Appeals Tribunal N2006/1443, 2007; Lincoln-Smith 2007). More recent published research provides a census (a count of sharks identified as different individuals) of a minimum of 927 individual sharks (approximately double earlier estimates) at a total of 24 sites in NSW (Bansemer and Bennett 2008a). This same study detected that 145 of these sharks had visible retained fishing tackle, or a jaw wound presumably resulting from fishing tackle.

This most recent population estimate must not be interpreted as proof of a recovery in the eastern population of grey nurse sharks. It is comforting to know, however, that the population size is at least considerably greater than had been reported earlier. There is other preliminary information to suggest optimism: such as the suggestion that juvenile sharks are now being found in more areas outside aggregation sites and that their numbers appear to be on the increase in recent years (Lincoln Smith, M. Cardno Ecology Lab, pers. com. Jan. 2009). Again however, the importance of ongoing precise monitoring of population characteristics and thorough assessment of appropriate, alternative management measures are stressed.

There is no doubt line-fishing represents a threat to some degree to the species: repeated observation of up to 16% of sharks at numerous sites with hooks or hook damage (Bansemer and Bennett 2008a) is proof of an interaction. The importance of this interaction should not be underestimated. It must be noted, however, that the severity of the threat to the total population is difficult to quantify. While hooks in the mouth are unlikely to normally represent life threatening injuries it is not precisely known what the impact of hooks that have been swallowed might be. There is little doubt that swallowed hooks could represent a greater stress to individual sharks, but how numerous swallowed hooks are and what threat they do actually represent to the overall well-being of individual sharks, and subsequently to the wellbeing of the species, is unknown. Therefore, evaluation of the real impact of hook and line fishing on the status of grey nurse sharks, and the correct management of this impact, appears critical to the management of this species and the threats to it. Reliable assessment of this impact, in combination with that of other threats, will

most likely be obtained from precise repeated assessments of changes to population size and structure. Structured repetition of the identification of individual sharks, such as carried out by (Bansemer and Bennett 2008b), appears a good approach. The management of a recovery in the numbers of grey nurse sharks is of particular importance to all anglers as this is a rare report of a dominant negative impact of hook and line fishing on an individual species in NSW.

Grey nurse sharks are highly mobile and perhaps even truly migratory. Their seasonal distribution varies considerably in many locations; individuals are considered to travel considerable distances and the distribution of juveniles is not the same as that of adults. Therefore, they are known to be vulnerable outside documented aggregation sites even if their vulnerability, or at least availability, is greater at certain sites. Indeed, Winn (2008) acknowledges this vulnerability across the whole of their range, *“the risk that the fishery will have a significant impact on the grey nurse shark remains high in all areas outside Marine Park sanctuary zones”*. There is little doubt that the most effective protection of this species will be provided by management measures that mitigate threats across the whole area of distribution of the various life-history stages of the species. Gear restrictions and modifications, and increased awareness and responsibility by all individuals who are likely to encounter an individual(s) of the species, appear to be the management measures most likely to facilitate the desired management outcomes. Fishing restrictions for some gear types in at least some of the key areas of aggregation of the species, particularly at seasons or times when the species is known to be unusually vulnerable, may be useful additions to the above-mentioned primary management strategy, at least until such time as the collective impact of the numerous management measures can be assessed and/or more effective specific management measures identified. Adequate and precise ongoing monitoring of shark populations appears essential for the evolution of the most efficient strategies for the future management of the conservation of this species.

It is important to note that grey nurse sharks are reported only to be vulnerable to hook and line fishing, some forms of set net fishing and spear fishing. As there is unlikely to be incidental impact from spear fishing it appears to be particularly

amenable to management by publicising the specific responsibilities of participants to achieve compliance with the existing total ban on harvest and harassment. Some other fishing practices, such as targeted trapping, have not been reported to directly impact the species. The interests of the wise management and conservation of NSW species collectively, and in this case the grey nurse shark specifically, necessitate differentiation of the impacts of the various gear types and management relating specifically to each, rather than blanket bans on all types of fishing regardless of their impacts.

