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Minister Joe Ludwig
Mr David Borthwick
Parliament House
Canberra ACT 2600

Dear Mr Ludwig

Submission to the 2012 fisheries inquiry by David Borthwick:
**Dishonesty in fisheries management and science, and its implications
for fisheries management reform in Australia**

Summary

I am writing to you to highlight a lack of comprehensive and honest communication in regard to the way AFMA provides information to the public. I have observed AFMA over some years, and the 'white lies' which I document below are typical of this organisation. This discussion leads to the related issue of comprehensive and honest communication in fisheries science, and as part of this discussion I compare the management of the Commonwealth's Small Pelagic Fishery with 'world's best practice'. I draw the conclusion that there has been a long-standing and intractable problem with the organisational culture within AFMA, an agency which tends to act in a way subservient to the commercial fishing industry.

While such a culture undermines AFMA's credibility with the public at large, the main problem is that the culture impedes effective implementation of modern management tools (discussed in detail in my 2010 book "Overfishing under regulation"). In essence, in applying tools such as the precautionary principle and the ecosystem approach, there are often important trade-offs between short term benefits to the commercial fishing industry, and long term values related to ecosystem services, as well as the economic stability of the industry itself. AFMA's management decisions lean strongly towards the short term; this is illustrated below in relation to the Small Pelagic Fishery.

AFMA's predecessor, the Australian Fisheries Service (AFS), suffered from the same cultural problem before being replaced in the early 1990s. While many of the changes that accompanied AFMA's replacement of the AFS follow modern management principles, in practice the outcome has been disappointing, and the original vision of a competent and impartial fishery management agency has not been realised. I believe that major reform is needed now. The most important question is how to reform the pro-fishing culture within AFMA. I recommend that AFMA be closed down, and replaced by an agency charged with the management of Australia's marine biological assets. Such an agency would take over responsibilities for both harvesting (fishing) AND the Commonwealth network of marine protected areas.

Comment on the inquiry terms of reference:

The inquiry terms of reference, in my view, are unnecessarily limited by the age-old notion that the Commonwealth's responsibilities in this area, and its legislation, must continue to focus on fishing. In fact, looking to the global scene, there is one international agency which is primarily responsible for husbanding marine biodiversity assets, and within this visionary charter (dating to 1980) the agency manages both the harvesting of the products of those assets, as well as a developing network of marine protected areas (see p.5). This agency

has received international recognition for its sustainable fisheries management regime, amongst other matters, and offers Australia (and the rest of the world) a model which can be followed in the quest for science-based management of marine resources within a long-term perspective. This is exactly what Australia needs now.

I also make brief comment on the emphasis on the precautionary principle in the inquiry terms of reference. While the precautionary principle, and the related issue of ecosystem-based management, are fundamental to the future development of sustainable fisheries, the emphasis on the principle in the terms of reference is unfortunate, as it creates an impression that details on how the principle should be applied through fisheries science and management can in fact be written into a revision of the *Fisheries Management Act 1991*. This cannot and indeed should not be attempted, for reasons which I explain below.

AFMA: A HISTORY OF THE ROUTINE USE OF PETTY DISHONESTY

Background:

Between 2004 and 2009 I made a careful study of AFMA's management of two fisheries in particular: orange roughy and northern prawn. In my book "Overfishing under Regulation" (published in 2010) I detailed examples where management did not meet high standards in communicating with the public. Looking back now over my findings, I classify these failures into four categories:

- dishonesty by omission – where information which reflects poorly on fishery management is simply not discussed;
- dishonesty by exaggeration – where exaggeration is used to blur reality;
- dishonesty with regard to context – where the meaning of particular material is blurred or mis-represented by a failure to explain the context; and
- dishonesty through incorrect statements.

Chapters 11 and 12 of my book discuss examples of these four forms of dishonesty. The most common form was dishonesty by omission – often in regard to issues of bycatch, incidental kill or habitat damage. This was particularly noticeable in my review of the orange roughy fishery. The least common is dishonesty through incorrect statements. In reply to my criticisms AFMA have said that new management approaches ensure higher standards, implying that communication with the public is now unbiased, honest and comprehensive.

But is this the case? The issue of the *Margiris* supertrawler offers a topical case study.

AFMA's website (26/8/12) contains two 'front page' documents to provide information to the public on the issue of the supertrawler and its proposed work within the small pelagic fishery (SPF). These are: "*Fishing regulator re-affirms management is watertight*", and "*Super trawler FAQs*". Both appear to have been authored by AFMA staff. I refer below to these as 'Document 1' and 'Document 2'. Presumably the intent behind these documents is to provide a brief but wide-ranging summary of the issues surrounding use of the supertrawler, without bias towards the interests of the operator Seafish Tasmania (or other stakeholders such as recreational fishers or conservation groups). The examples below illustrate that this presumed intent has not been achieved:

Dishonesty by omission:

An important omission from both AFMA documents relates to incidental kill: the mortality caused as small fish and other animals within the path of the net are squeezed through and ejected behind the net. In some trawl fisheries, particularly multi-specie fisheries, this can be an important problem, causing considerable ecological damage.

