September 17, 2018

To: The Marine Estate Management Authority (MEMA)
submissions@marine.nsw.gov.au

Re: Submission re: MEMA Strategy, the Hawkesbury bioregion assessment, and the "Sydney" Marine Park

Dear Sir/Madam:

Please accept this submission from the Sydney institute of Marine Science as part of your public consultation process, addressing the following:

- Marine Estate Management Strategy 2018-2028

- Hawkesbury Shelf Marine Bioregion Assessment and Marine Park Proposal

About SIMS. The Sydney Institute of Marine Science is a partnership between Macquarie University, UNSW Sydney, the University of Sydney and the University of Technology, Sydney. The partnership is enhanced by collaborations with several NSW State government departments, the Australian Museum and the University of Wollongong. SIMS has over 100 scientists and graduate students associated with the Institute, representing a broad diversity of skills in marine science. SIMS is the largest independent marine science institute in NSW, and is a unique focal point for collaborative marine research and innovation, provision of marine research for policy makers and managers, and research training and teaching in the marine sciences.

The NSW Marine Estate Strategy 2018-2028. SIMS has previously gone on record with its strong support for the work of MEMA and the NSW Marine Estate Strategy. The Strategy represents a bold and comprehensive plan to manage NSW's magnificent and pressured marine estate, including estuaries. The Government has committed significant resources to implement the Strategy over the next two years, and we hope that commitment continues over the current 10 year life of the Strategy as currently framed. The basis for the Strategy and its implementation are underpinned by the State-wide Threat and Risk Assessment (TARA) which describes and ranks threats to the marine estate. The TARA is based on more than 5 years of research which is summarised in comprehensive background documents, and represents an extensive amount of work by Government agency scientists and others.

We are concerned, however, that the TARA and associated documents do not adequately represent some of the significant threats to the NSW Marine Estate generally and to the Hawkesbury Shelf Bioregion (including Sydney) specifically. For example, the TARA concluded that pollution, 4WD beach driving, and cattle consumption of marine flora were ranked as greater threats to the marine estate than the various forms of fishing. SIMS recognises the economic, social and cultural importance of fishing to the people of NSW. However, the available science strongly supports an important and significant impact of fishing on the NSW Marine Estate, which in our view is not adequately represented in the TARA. Recognising that the impact of fishing and the Marine Park component of the MEMA Strategy is likely to be the most contentious aspect of the Strategy, we focus the rest of our submission below on the science behind the consequences of recreational fishing and the important role of Marine Protected Areas and Marine Parks in the management of the marine environment.

In this context, the central point of this submission is that the science supporting the benefits of Marine Protected Areas for both the marine environment generally ***and*** for fish abundance is very strong. The notion which sometimes arises in the discussion about Marine Protected areas or their impact, that "there is no science", is incorrect, and below we detail that science.

The evidence for fishing impacts in NSW is extremely strong, with identifiable benefits when no-take zones are large enough and enforced (Edgar et al. 2014). A selection of recent scientific studies supporting this are summarised in Table 1. We also highlight the impacts of recreational fishing, where we have reproduced a table from a study on the relative impacts of recreational fishing vs. commercial fishing. This recent analysis by the Department of Primary Industry (Fisheries) by West et al. (2015) of data for 10 species of key interest to both commercial and recreational fisheries showed that the recreational sector took 49% or more of the total NSW catch. This study also highlighted reductions in recreational catch rates of desirable fish by about 26% between this survey (2013/14) and the last (2000/01).

Table 9 Harvest of key species in NSW waters by NSW/ACT residents, aged five years and older - indicative estimates of the total weight (tonnes), compared with estimates for the commercial fisheries sector during 2013/14.

	Total (tonnes)			%
Species/group	Recreational	Commercial	Total	recreational
Bream	330	343	672	49.1
Flathead, Dusky	288	115	404	71.4
Flathead, Sand	210	101	311	67.5
Mulloway	103	59	162	63.5
Salmon, Australian	182	1,112	1,294	14.1
Silver Trevally	27	168	195	13.9
Snapper	148	220	368	40.2
Tailor	107	62	169	63.5
Whiting, Sand	69	79	148	46.5
Yellowtail Kingfish	120	109	229	52.5

Selected (ie, non-exhaustive) examples of the impact of marine parks on fish size and abundance, and fishing, are described below in Table 1, including in many instances the *positive* effects on fishing. As one highlighted example, sanctuary zones benefit fisheries when the large breeding fish are resident species, because there is a spill-over of larvae and new small fish (Harrison et al. 2012). We note that spill-over in parks outside of NSW has encouraged the local community to support marine parks (Alemeny et al. 2012).