Winn (2008) follows a statement on the need to reduce fishing pressure on grey nurse sharks, and the need for reducing fishing pressure generally (the latter attributed to Cropp 1964, a reference that unfortunately does not appear in Winn's list of references), with the statement that *"until fishing pressure is banned from in and around all known grey nurse shark aggregation sites in NSW, the survival of this species cannot be assured"*. This statement represents advocacy for a reduction in all fishing, but it is misleadingly imprecise and basically incorrect. The survival of the species cannot be assured until it is properly established that the species is able to cope with all of the threats it is subject to across the whole of its distribution. Management at only some sites will not necessarily provide the stated assurance, particularly for a mobile species. Similarly, restriction of all fishing practices, regardless of their impacts, is not only, not justified, but it does not constitute wise implementation of ESD.

3.6 Recreational Fishing Havens

Recreational Fishing Havens (RFHs) are primarily a resource allocation mechanism. Conservation benefits, if they occur, are secondary. This principle in no way represents a failure to conserve fisheries resources as none of those exploited in RFHs in NSW are threatened as a result of fishing in those havens. The statement that RFHs *"do not protect essential nursery and breeding areas from destruction by mining and coastal development"* (Winn 2008) is true, but irrelevant. The real threats to the areas where RFHs have been declared are pollution in its many forms, introduced species and damage to nursery and catchment areas from development and agriculture outside the area. Marine parks, including 'sanctuary zones', in NSW do not protect against these threats either.

The claim “*due to the difficulty in managing recreational fishers compared to commercial fishers . . . (RFHs) . . . have a very short-term limited benefit for the sustainability of seafood resources*”(Winn 2008), is totally unsubstantiated. It represents further evidence of the continued bias against fishing, by incorrectly stating, without providing evidence, that recreational fishers are difficult to manage and that recreational fishing actually represents a threat to the long-term sustainability of seafood resources. Recreational fishers might take exception to both suggestions.

The following claim that RFHs “*have a direct negative impact on the ability to implement real and effective conservation measures such as marine reserves*”(Winn 2008) is a yet another misrepresentation of reality. The only distinguishing characteristic of RFHs is that they have restricted, and in most case eliminated, commercial fishing. Therefore, regardless of the relative impact of fishing in RFHs, or lack thereof, when new management measures are necessary there is one less group of stakeholders (commercial fishers are usually excluded from RFHs) who need to be committed to the proposed conservation measures. Furthermore, the claim in the statement quoted above that marine reserves would represent a real and effective conservation measure in the areas where there are RFHs, is just another example of misguided advocacy that is contrary to the available evidence.

The concluding statement to this Section that establishing RFHs as ‘Aquatic Reserves’ allows the “*imposition of more appropriate bag limits*” is a classical example of the biased distortion of the real relationship between fisheries and conservation that permeates Winn’s Report. NSW DPI is responsible for bag limits in NSW and they can be varied in any area at any time. There is no need to have a ‘reserve’ of any form to affect conservation. There is absolutely no need to declare an area an aquatic reserve to change a bag limit. What is required is scientific evidence that such a change would have either conservation or allocation benefits.

CHAPTER 4. REVIEW OF PROTECTION OF NSW MARINE HABITATS AND ECOSYSTEMS

This Chapter is largely descriptive of existing situations and as such, does not warrant as much comment as other Chapters that make more inference on future

requirements. The following comments are restricted to selected statements in the Chapter of Winn (2008) that appear to provide insight into the processes used to advocate for more marine parks.

4.1 NSW Estuarine Ecosystems

The point is made by Winn (2008) that NSW estuaries are complex systems which are affected by a large number of biotic and abiotic influences. Winn (2008) then notes suggestions that *“about 60 % by weight and 70 % by value of the commercial fishery catch in New South Wales is estuarine dependent”*, to conclude that *“protecting representative areas of estuarine habitats and ecosystems is an important goal for both biodiversity conservation and fishery sustainability”*. This conclusion exemplifies the misunderstanding of what is really required to protect biodiversity and aquatic resources that permeates Winn’s Report. Estuaries are indeed tremendously important to a very substantial proportion of NSW commercial fisheries. They are also extremely important to the majority of NSW anglers. Estuaries are likely to be subject to a complex array of potential impacts, including many that originate in terrestrial areas and freshwater systems. Therefore, if estuaries are to continue to provide such an important service to the State’s fisheries, both commercial and recreational and to the seafood consuming public, then all of our estuaries must be protected, not merely ‘representative areas’ of some of them. True protection of our estuaries and the fisheries they support requires effective management of all major threats over the whole area which generates the threat, i.e. including management of threats from outside the estuaries themselves. Estuaries will not be protected by a series of sanctuary zones in parts of their areas, even if such zones did actually provide true protection from all harmful activities within the sanctuary, which those in NSW certainly do not. Estuaries in NSW cannot be protected by a series of fishing closures, such as occur in the proclaimed ‘sanctuary zones’ of NSW marine parks.