Redbait, Blue Mackerel and Jack Mackerel tend to form multi-specie schools. Within the SPF incidental kill damage will be naturally mitigated to some extent by the fact that these fish tend to move to deep waters farther from shore as they grow older (and larger) – thus segregating themselves by size.

Nevertheless the issue is part of the larger question of the environmental damage of the fishery, and should be discussed.

Dishonesty by exaggeration:

In Documents 1 and 2 AFMA refer to the supertrawler as having “100% observer coverage”. To the lay reader (for which these documents are intended) this will likely be interpreted as meaning that *all* the fishing operations of the trawler will be subject to scrutiny by a professional observer. In fact this is not the case. AFMA informed me (letter from Nick Rayns dated 31/8/12) that only one observer will be employed. This will enable practical observation for 6-8 hours per working day. Given that the trawler has the capacity to fish 24/7, in fact observer coverage will be much less than “100%”. At the time I received advice from AFMA, no decision had been made on the use of closed circuit television.

Document 1 paragraph 7 provides the information that mid-water trawl bycatch “is exceptionally low”. Some collection fisheries (abalone for example) do have *exceptionally low* bycatch – however I doubt that this label should be applied to the operations of a supertrawler. I wrote to AFMA (letter referenced above) asking if they could send me links “to scientific reports .. based on observer studies” which would justify their statement. AFMA replied to my letter (as referenced) but were unable to identify a single scientific report. It seems that AFMA’s comment here cannot be backed up, and would appear to be exaggerated, noting the FAO’s comment (<http://www.fao.org/fishery/geartype/207/en> accessed 1/9/12) that “in most cases... [mid-water trawl] bycatch rates of other species are low”. Let us be clear here; *low* and *exceptionally low* have different meanings.

Dishonesty through missing context:

Document 1 states: “Australia’s fisheries management is consistently ranked among the world’s best in independent reports by international experts”. Broadly, Australia’s marine management is comparatively good by world standards; however this statement should be seen within the context that most of the world’s fishing nations do not manage their fisheries well. For example Pitcher et al. (2006) conducted a comparative evaluation of nations’ compliance with the United Nations Food and Agriculture Organisation (FAO) *Code of Conduct for Responsible Fisheries*. In this study Australia scored “good” against only 2 of the 6 benchmarks (scoring ‘moderate’ or ‘low’ for the remaining four), yet in spite of this poor performance it ranked amongst the best compared with other nations.

In another study, the University of British Columbia (Alder & Pauly 2008) ranked Australia’s marine management (assessed against modern management benchmarks including, for example, the development of marine protected areas) as seventh in a field of 53 nations (Table 3 page 6) yet when ranked against one of the component benchmarks of most interest to us – fishery sustainability – Australia ranked as only number 32 out of the 53 (Table 6 page 20). As an aside, I was personally surprised by our low ranking here, in spite of my reservations about AFMA’s management. Nevertheless Australia’s good record in some areas of marine management should not be taken out of context: our fisheries management, both at Commonwealth and State levels, leaves considerable room for improvement (for more details see Nevill 2012).

Dishonesty through factual mis-statements:

Document 1 states “Independent scientific experts commenting on the FV Margiris proposal have *all* supported AFMA’s sound fisheries management arrangements and the science that these decisions are based on” (italics added). There is an issue here with the word “all”. Dr Andrew Wadsley, a statistician, has published views in *The Tasmanian Times* questioning the validity of the SPF stock assessments, especially their statistical derivation. Professor Jessica Meeuwig, and Dr Colin Hunt (University of WA and University of Queensland) have published articles on *The Conversation* website (theconversation.edu.au) criticising the Margiris proposal on issues of stock assessment and bycatch.

There is also an issue relating to AFMA's use of the word "independent". When I asked which 'independent' scientists were specifically referenced in this paragraph (Document 1 paragraph 3) I was referred to articles published by Bob Kearney, Colin Buxton, Gavin Begg, Jeremy Lyle, Tim Ward, Keith Sainsbury, Tony Smith, and David Smith (letter from AFMA quoted above). It is my understanding that all these scientists have obtained benefit from recent contracts or positions with AFMA. Note that I am not criticising the scientists – they have not labelled themselves as 'independent'. This is AFMA's label, and it does not seem to be appropriate in the circumstances.

Does it matter?

AFMA has been telling 'white lies', just as it has in the past. AFMA's dishonesty characteristically slants in two directions: either to make AFMA's management appear better than it actually is, or to ease the path of the commercial fishing industry. In my 2010 book, after a detailed examination of AFMA's management, I described it as "at best incompetent, at worst dishonest". I had found a long history of AFMA promising sustainable precautionary management, but in fact delivering something less. Since my book was written AFMA has improved some aspects of their management framework, but in my view the old organisational culture – a culture of subservience to the fishing industry – still prevails. It is this culture which explains the dishonesty which I have discussed above. This is not in the past; this is happening now. And it does matter. As a publicly funded agency, AFMA has a responsibility to provide unbiased, comprehensive and honest information to the public. Where the public detect dishonesty, no matter how trivial, their confidence in the agency is undermined – in a big way.