Table 1. Summary of recent published studies (order chronologically with most recent studies first) on the effects of marine protected areas in coastal regions of direct relevance to New South Wales

Author & Year	**Main results**
Navarro et al. 2018	This study surveyed recreational fishers in ten Australian marine parks, including the proposed Sydney Marine Park. On average, most (63%) recreational fishers who fish in established marine parks support no-take zones, with only 18% opposing them. This pattern of support however depends on the age of reserves: the older the marine park, the stronger the level of support. On average, support for no-take zones increased from 42% to 71% over 15 years, with the most rapid change occurring in the first 5 years after establishment. This study therefore suggests that opposition to no-take zones among Sydney fishers is unlikely to be long-lasting.
Turnbull et al. 2018	This paper is particularly relevant to the proposed park as it specifically measures the effectiveness of ten small (< 3 km2) Aquatic Reserves in the Hawkesbury Shelf bioregion for protection of biodiversity and fish biomass. Concludes MPAs as currently designed in this region are generally not effective, thereby providing a strong justification for improvements to our spatial planning. Authors also conclude that full no-take protection is essential for positive conservation outcomes, as partially protected areas are undistinguishable from areas open to fishing. They also highlight the importance of other attributes of individual locations (e.g. structural

	complexity, relative low exposure and protection enforcement) that can strongly influence ecological communities.
Barneche et al. 2018	This paper shows that, for most fish species, larger female fish contribute disproportionally more to the reproductive output of a population than smaller fish. Given that one of the most clear, consistent effects of no-take zones is an increase in the size of fish (by 28% on average globally), these protected areas can have a much larger impact on conserving populations than previously acknowledged by acting as a refuge for bigger mothers that reproduce more.
Harasti et al. 2018a	This study shows very clear effects of implementing protection from fishing in the Port Stephens-Great Lakes Marine Park on snapper (*Chrysophrys auratus*). The abundance and size of snapper increased the most in sanctuary zones after protection, while Habitat Protection Zones had intermediate levels (higher than fished areas, but lower than no-take sanctuary zones). Surveys were done offshore and we note that the size of sanctuary and habitat-protection zones in PSGLMP are relatively large compared to existing Aquatic Reserves in the Hawkesbury Shelf bioregion.
Harasti et al. 2018b	Study from Port Stephens Great Lakes Marine Park showing five fishery targeted families (Labridae, Scorpaenidae, Sparidae, Monacanthidae and Cheilodactylidae) increased in relative abundance within no-take zones as compared to fished zones.
Edgar et al. 2018	This Australia-wide study with data from 2005-2015 shows clear conservation gains derived from marine protected areas in shallow reefs. Populations of exploited fishes declined by 33% in fished areas, while *increases* of 25% were observed within no-take areas. The biomass of large fishes decreased by 36% and 18% in fished and partially protected reefs, respectively, but was maintained through time inside no-take areas.
Malcolm et al. 2018	Study from the Solitary Islands Marine Park that demonstrates clear positive effects of no-take zones on four species targeted by fishers: snapper (*C. auratus*), grey morwong (*Nemadactylus douglasi*), pearl perch (*Glaucosoma scapulare*) and venus-tuskfish (*Choerodon venustus*), all of which were more abundant and larger in sanctuary zones. In contrast, there were no differences in the abundance of these species between partially protected and fished areas.
Coleman et al. 2015	Study encompassing all NSW marine parks (Cape Byron, Solitary Islands, Port Stephens-Great Lakes, Jervis Bay, Batemans) showing a greater abundance of larger bodied species inside no-take sanctuary zones.
Soler et al. 2015	Analysis of 79 marine reserves world-wide proved that reserves increased the overall biomass of the fish community – and not just the targeted species. Some ecological (i.e. trophic) groups such as carnivores, herbivores, planktivores, etc., were significantly greater by 40 to 200% in effective no-take MPAs compared to fished areas. An "effective" reserve is one where there is no-take for over 5 years and reasonable compliance.
West et al. 2015	Recreational fishing by the vast urbanised population has a substantial impact on fish communities. The magnitude of fishing activity in NSW was evident in a detailed, 12 month telephone survey of 9,400 households and 1,700 detailed follow-up interviews. Between 8% and 20% of NSW/ACT residents go fishing at least once per year, averaging 11.7% (a decline from 16.6% in 2000). Importantly, the total harvest weights of recreational catch were greater than the commercial catch in 5 of the 10 key species: dusky flathead (71%); sand flathead (67%); mulloway (63%); tailor (63%); yellowtail kingfish (52%). Bream (49%), sand whiting (46%) and snapper (40%) were slightly less than half the commercial catch.