4.1.1. Near Pristine Estuaries

The logic in this section that leads to the recommendation that all 14 of the State’s near pristine estuaries should be declared as ‘Aquatic Reserves sanctuaries’ is again illusive. It is stated that *“they have not been altered by humans in a significant way. Therefore they are not used for aquaculture”*(Winn 2008). The fact that they have not

been altered does not render them unsuitable for aquaculture, nor does it explain why they have not been used for aquaculture. More importantly, at least most near-pristine estuaries have been open to fishing and yet they have not been substantially altered. This again confirms, contrary to the author's intentions, that fishing is not a significant threat and fishing closures are not necessary.

4.1.2. Estuarine Vegetation

Attention is drawn by Winn (2008) to changes in several forms of estuarine vegetation in one NSW estuary, Port Stephens, and to the loss over recent decades of *"at least half of the State's estuarine seagrass"*; a statement referenced to Poiner and Peterken 1995, which once again is not in Winn's reference list. It is then stated that, *"most of this loss is due to eutrophication of estuarine waters leading to increased algal growth that has led to seagrass dieback occurring"*. Once again, the primary cause of the problem is pollution, this time in the form of excess nutrients almost certainly from agricultural and urban runoff.

Despite acknowledging that eutrophication is the primary problem, Winn (2008) makes the unsubstantiated claim that commercial and recreational fishing have a number of negative impacts on seagrasses. While it is probable most activities in an estuary could have some impact on seagrasses the real question should be, which have sufficient impact to require amelioration? There have been numerous studies on the impact on seagrasses of commercial haul netting; one of the most common commercial fishing activities in estuaries in NSW and one usually assumed to likely impact seagrasses. The overwhelming conclusion is that the impacts of hauling on different types of seagrass can vary seasonally and by type of seagrass, but they are generally very minor (Lamberth *et al.* 1995, WBM Oceanics Australia 1997, Otway and Macbeth 1999). The long-term consequences of hauling on seagrass distribution or the seabed are extremely minor when compared to other non-fishing impacts. Much of the impact attributed to anglers is from the impact of boats, including their anchoring, and here the impact from the fishing sector is largely common to other forms of boating.

The final paragraph on seagrasses acknowledges the problem to native seagrass beds from the introduced aquarium seaweed, *Caulerpa taxifolia*. Rather than supporting management to protect estuaries from further such introductions, which represent a real threat to biodiversity, Winn (2008) instead continues his demonization of fishing with the unsubstantiated claim that “*commercial and recreational netting are likely to be responsible for its spread*”. This statement is completely unsubstantiated. In light of the spread of *Caulerpa* in estuaries where there is neither commercial nor recreational netting, such as Port Hacking, this statement not only misrepresents the true role of fishing in the threat from introduced species, but it also obscures the need for investigation and management of the mechanisms by which threats from introduced species occur. Experience from Victoria’s bays and inlets, where a number of aquatic weeds introduced from the aquarium industry have seriously displaced native seagrasses (Gunthorpe *et al.* 1997) confirms the priority for addressing the real threats at their source.

A number of environmental problems were identified by Gunthorpe *et al.* (1997) for most bays and inlets in Victoria; several of these problems were common across areas. Excess nutrients, largely due to agricultural and urban run-off, were already a major problem in most areas and were a threat to all. Significant loss of seagrass had been recorded for several bays and inlets (for example 70% loss in Western Port) and physical disturbance through siltation and other anthropogenic causes was associated with such losses. Reduced flows from freshwater streams, exotic species and toxicants were other major factors contributing to environmental degradation. In considering Gunthorpe *et al.* (1997) and other reports commissioned for the investigation of the status and allocation of fisheries resources in Victorias bays and inlets, the Victorian Co-management Council concluded that “*continued environmental damage poses fare more serious threat to the fisheries of Victoria’s bays and inlets than do current commercial or recreational fishing practices*” (Co-Management Council 1998).