However an even more important effect is that AFMA's bias towards the short-term interests of the fishing industry impedes the agency's responsibility to apply long-term management tools, the most important being the precautionary principle and the ecosystem approach. In many instances the outcome of this conflict between short and long term objectives results in 'unsafe' levels of sustainable catch being set, while ecosystem damage through bycatch and habitat destruction is under-researched and under-reported (often not reported at all in useful detail). The history of the orange roughy fishery between 1990 – 2008 (Nevill 2010 chapter 12) provides good examples of this problem. For a recent example, in the case of the Small Pelagic Fishery, Dr Andrew Wadsley has argued (Tasmanian Times 18/9/2012) that the permissible catch levels have been set at unsafe levels, given sampling problems and statistical uncertainties inherent in the methods used.

The need for reform

Where should we go from here? How can organisational cultures be changed? Strengthening the existing Act and changing the organisation's statutory objectives seems the simple solution, but this is most unlikely to work. The problem is illustrated by considering AFMA's history.

During the 1980s it was widely recognised that the Australian Fisheries Service (AFS) had been 'captured' by their clients, the fishing industry. In the late 1980s the AFS underwent a major review followed by a change of name (to the Australian Fisheries Management Authority) and a new framework which in theory at least required more transparency through better reporting and review frameworks, gave the organisation some independence from the Minister for Fisheries, and placed environmental objectives within AFMA's charter.

A new Act was developed to guide the new agency, the *Fisheries Management Act 1991*. The new Act contained laudable objectives. It required that the Minister for Fisheries, and AFMA, to act "*consistent with the principles of ecologically sustainable development and the exercise of the precautionary principle, in particular the need to have regard to the impact of fishing activities on non-target species and the long term sustainability of the marine environment...*" (Section 3).

However the new organisation was just the old organisation re-badged. Same staff, same building, same clients, different letterhead. The organisation's immediate reaction to their

new legislation was to try to get around it – or at least the parts which contained new ecological responsibilities. The new Act required the application of the precautionary principle, yet AFMA has never sought to develop guidelines on what that actually means – if guidelines were developed AFMA might be held to them. When the Commonwealth Government published the final version of their fisheries sustainability guidelines, most of the specific criteria which had appeared in the draft version were replaced by vague and ambiguous phrases (presumably in response to comments by AFMA or the fishing industry). This is discussed in detail in Nevill 2010 Appendix 3.

In 1995 AFMA was required (through Australia's endorsement of the FAO Code of Conduct) to end destructive fishing practices, yet it took no action to outlaw shark finning until there was a public outcry against the practice in 2000, and even then did not outlaw the practice from all Commonwealth fisheries until 2004. The new Act required AFMA to ensure fishing activities took particular regard for "the impact of fishing activities on non-target species" (Section 3b) yet AFMA allowed deep sea trawling to virtually eliminate deep sea coral ecosystems from most of the seamounts off southern Tasmania. To this day AFMA have not published their observer data on deep sea coral bycatch in the orange roughy fishery (dishonesty by omission).

Even today Andrew Wilke has informed me that AFMA told him that they did not interpret some aspects of their Act literally, and routinely worked around those parts of the Act they found created administrative difficulties.

The Minister for Fisheries, Joe Ludwig, announced on September 11, 2012 that the Act would be reviewed. This opens the door to reform, and a direction can be found by looking backwards 100 years. In those days, some Australian colonies, later to become States, had both Fisheries Acts, and Hunting and Game Acts (Victoria is a case in point). Over the last century, terrestrial wildlife came under increasing threat, and legislation gradually evolved so that Victoria's *Hunting and Game Act* evolved into the *Wildlife Act*. The focus of the Act changed from an emphasis on the promotion and control of harvesting to an emphasis on the protection of biodiversity assets. But Victoria's *Fisheries Act* never changed its name, and although the protection of marine ecosystems is now built into the legislation (through revisions and re-writes over the years) the Act remains essentially focussed on the promotion and control of harvesting. To this day, the harvest, not the ecosystem, is central to all State and Commonwealth fishery management legislation.

This is the real issue, and if the activities of the Margiris could lead to substantial legislative reform then the supertrawler will have done Australia a great favour.

Looking across the globe, there is one outstanding model for the direction Australia should take: the Convention for the Conservation of Antarctic Living Marine Resources – and the Commission created to put the principles of the Convention into action. That Commission (CCAMLR) is a multi-national agency based in Hobart. Dr Denzil Miller, its former CEO, has been recognised through international awards for his work. CCAMLR has largely achieved a sustainable fishing regime (issues of poaching aside). The key reason (Nevill 2010 chapters 10 & 17) is that the Convention *placed protection of the ecosystem above all else* in establishing the objectives of the organisation – which in several other respects closely resembles a regional fishery management authority. In a review of global regional fishery management agencies done a few years ago, CCAMLR emerged as virtually the only agency to have made significant progress in implementing the FAO *Code of Conduct for Responsible Fisheries* (discussed in Nevill 2010).

This is the model Australia needs to follow, and the proposed review of AFMA's enabling legislation provides the vehicle to do it. AFMA needs to be closed down, not rebadged, and replaced by a Commonwealth Government agency tasked with the protection and utilisation of marine biodiversity assets. Following CCAMLR's footsteps, the focus needs to be on protecting marine ecosystems, with sustainable utilisation permitted only within that context.