The sections in Winn (2008) that deal with mangrove and saltmarsh are largely descriptive, but again the likely impact of fishing is seriously over-represented. No evidence is given that fishing is a significant threat to either habitat. It is interesting that in relation to the outcome by the end of the last century that “*25-30% of the*

remaining saltmarsh had been lost to mangrove encroachment", Winn (2008) states that *"the main driver of mangrove invasion is likely to be regional rises in sea level due to climate change"* which is referenced to Rogers *et al.* 2006 (yet another cited paper that does not appear in the reference list). Attribution of substantial change in these aquatic ecosystems due to regional sea level rises last century, however, seems an unlikely association with climate change. If climate change had already resulted in sea-level rises by the end of the last century, then such rises would be global and not just regional. It is much more likely the change in distribution of mangroves and saltmarshes is due to more direct anthropogenic impacts, such as pollution, particularly in the form of siltation, altered fresh water flows and direct physical damage from development. The Victorian review discussed above (Co-Management Council 1998) is but one source of identification of the more likely causes of such change.

4.2. NSW Coastal Habitats

The introductions to this Section, and to Sections 4.2.1 and 4.2.2, are largely descriptive of the areas of habitats classified into the various categories. It is notable that only the so-called impacts of fishing are highlighted and again, these are unsubstantiated, over-represented and over-stated. Section 4.2.3. *Sub-tidal Rocky Reefs*, highlights that *"many times more reef habitat exists that has not been mapped"*. Indeed, Winn's call for more comprehensive mapping appears reasonable if goals for such collection of data are clear and defined *a-priori*. The area of mapped reef habitat is not however, as stated by Winn (2008), limited to *"that which is visible from air photos"*. Indeed, Winn cites Andrew and O'Neill (2000), which is but one paper that reports other parts of NSW reefs that have been mapped. If the mapping of reefs is to be a priority, it would be much better to have specific aims for such collection of data. Such mapping is difficult and expensive and in the absence of identification of specific goals for the use of these data it is difficult to see this as an urgent research priority. Identification of the real threats to marine and estuarine organisms is a much higher priority. If the threats are identified, targeted mapping will become much more meaningful.

Then under *Seaweed (Macroalgae)* it is acknowledged that “*habitat protection is important to protect seaweed; however, protecting seaweed from being impacted directly is a limited response*” (note that the term ‘seaweed’ is a colloquial term, is not formally defined and is imprecisely used in this context). It is a great pity that Winn (2008) selectively espouses this principle only for macroalgae! All fish, mammals and invertebrates need to be conserved. Protecting them from only the direct impacts of fishing is similarly an inadequate response. The real threats, direct or indirect, to each and every species and habitat must be identified and then management action taken in accordance with the severity of the threat.

Winn (2008) makes much of urchin barrens. While they can be indicators of ecological change and fishing has likely contributed to their occurrence in some areas, urchin barrens can also be a naturally occurring alternative state to forests of macroalgae (Konar and Estes 2003). Whilst there is no doubt they cover a large area of rocky reefs in NSW (e.g. Andrew and O'Neill 2000), how much of this is due to anthropogenic release of predation pressure from *Centrostephanus rodgersii* and *Heliocidaris* spp. is unknown. Many of the references (most of which are yet again not included in the reference list) cited by Winn (2008) to support the notion that the removal of large predators allows herbivores to ‘overgraze’ forests of macroalgae are from studies done in the northern hemisphere; the ecological dynamics of which are inherently different to Australia. Indeed, Sala *et al.* (1998; a publication cited by Winn 2008 but once again not in the reference list), argue “*that other processes (recruitment, pollution, disease, large-scale oceanographic events, sea urchin harvesting, food subsidies, and availability of shelters) may also be important in regulating the structure of Mediterranean algal assemblages*”. It has not been generally accepted that increases in urchin predators via the restricting of fishing, have resulted in sufficient decrease in urchin density to give rise to the establishment of forests of macroalgae in urchin barrens in NSW. Indeed, studies done in NSW have shown that urchin barrens may be resilient habitats and only substantial and catastrophic removal of urchins from barrens allows opportunity for growth of foliose species of algae, whilst partial removals of urchins does not (Andrew and Underwood 1993, Hill *et al.* 2003). Even then, successional transitions from foliose algae to forests of macroalgae can be quite complex and unpredictable in NSW (Kennelly and Underwood 1992). What is

important to note here is that no-take fishing zones are not the best solution to the total problem, as even if they do represent a partial or even total solution in specific instances this will only be within the no-take zone itself. The component of the broader problem that can be attributed to fishing would be more appropriately addressed by sound fisheries management across the whole area of the relevant fisheries.

It is interesting that in the discussion of the amelioration of the so-called problem of urchin barrens, Winn (2008) uses the example of the Leigh Marine Reserve in New Zealand (citing a reference, Parsons *et al.* 2004, which again is not in the reference list). Winn (2008) reports “*the total disappearance of ‘urchin barrens’ across all depths*” within the marine reserve from this publication. It should be noted that the Leigh Marine Reserve is only approximately 500 hectares, yet according to Winn (2008), it completely solved this biodiversity issue in this area. This example suggests that if area closures are to be part of a solution to a specific biodiversity problem they do not need to be bigger than 500 hectares, not the many thousands of hectares proposed by Winn (2008). If, as Winn (2008) subsequently states, the problems of barrens were wide-spread in New Zealand, and were related to the sudden increase in snapper landings then the solution to the total problem, including the sustainable development of fisheries, lies in managing the snapper population across the whole area of its distribution. Again the real issue is to first identify exactly which problem requires solving and where.

Sections 4.2.4 *Offshore Islands and Emergent Rocks* and 4.2.5 *Ocean Ecosystems* are short and predominantly descriptive. Section 4.2.4 does include, however, one statement, “*offshore islands and emergent rocks provide important habitats for numerous species, some of which are threatened with extinction due to fishing practices*”, that in the absence of evidence to support such a claim, should not be accepted. This is another example of an emotive criticism of fishing which is not at all substantiated. If there are indeed numerous species that are threatened with extinction due to fishing then it is critically important to identify them and then identify what type of fishing is causing the problem. Only then can adequate and appropriate management plans be developed. In the interest of conservation of NSW marine biodiversity, this would

be far more meaningful than the claims for more marine parks to restrict fishing of all types, across huge areas, regardless of whether or not fishing in any form is the cause of any threat in even part of the area.

CHAPTER 5. DISCUSSION

This Chapter in Winn (2008) begins with the statement that *“It is to our collective shame that out of ignorance or apathy many of our estuaries and near shore marine ecosystems and habitats have been damaged, degraded or destroyed. The consequences of pollution, habitat alteration and the removal of far too much of its life has led to a situation that dictates immediate and effective action”*. The misuse of half-truths and/or misrepresentation of information that impacts the basis of much of Winn (2008) are exemplified in the actions that Winn recommends to follow these statements.

There is no doubt that our estuarine and near shore marine systems have been seriously damaged, degraded and even in some cases destroyed, and that we have failed to stop the rot. There is also no doubt that pollution and habitat alteration have led to a situation that requires immediate attention and effective action. It is Winn’s use of these statements to advocate for more marine parks, that are in effect nothing more than restrictions on fishing, that is at issue.

A fundamental flaw in Winn’s whole approach is exposed by his acknowledgement that pollution and habitat alteration are the first two of his identified three causes of the problem and yet he proposes to do nothing about them. Instead he advocates for more fishing closures, usually under the conveniently misleading title of ‘sanctuaries’ or ‘protected areas’.

Winn attempts to demonstrate that the third of his causes, *“removal of far too much of its life”*, is a major problem that is caused by fishing, by providing data on the status of the fisheries resources of NSW. These data actually show that removals of fish by fisheries under NSW jurisdiction have had remarkably little deleterious impact. In fact the fisheries resources of NSW are in remarkably good condition, particularly considering the damage that has been done to the underlying habitats and the resource base from pollution and habitat alteration. Even the excessive fishing effort

of earlier decades does not appear to have inflicted major damage, and certainly not any that is irreparable.