IS THE SMALL PELAGIC FISHERY WELL MANAGED?

The Pikitch forage fishery recommendations; world's best practice?

A recent paper by Pikitch et al. (2012) is the result of a global review of the state of both small pelagic fish stocks and associated fishery management regimes. Due to the calibre of the team and the comprehensive nature of the study undertaken, the Pikitch paper and its recommendations provide a global benchmark for minimum fishery management standards relating to forage fish (another term for small pelagic fish).

It is most important to recognise the issue about a minimum standard. In formulating their recommendations the Pikitch team did not set themselves the ambitious goal of devising a framework which would ensure healthy predator communities able to maintain their full role within the context of pelagic ecosystem function. Given that management of many global forage fisheries is currently on a very low base, where even the survival of the target stocks themselves is at risk, this level of ambition would have prejudiced the acceptance of their recommendations across global management agencies. Instead they adopted a less ambitious but more practical goal of a framework which would at least protect predator communities from extinction pathways.

The Australian community probably expect more than this minimum standard. A broad interpretation of the Commonwealth's *Fisheries Management Act 1991* (see quote from section 3 above) requires protection of long-term sustainability, closely linked to ecosystem function. In my view comprehensive fishery management controls designed to minimise impacts on forage fish predators (not merely to protect them from extinction pathways) should be applied to the Australian SPF.

Forage fish and their predators are not evenly spread over the ocean – far from it. The topography of the sea floor and the coastline, as well as oceanographic features such as currents and upwellings, create 'hotspots' for biological activity. These hotspots vary in intensity seasonally and from year to year. For example, it is not surprising that most of South Australia's commercial catch of Southern Bluefin Tuna are taken from areas not far from two important upwelling zones – areas where enriched nutrients fuel biological activity.

Over the last few years Australian scientists have gathered considerable information using tracking devices, so that, for example, the movement patterns of seals around their colonies can be predicted to some extent. Likewise the foraging areas for seabirds around their colonies can be estimated. Naturally the biological importance of these foraging areas will increase during breeding season.

Broadly speaking, where there are schools of forage fish, there will be predators. However both the forage fish and their predators are unevenly spread in space and time. There are two interrelated issues here:

- local depletion by fishing activity may prejudice the health of predator communities, particularly at some times in the year, and
- predators will be caught in trawl nets as bycatch, notwithstanding the use of bycatch reduction devices.

For these reasons the recommendations of the Pikitch paper *mandate* the use of spatial and temporal controls (eg exclusion zones) to protect predator communities. In fact the two most important aspects of the Pikitch recommendations relate to (a) keeping forage stocks healthy by the use of low harvest rates, and (b) protecting predator communities through the use of spatial and temporal controls (eg: zoning the ocean to exclude particular activities at particular times).

Australia's SPF compared with the Pikitch recommendations:

Does Australia's SPF fishery regime, including both the underlying science and the practical fishery controls, match up to the Pikitch 'minimum standards'? If it does, should the Australian community expect the regime to surpass these standards?

Taking the second question first, in my view the Australian regime should go well past the Pikitch recommendations, so that the ecological health of predator communities, and their ecological function in the broader pelagic ecosystem, are both protected. Where threatened species are involved, further action is needed to not merely protect, but enhance the status of that particular animal.

To simplify answering the first question, here I discuss only the two main thrusts of the Pikitch recommendations: the forage fish harvest rate, and the need for zoning to protect predator forage and nursery areas.

At first glance Australia's regime appears to go beyond the Pikitch recommendations with regard to harvest rate. The SPF Harvest Strategy specifies that where there is a high level of confidence in the estimate of the size of a spawning stock, a harvest rate of up to 10% may be permitted in determining the annual allowable catch. Where uncertainty regarding stock size is higher, the maximum harvest rate is 7.5%. These controls appear to surpass the Pikitch recommendations, as they should.

My reservations relate to uncertainties regarding the estimation of stock size – particularly when viewed against the backdrop of the precautionary principle, and the issue of Type I and Type II errors.

There is considerable uncertainty regarding the size of Australian stocks of Blue Mackerel, Jack Mackerel and Redbait, and little is known of stock structure or movement (Ward et al. 2011, 2012). The current estimate of Jack Mackerel spawning stock in the Eastern Zone is based on data now ten years old. According to Ward et al. 2011:21 "There is some concern for the state of this fishery due to the large decline in historical catches". According to Ward et al. 2012:vii "Coupled with large declines in historical catches, this gives rise to concern for the status of Jack Mackerel in the East." There is no estimate of spawning biomass for Jack Mackerel or Redbait in the Western Zone, and the annual take here is based on 'expert judgement' (for which there appears to be no public explanation).

The statistical validity of the Jack Mackerel estimates has been questioned by Dr Andrew Wadsley (noted above). This issue aside for the moment, the current estimates provide a 95% confidence interval of 114,900 to 169,00 tonne (Ward et al. 2012). In other words, scientists believe this estimate band has a chance of only one in twenty of being wrong. Ward et al. select a median value of 141,500 tonne as being 'the most likely' value, and this is the value which is used in determining the allowable catch.