Consideration, in this review, of the biology of the few species that are currently subjected to excessive fishing pressure shows that area closures in the form of marine parks as currently managed in NSW do not, and will not, represent either appropriate or adequate management of any of them.

The “Discussion” in Winn (2008) also claims that the NSW Government’s commitment to a system of marine parks requires more parks than are currently in place. Consideration, in this Review, of the documents cited by Winn to support the call for more parks clearly shows that NSW already has more parks than are necessary to meet its national commitments and that Australia in total has already exceeded international expectations.

The commitments of the NSW Government that have not been met are the numerous requirements to identify the real threats (Article 7 Convention on Biological Diversity, IUCN 1993, EPBC Act, Commonwealth of Australia 1999, Intergovernmental Agreement on the Environment, Commonwealth of Australia 1992a,) and then to manage these threats in proportion to the significance of the problem (Commonwealth of Australia 1992: for details see the discussion of Chapter 3). Marine parks in NSW are, in effect, little more than fishing closures. They intentionally do not address known threats, such as pollution and introduced species (Marine Parks Authority 2008) and therefore do not meet the requirements of the Government’s commitments to marine conservation. More marine parks will merely exacerbate this major problem. It will remain impossible to get the proper outcome from the “*effective action*” Winn calls for in the opening comments to his “Discussion” unless adequate action is directed at the effectively identified threats.

REFERENCES

- Andrew, N. L. and A. L. O'Neill. 2000. Large-scale patterns in habitat structure on subtidal rocky reefs in New South Wales. *Marine and Freshwater Research* **51**:255-263.
- Andrew, N. L. and A. J. Underwood. 1993. Density-dependent foraging in the sea-urchin *Centrostephanus rodgersii* on shallow subtidal reefs in New South Wales, Australia. *Marine Ecology Progress Series* **99**:89-98.
- ANZECC TFMPA (Australian and New Zealand Environment and Conservation Council Task Force on Marine Protected Areas). 1998. Guidelines for establishing the National Representative System of Marine Protected Areas. Environment Australia, Canberra.
- ANZECC TFMPA (Australian and New Zealand Environment and Conservation Council Task Force on Marine Protected Areas). 1999a. Strategic plan of action for the National Representative System of Marine Protected Areas: a guide for action by Australian governments. Environment Australia, Canberra.
- ANZECC TFMPA (Australian and New Zealand Environment and Conservation Council Task Force on Marine Protected Areas). 1999b. Understanding and applying the principles of comprehensiveness, adequacy and representativeness for the NRSMPA, Version 3.1. Environment Australia, Canberra.
- Asch, R. G. and J. S. Collie. 2008. Changes in a benthic megafaunal community due to disturbance from bottom fishing and the establishment of a fishery closure. *Fishery Bulletin* **106**:438-456.
- Bansemmer, C. S. and M. B. Bennett. 2008a. Frequency of retained fishing tackle and resultant wounds in grey nurse sharks, (*Carcharias taurus* Rafinesque 1810) along the east coast of Australia. Poster presented at the OCS Conference. Sydney.
- Bansemmer, C. S. and M. B. Bennett. 2008b. Multi-year validation of photographic identification of grey nurse sharks, *Carcharias taurus*, and applications for non-invasive conservation research. *Marine and Freshwater Research* **59**:322-331.
- Beverton, R. J. H.; Holt, S. J. (1957), *On the Dynamics of Exploited Fish Populations*, Fishery Investigations Series II Volume XIX, Ministry of Agriculture, Fisheries and Food, London
- Buxton, C.D., M. Haddon, N. Barrett, C. Gardiner and G. Edgar. 2004. Evaluating the effectiveness of Marine Protected Areas as a fisheries management tool. Fisheries Research and Development Corporation Final Report Project 1999/162. FRDC Canberra, 384pp.
- Buxton, C.D., Haddon, M. and Bradshaw, M. 2006. Regional Impact Assessment for the Marine Protected Areas proposed for the South-East Region. Fisheries Research and Development Corporation Final Report Project 2005/083. FRDC Canberra, 198pp.
- Carr, M. H., J. E. Neigel, J. A. Estes, S. Andelman, R. R. Warner, and J. L. Largier. 2003. Comparing marine and terrestrial ecosystems: Implications for the design of coastal marine reserves. *Ecological Applications* **13**:S90-S107.
- Co-Management Council. 1998. Fisheries Co-Management Council bay and inlet fisheries study (as forwarded to the Minister for Agriculture and Resources). Fisheries Co-management Council, Melbourne.