AFMA *must* apply the precautionary principle, under its enabling legislation. But as AFMA have never attempted to develop guidelines on what this means in practice, managers have open discretion in choosing the value they wish to use in determining annual take. Clearly there is scope for disagreement and debate. If a higher level of 'certainty' was chosen, say 99% instead of 95%, then the range of values would be much greater, so the bottom end of the range much lower. However if the 95% level is accepted, my argument for the application of precaution in this instance is that the *lower* bound, not the *median*, should be used, providing a higher 'margin of error' if the true level of the stock is lower than expected. In this example, such an approach would result in a reduction of the permitted catch by roughly 20% - to what I would describe as a more precautionary level.

There is a further issue about the age of the data. While the SPF harvest strategy aims to take that into account so that where data is more than five years old, the maximum harvest rate will be 7.5%, there should, in my view, also be a precautionary cut off point. Of course

these issues are a matter of judgement to some extent, however my view is that fishing should cease altogether when available stock estimate data is more than ten years old. This would take into account uncertainties surrounding fish with relatively short live spans, whose populations can be strongly influenced by year-to-year and decadal oceanographic variations.

A precautionary approach should also be interpreted to mean that the statistical *power* of the analysis should be transparent, and should accompany every stock assessment (Peterman 1990). Statistical power refers to the probability of Type II errors. The traditional approach in estimating stock size focuses on Type I errors, even though ignoring Type II errors carries considerable risk. It is important that this information be transparent, as the degree of precaution inherent in decisions on allowable catch relates directly to the chosen error probabilities. This also must be considered in assessing the validity of the statistical approaches used in estimating spawning stock size. At present this information is not readily available to the public. All stock assessments should also undergo two independent peer reviews, by a statistician and a marine conservation biologist.

If the above changes could be made, the Australian public could have a reasonable degree of confidence that the first 'pillar' of the Pikitch recommendations would be met by the SPF management framework.

The second 'pillar' of the recommendations relates to zoning controls to protect predator foraging areas. Here the answer is simple – the Australian fishery at present lacks any credible controls, plans or programs in this area. It is to be hoped that this vital issue will be comprehensively addressed in the proposed revision of the SPF Harvest Strategy, which AFMA apparently plans for 2013.

In summary, the current SPF Harvest Strategy *appears* to meet and exceed the first pillar of the Pikitch recommendations. However there are currently problems in the way estimates of spawning stock size are derived (relating to the scope and age of the basic data, the transparency and validity of the statistical methods used, the way precaution is applied, and the way the stock assessment science is peer reviewed). These problems could be addressed within a relatively short timeframe of one to two years.

With regard to the second pillar of the Pikitch recommendations, the current Harvest Strategy fails entirely to provide a zoning framework to protect predator foraging areas. While an immediate start should be made using available information, protecting all significant predators will need more information than is presently available, so this issue should be seen as a "work in progress". It should also be immediately noted that the voluntary guidelines used in the South Australian sardine fishery to protect seals and dolphins are designed specifically for small fishing craft, where crew have the ability to search for animals prior to setting the net, and where necessary the crew are to take action to release trapped animals if they are still alive. Due to the scale of supertrawler operations, these options are not practical for such a large boat using such a large net. AFMA also needs to arrange for the testing of any bycatch reduction device intended for a very large net – with the subsequent report made available to the public.

Another problem with the current management regime is the use of "expert judgement" to set permissible annual catch levels. Where this is applied, there should at least be a written explanation of the decision, along with a brief peer review by a conservation biologist, available for the public to read.

The Buxton paper also contains an explanation about the determination of the permissible catch for Eastern Redbait which shows that AFMA 'bends the rules' in favour of the fishing industry. Buxton's table on p.3 shows that Redbait were placed in the Harvest Strategy Tier 1 for the 2012/2013 season even though the most recent data dated to 2006. According to the Harvest Strategy Tier 2 must be used where data is over 5 years old. Moreover, although AFMA is 'committed' to use the best available scientific information, the estimated spawning

stock size was in fact obtained by averaging the 2006 figure (51,000 t) and the 2005 figure (87,000 t). On the face of the matter the most recent estimate would appear to be the 'best available science' - posing the question as to why it was averaged with older data. The explanation may be simply that AFMA wanted an excuse to increase the size of the allowable catch. If this explanation is unduly cynical, one would expect to find (amongst AFMA's other fishery management decisions) an example of the use of averaging with older stock size data which *reduced* the allowable catch. Although I made a search for such an example I was unable to find one.

At present it is very clear that AFMA's management, as applied to the small pelagic fishery, does NOT meet world's best practice, let alone exceed it.

Another important point made in the Pikitch paper relates to the value of small pelagic fish. The paper discusses evidence on the value of each fish harvested compared with the value of each fish left in the ocean. The value of the fish left in the ocean derives both from the commercial value of the predators higher up the food chain, as well as the more intangible value stemming from maintenance of a healthy ecosystem. Humans place considerable value on seals, dolphins and seabirds, for example, even though none are harvested and eaten. The Pikitch paper found evidence that the value of fish left in the ocean may be up to twice the value of fish that are harvested.

In Australia, this finding raises the question of whether the small pelagic fishery should in fact continue in any commercial form. If the fishery costs the taxpayer more to manage than the gross value of the product (as is currently the case), and if the small pelagic fish provide an important ecosystem function in maintaining a healthy ocean ecosystem, added to the importance of supporting a recreational fishery worth many millions of dollars each year, then there would seem to be a good argument for phasing out commercial SPF operations.

HAVE SCIENTISTS THEMSELVES BEEN INFLUENCED BY AFMA'S CULTURE?

Honesty in fisheries science:

While the public probably *hope* for unbiased information from AFMA, they *expect* it from fisheries scientists. Recently the AFMA website carried a short paper by seven experienced and well-respected fisheries scientists, under the lead author Professor Colin Buxton of the University of Tasmania. The paper is titled *The Commonwealth Small Pelagic Fishery: general background to the scientific issues*. It is referred to below as 'the Buxton paper'.

In the discussion below, this paper is examined against four questions:

- have issues been omitted which are important to the subject?
- are there examples of overstatement or exaggeration?
- is material presented without important context?
- has incorrect information been provided?

The Small Pelagic Fishery (SPF) is a Commonwealth fishery for four species of small pelagic fish: Blue Mackerel, Jack Mackerel, Redbait and Australian Sardine. The fishery occupies the southern half of the Australian continent, and is divided for management purposes into two zones, with the boundary running north-south through Tasmania. The company Seafish Tasmania, owned by Gerry Geen, holds quota for 18,000 tonne for the current fishing season, and has contracted the Dutch owners of the supertrawler *FV Margiris*, now renamed the *Able Tasman* to harvest their quota. The remaining quota is held by other Australian fishers, who have the option of selling quota to Seafish Tasmania.

Presumably the objective of Buxton's paper is to provide the public with an unbiased summary of the science underpinning SPF management. If such an objective has not been achieved, questions arise as to the extent scientists themselves have been influenced by the pro-fishing culture within AFMA.

The Buxton paper follows usual scientific practice in that the names and affiliations of the seven authors are provided, and it includes a list of references at the end of the paper, as well as a short appendix. It is unusual in that it is not dated, although it was apparently written in 2012. It also contains a disclaimer which in part states “the authors do not warrant that the information in this document is free from errors or omissions”. There is no indication that the paper received peer review prior to publication; however the absence of review is normal practice for lightweight academic work.

Nevertheless the paper contains examples where information appears to have been misrepresented, deliberately or unconsciously, to present the management of the SPF in a good light:

Relevant omissions:

The Buxton paper contains no information relating to:

- incidental kill;
- genetic and demographic effects of fishing;
- the transparency and accountability of ‘expert judgement’ when used to assess permissible annual catch levels;
- uncertainties (including sampling and statistical) behind stock estimates;
- population structures and movements within defined East and West zones;
- seabird bycatch (noting this should be low but not negligible in an off-shore midwater trawl fishery).
- published concerns by fisheries managers over stock status (eg Ward et al. 2011/12 – noting that Ward is a co-author of the Buxton paper).

While the Buxton paper does not claim to present a comprehensive overview of the scientific issues, given the title it is reasonable to assume that most readers would expect all the important issues to receive attention, even if it is to explain that a particular issue does not apply to the SPF. It is also reasonable to assume that lay readers will expect an unbiased discussion from senior and well-respected scientists.

Examples of exaggeration:

Probably the most important issue with exaggeration in the Buxton paper is that it (especially the Appendix) conveys the impression that the SPF management regime meets or exceeds the recommendations of the Pikitch paper. As pointed out above, the SPF regime does approach (and depending on certain assumptions, may exceed) one of the key pillars of the Pikitch recommendations (ie: catch levels must be kept relatively low), but the regime entirely fails to meet the second pillar – relating to zoning controls to protect important predator forage areas. This is a serious and apparently intentional exaggeration – about a matter of fundamental importance.

Another example can be found on p.4 of the Buxton paper where stock size estimates from a modelling study are stated to be “similar to the estimates provided by the DEPM [daily egg production model] and expert judgement.” The issue here is with the word *similar*.

The Atlantis model (Buxton et al. p. 9) provided a SPF Jack Mackerel total stock estimate of 90,000 to 200,000 t. Using a conversion factor of 2 (at this stage I have not been able to locate a more accurate conversion factor) this would give a spawning stock estimate of 45,000 to 100,000 t. The spawning stock estimate on which the permissible catch for 2012/13 was based was 67,000 t for the Western Zone and 140,000 t for the Eastern Zone, giving a total of 207,000 t – twice the upper bound of the model estimate, and four times the lower bound. Such a comparison hardly justifies the use of the word ‘similar’.

Context not adequately explained:

In scientific circles, when citing from the work of another author, there is a convention that where material is presented in quotation marks, the *exact words of the cited work are used*.

If there needs to be any elaboration of the cited findings that is done outside the cited quote. To change words inside the quote is a breach of academic protocol. However the key point from a comparison of the quotes below is that Buxton et al. present the quote as a *general conclusion* “after 20 years of fishing and close ecological monitoring”, whereas the actual quote from Goldsworthy is presented as a conclusion in relation to a particular modelling study.