Commonwealth of Australia. 1992a. Intergovernmental Agreement on the Environment. Department of Environment, Water, Heritage and the Arts, Commonwealth of Australia, Canberra.

Commonwealth of Australia. 1992b. National Strategy for Ecologically Sustainable Development. Ecologically Sustainable Development Steering Committee, Department of Environment, Water, Heritage and the Arts, Commonwealth of Australia, Canberra.

Commonwealth of Australia. 1996. National Strategy for the Conservation of Australia's Biodiversity. Department of Environment, Sport and Territories, Commonwealth of Australia, Canberra.

Commonwealth of Australia. 1999. Environment Protection and Conservation of Biodiversity Act, Department of Environment and Heritage, Commonwealth of Australia, Canberra.

Dial, R. and J. Roughgarden. 1998. Theory of marine communities: the intermediate disturbance hypothesis. *Ecology* 79:1412-1424.

DPI (Department of Primary Industries) Fisheries. 2001. Estuary General Fishery Environmental Impact Statement public consultation document. NSW Fisheries, Sydney.

Dudley, N., editor. 1994. Guidelines for applying protected area management categories. IUCN (International Union for the Conservation of Nature), Gland.

Environment Australia. 1998. Australia's Oceans Policy. Marine Group, Commonwealth of Australia, Canberra.

Gunthorpe, L., P. Hamer, and S. Walker. 1997. Influence of environmental and habitat features on scalefish catches from Victorian bays and inlets. Final Report. Fisheries Co-Management Council, Melbourne.

Halpern, B. S. 2003. The impact of marine reserves: Do reserves work and does reserve size matter? *Ecological Applications* 13:S117-S137.

Harley, C. D. G., A. R. Hughes, K. M. Hultgren, B. G. Miner, C. J. B. Sorte, C. S. Thornber, L. F. Rodriguez, L. Tomanek, and S. L. Williams. 2006. The impacts of climate change in coastal marine systems. *Ecology Letters* 9:228-241.

Hilborn, R. 2007. Moving to sustainability by learning from successful fisheries. *Ambio* 36:206-393.

Hill, N. A., C. Blount, A. G. B. Poore, D. Worthington, and P. D. Steinberg. 2003. Grazing effects of the sea urchin *Centrostephanus rodgersii* in two contrasting rocky reef habitats: Effects of urchin density and its implications for the fishery. *Marine and Freshwater Research* 54:691-700.

Hobday, A. J., T. A. Okey, E. S. Poloczanska, T. J. Kunz, and A. J. Richardson, editors. 2006. Impacts of climate change on Australian marine life. Part B Technical report. CSIRO Marine and Atmospheric Research, report to the Australian Greenhouse Office, Department of the Environment and Heritage, Canberra.

IUCN (International Union for the Conservation of Nature). 1993. Convention on biological diversity. IUCN United Nations Treaty Series, Rio de Janeiro.

Kearney, R. E. 2007. The pros and cons of Marine Protected Areas in New South Wales: who's been hoodwinked? in Proceedings of the ASFB Conference 12/9/2007, Canberra.

- Kearney, R. E. 2008a. The hoodwinking continues. Seminar presented to the Fisheries Centre, NSW Department of Primary Industries, Sydney, October 30, 2008.
http://aerg.canberra.edu.au/reprints/2008_Kearney_MPA_seminar_no_2.pdf.
- Kearney, R. E. 2008b. Securing Australia's fish supply and improving the environmental sustainability of fisheries. Pages 97-103 *in* D. Lindenmayer, M. H. Olson, S. Morton, and S. Dovers, editors. Ten commitments: reshaping the lucky country's environment. CSIRO Publishing, Melbourne.
- Kennelly, S. J. and A. J. Underwood. 1992. Fluctuations in the distribution and abundances of species in sublittoral kelp forests in New South Wales. *Australian Journal of Ecology* **17**:367-382.
- Konar, B. and J. A. Estes. 2003. The stability of boundary regions between kelp beds and deforested areas. *Ecology* **84**:174-185.
- Lamberth, S. J., B. A. Bennett, B. M. Clark, and P. M. Janssens. 1995. The impact of beach-seine netting on the benthic flora and fauna of False Bay. *South African Journal of Marine Science* **15**:115-122.
- Lincoln-Smith, M. 2007. Review of issues related to research on grey nurse sharks (*Carcharias taurus*) in New South Wales. Report to Recfish Australia. The Ecology Lab Pty. Ltd., Sydney.
- Marine Parks Authority (2008) A review of benefits of marine protected areas and related zoning considerations, www.mpa.nsw.gov.au
- Minister for Environment and Water Resources. 2007. Administrative Appeals Tribunal N2006/1443 NSW Approved wildlife trade operation: NSW ocean trap and line fishery. Commonwealth of Australia, Sydney.
- Otway, N. M. and W. G. Macbeth. 1999. Physical effects of hauling on seagrass beds. NSW Fisheries Research Institute, Sydney.
- Pauly, D., V. Christensen, S. Gu  nette, T. J. Pitcher, U. R. Sumaila, C. J. Walters, R. Watson, and D. Zeller. 2002. Towards sustainability in world fisheries. *Nature* **418**:689-695.
- Ridder, B. 2008. Questioning the ecosystem services argument for biodiversity conservation. *Biodiversity and Conservation* **17**:781-790.
- Roberts, C. M., G. Branch, R. H. Bustamante, J. C. Castilla, J. Dugan, B. S. Halpern, K. D. Lafferty, H. Leslie, J. Lubchenco, D. McArdle, M. Ruckelshaus, and R. R. Warner. 2003. Application of ecological criteria in selecting marine reserves and developing reserve networks. *Ecological Applications* **13**:S215-S228.
- Sala, E., C. F. Boudouresque, and M. Harmelin-Vivien. 1998. Fishing, trophic cascades, and the structure of algal assemblages: evaluation of an old but untested paradigm. *Oikos* **82**:425-439.
- Scandol, J., K. Rowling, and K. Graham, editors. 2008. Status of Fisheries Resources in NSW 2006/07. NSW Department of Primary Industries, Sydney.
- Soto, C. G. 2001. The potential impacts of global climate change on marine protected areas. *Reviews in Fish Biology and Fisheries* **11**:181-195.
- Underwood, A. J. 1991. Beyond BACI: experimental designs for detecting human environmental impacts on temporal variations in natural populations. *Australian Journal of Marine and Freshwater Research* **42**:569-587.

Underwood, A. J. 1992. Beyond BACI: the detection of environmental impacts on populations in the real, but variable, world. *Journal of Experimental Marine Biology and Ecology* **145**:145-178.

Underwood, A. J. 2007. Assessment and management of potential impacts of prawn-trawling on estuarine assemblages. Final Report, Project 2000/176., Fisheries Research and Development Corporation, Canberra.

Underwood, A. J. and M. G. Chapman. 2002. Conservation of coastal organisms depends on scientific realism, not community "monitoring". Pages 20-37 *in* D. Lunney, C. Dickman, and S. Burgin, editors. A clash of paradigms: community and research based conservation. Royal Zoological Society of New South Wales, Sydney, Australia.

UNEP (United Nations Environment Program). 2003. Integration of outcome-oriented targets into the programmes of work of the convention, taking into account the 2010 biodiversity target, the global strategy for plant conservation, and relevant targets set by the world summit on sustainable development. Item 7 of the provisional agenda*. Subsidiary Body on Scientific, Technical and Technological Advice, Convention on Biological Diversity, Montreal.

WBM Oceanics Australia. 1997. Review of scalefish fishing practices in Victoria's bays and inlets. Fisheries Co-management Council, Melbourne.

Winn, P. 2008. The Torn Blue Fringe: Marine Conservation in NSW. National Parks Association of New South Wales, Sydney.