From Buxton 2012:15	Quote from Goldsworthy et al. 2011:11
After 20 years of fishing and close ecological monitoring the conclusion from a recent study by SARDI, CSIRO, SA universities, and consulting scientists is that “despite the rapid growth of the sardine fishery since 1991, there have likely been negligible fishery impacts suggesting that current levels of fishing effort are not impacting negatively on the ecosystem function”.	Despite the rapid growth of the sardine fishery since 1991, sensitivity analyses, based on mixed trophic impacts, detected negligible fishery impacts on other groups, but Ecosim indicated that many of these groups were sensitive to changes in sardine biomass. This finding suggests that current levels of fishing effort are not impacting negatively on the ecosystem function.
<i>Context:</i> presented as a general conclusion	<i>Context:</i> presented in a discuss of the implications of a particular modelling study

The lay reader will of course not detect the distortion of context, and will be likely to attribute a higher weight to the conclusion than is actually warranted.

Presentation of factually incorrect information:

Buxton p.7 comments on the findings of Goldsworthy et al. (2011):

Extensive ecological studies have been conducted to investigate potential ecosystem impacts of the SASF (Goldsworthy *et al.* 2011). Ecosystem monitoring and modelling have provided strong evidence that: i) no predatory species feeds exclusively or even predominately on sardine; ii) food availability is not negatively impacting on the foraging behaviour or reproductive success of any predatory species; iii) that ecosystem function has not been negatively impacted by the relatively rapid growth of the fishery; and iv) ecological effects from local depletion have not occurred.

With regard to Buxton’s first point, it is correct that sardine predators in general consume a variety of other species, however ecological monitoring of predator diets is time-consuming and expensive and has been necessarily limited; it may well be that certain predators do rely heavily on a diet of sardines at certain times or locations. With regard to Buxton’s second point which relates to “any predatory species”, the limitations on Goldsworthy’s monitoring data and modelling study make it clear that such a broad conclusion cannot be justified. Generally marine predators have been found to be highly responsive to food availability in their foraging patterns and timing. With regard to Buxton’s third point concerning ecosystem function, Goldsworthy used the word “suggests” which has become “strong evidence for” in Buxton’s text (see quote comparison above). With regard to Buxton’s fourth point, again the broad time/spatial framework of the modelling study would prohibit such a conclusion; nor does the monitoring data presented justify it.

THE PRECAUTIONARY PRINCIPLE IN FISHERIES MANAGEMENT

The central argument of my 2010 book “Overfishing under regulation” is that scientific uncertainty, and the way in which managers handle this uncertainty, lies behind poor fisheries management, and the economic and ecological damage which follow. I argue that two ‘modern’ management principles or approaches are the key to addressing uncertainty and providing sustainable fisheries management: these are the precautionary principle and the ecosystem approach. In my book I document the reluctant adoption of these modern tools by both Commonwealth and State fisheries agencies. This reluctance stems from organisational cultures which for decades have preferred the short-term vision of the commercial fishing industry over long-term management objectives.

While these two tools (the precautionary principle and the ecosystem approach) are interlinked, and I have argued that *both* must be adopted with enthusiasm in the quest for sustainable management, in the discussion below I deal only with the precautionary principle. The reader should bear in mind that comprehensive application of the ecosystem approach (sometimes referred to as 'ecosystem-based fisheries management') is of equal importance (see Nevill 2010).

The precautionary principle:

There are many versions of the precautionary principle. In its simplest form, it states that, *where there is the possibility of serious harm, decision makers should not wait for scientific certainty before taking action to mitigate or prevent such harm*. While it seems like common sense to many observers, it has the effect of reversing the onus of proof – here a proponent of an activity has the obligation, prior to the commencement of the activity, of demonstrating that risks involved have been minimized (Preston 2006).

Australia's *Fisheries Management Act 1991* requires application of the precautionary principle (PP) to fisheries management. Currently, the Commonwealth Government's inquiry into fisheries management has been specifically tasked (see the inquiry's terms of reference) to examine the application of the precautionary principle. As noted above, this creates an expectation that the inquiry should recommend ways in which the PP should be described and enforced within legislation. In my view this is counter-productive, and misunderstands the complexities of precautionary management, noting a wealth of international policy discussion on the issue over many years (see for example the detailed discussions by FAO 1996).

Australia, as a nation, first committed itself to apply the PP within natural resource management when it supported *The World Charter for Nature 1982*, a resolution of the General Assembly of the United Nations. This commitment was reinforced through Australia's support of the *Rio Statement* in 1992, and through the ratification of the *FAO Code of Conduct on Responsible Fisheries 1995*. In addition, Annex II of the international *Fish Stocks Agreement 1995* (to use its shorthand name) contained important recommendations on the application of the PP. There is no doubt that the most important policy discussions on the PP in the context of global fisheries have been developed by the FAO, again noting guideline documents developed in the late 1990s. Within Australia, Justice Preston (Preston 2006) has made important general remarks concerning the application of the PP. While not intended specifically for fisheries, his carefully researched and explained recommendations hold good nevertheless (and are by far the most detailed to emerge from Australia's justice system).

Australian fisheries managers have had plenty of time (and a great deal of encouragement from the FAO) to develop guidelines on how the PP should be applied in different situations by both Commonwealth and State fisheries management agencies. Such guidelines should of course have been developed through a public consultation process. In my view, the fact that AFMA has not attempted to do this can be explained very simply: vague benchmarks are much more useful than clear measurable benchmarks to an agency with an unwritten agenda – to act as a lapdog to the commercial fishing industry.

There are many areas where guidelines on the application of the PP could be of great assistance to an agency sincerely committed to sustainable fisheries management. The issue of stock assessment has been discussed above, where I recommend the precautionary use of the *lower bound* (NOT the median) of the 95% confidence interval in calculating permissible annual catch levels.

In my view the most important aspects of precaution in fisheries management apply to (a) stock assessment (where a more conservative approach is needed), to (b) the development of marine protected areas over spawning, nursery and feeding areas (of both commercial and non-commercial species), and to (c) bottom trawling. In relation to this last point, bottom trawling traditionally has been permitted everywhere outside sites of special interest or

sensitivity (such as seamounts). The problem with this approach is that it assumes a high degree of scientific knowledge about the importance and vulnerability of benthic ecosystems. Australia, as globally, has had a history of 'too little, too late' with regard to establishing no-go areas for bottom trawling. An approach now being used by the European Union depends on at least a minimum ability to map benthic ecosystems: here trawling is ONLY permitted in areas which have been identified as resilient to trawling damage.

There are a multitude of other issues where precaution should be applied. For example, it is common practice within fishery agencies to set minimum catchable lengths, particularly with respect to management of recreational fisheries. A standard approach is to use the median length of female reproductive maturity – ensuring that half of all females have had one chance to breed. Clearly there is scope here for added precaution: a length could be chosen such that 95% (or even higher) of all females have had one breeding season.

Other examples of the application of the precautionary principle concern the use of pre-agreed decision rules to limit and halt fishing activities as target and limit reference points are exceeded (Nevill 2010 chapters 7 & 8), and the use of high levels of statistical certainty in regard to both Type I and Type II errors (Peterman 1990). The power of sampling and statistical approaches to detect Type II errors *must* be made transparent in all public reports estimating stock size in relation to permissible catch.

Due to the complexity of the issues, and the large amount of advice already available (FAO 1996), it seems to me both pointless and counter-productive to attempt to build detail on the application of the PP into legislation.

The *Fisheries Management Act 1991* was amended in 1999 to incorporate the precautionary principle (well over a decade after Australia's international commitment to the PP). In my view, the Minister for Fisheries should have required his department (in consultation with AFMA, the fishing industry, recreational fishers, scientists and conservationists) to prepare guidelines on how the principle should be applied in practice to fisheries management.

While I believe this is still the appropriate course of action, there is a danger. The development of the Commonwealth *Sustainable Fisheries Guidelines* provides an interesting example of how vested interests were able to undermine precautionary approaches in the development of these specific guidelines. In Appendix 5 of Nevill (2010), the original draft guidelines are compared with the final guidelines. Most of the measurable benchmarks present in the draft guidelines were removed in the final version – replaced by vague 'motherhood' statements of little practical use.

CONCLUSION

In brief:

AFMA has been 'captured' by their clients; the commercial fishing industry. By this I mean that a pervasive and long-standing organisational culture, going all the way back to AFMA's predecessor the AFS, exists whereby AFMA managers see themselves, perhaps unconsciously, as the agents of the industry. This pervasive culture has extended to fisheries scientists. In my book "Overfishing under regulation" I described many examples where this culture interfered with AFMA's application of two important modern management tools: the precautionary principle and the ecosystem approach. While the case studies in my book are to some extent dated, the discussion above focuses on the current management of the Small Pelagic Fishery. It appears that the problems which I identified over the last two decades have not gone away.

Those who masterminded the replacement of the AFS with AFMA, probably hoped that new modern management practices, which in theory demanded accountability and transparency, would transform the culture of the agency. In those days the vision was for the development of a competent, honest and impartial agency, taking the views of all stakeholders into

account, as the agency applied precautionary and ecosystem approaches to fisheries management. Two decades later, this vision has not been realised.

In my view radical change is necessary now, and as discussed above, there is a global model for an agency with a culture conducive of both technical competence and honesty in dealings with all stakeholders. This model is the *Commission for the Conservation of Antarctic Living Marine Resources* – an international agency based in Hobart. The Commission has achieved international recognition of its efforts to achieve sustainable fishing regimes. Today we need a new Australian agency, modelled in part on the Commission, charged with the management of marine biological assets. Such an agency would manage both fisheries and marine protected areas in Commonwealth waters. Only through such a radical change can the organisational culture within AFMA be reformed.

Review of this paper:

Professor Colin Buxton (University of Tasmania) was invited to comment on this paper in draft form. In reply he stated that: "I do not share your views and in fact disagree with many of your statements and interpretations." However beyond that he offered no specific comment (email 24/9/2012). Professor Craig Johnson (also University of Tasmania) was likewise invited and his comments are available as document 2.43b at <http://www.onlyoneplanet.com/marine.htm>.

Jon Nevill

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