Kelaher et al. 2014	In the Batemans Bay Marine Park, this extensive study showed from 4 years of monitoring that 6 no-take reserves had on average 38% greater fish abundance than 12 partial or no reserve protection. Interestingly, the response in fish abundance was related to compliance actions within only 5 years of the park's establishment.
Coleman et al. 2013	This study shows some clear effects of protection from fishing after only 5 years of establishing the Batemans Bay Marine Park. In particular, red morwong was 50% more abundant in sanctuary zones than in partially protected areas, and 75% more abundant when compared to open fished areas. Abalone were also more abundant in sanctuary zones than in either partially protected or fished areas.
Curley et al. 2013	This study showed significant effects of excluding spearfishers in the small Gordons Bay partially protected area which had approximately double the number of legal sized red morwong and yellowfin bream.
Harrison et al. 2012	Genetic parentage analysis in marine parks around Great Keppel Island showed that 3 MPAs exported 83% of coral trout and 55% of snapper. The reserves account for just 28% of the local reef area, yet produced approximately half of all juvenile recruitment to both reserve and fished reefs within 30 km.

The Table above highlights the utility of Marine Protected Areas as an effective management tool, including for managing fishing and fish stocks. More broadly, we support the nine Management Initiatives indicated in the MEM Strategy, but we note limited action in these Initiatives to manage recreational fishing, which in NSW represents a major extractive component, particularly in estuaries.

Initiative 6.8 aims to "work with fishing sectors and tourism authorities to investigate and implement opportunities to promote fishing in NSW". We hope this aims at increasing sustainable fishing practices, rather than encouraging more fishing pressure, which would only increase the threat. Initiative 6.5 aims to integrate various commercial, recreational and cultural fishing data and new research into the Monitoring Program to address key knowledge gaps associated with harvest and bycatch. We support this, as well as a future Environmental Impact Statement on recreation fisheries, to complement the commercial fishery EIS's.

Comments regarding the Hawkesbury Shelf marine bioregion assessment, with particular reference to "Sydney Marine Park". SIMS welcomed the draft proposal for the Sydney Marine Park, which fills the prominent gap in NSW/Australia's bioregional marine park plan, and which proposes 34 sites for protection from Newcastle to Sydney. Some of these sites have a history of protection from exploitation, so it is pleasing to see these perpetuated in the new Plan. We understand that the MEMA agencies undertook a detailed site by site analysis which underpins the proposal. Thus here we make general comments on the overall documents rather than comment specifically regarding the location of individual proposed sites (though we have expertise to speak to this, if requested).

We note that earlier this week, during the drafting of this submission, the Minister has announced that the Sanctuary ("no take") zones have been removed from the Marine Park Plan. While recognising this decision, we feel it remains important that the comments below are part of the public record. Our concerns below are based on global best practise

regarding no-take areas and global and local evidence on the impact of fishing on marine biodiversity, noting key fisheries species such as snapper and mulloway have declined due to fishing (Stewart et al. 2011).

Is 2.4% by area of no take 'Sanctuary Zones' sufficient? This area would represent the lowest area of marine no-take protection in Australia (compared to 30% of the Great Barrier Reef Marine Park and over 7% of the remainder of the NSW Marine Estate). Protecting only 2.4% from all fishing is likely to have only a marginal and very local positive impact on biodiversity in the NSW Marine Estate, based on the work of Turnbull et al. (2018). We recommend increasing the overall no-take areas to at least 7%, in keeping with the remainder of NSW, and suggest this is done by:

(a) increasing areas of the 17 recommended Sanctuary zones.
(b) adding new Sanctuary zones between southern Sydney and Wollongong, where a large gap currently exists.

The size of no-take areas is a key factor influencing the effectiveness of marine protected areas (Edgar et al. 2014). Larger no-take areas would not only protect fishes and habitats from direct fish removal and its consequences but also reduce fishing debris, a major source of marine debris (e.g. Smith et al 2014). We recognise that even smaller reserves such as Cabbage Tree Aquatic reserve have been shown to be effective if well-enforced (Turnbull et al. 2018).

We note the establishment of a new category of spatial protection, i.e., "Conservation Zone", covering a further 2.6% of state waters, which would prohibit all fishing, except for lobster and abalone. We note that it is likely to be difficult to ensure compliance when some forms of legal fishing for lobster and abalone will be allowed.

Despite these being well-regulated high value fisheries, allowing lobster fishing in conservation zones is concerning because rock lobsters are among the most important predators of the urchin *Centrostephanus rodgersii*, a crucially important ecosystem engineer species in eastern Australia (Ling et al. 2009). Global evidence shows that the removal of lobster and other urchin predators can lead to trophic cascades, causing profound regime shifts as large populations of urchins overgraze canopy seaweeds like kelp and form extensive barrens (Babcock et al. 1999; Ling et al. 2009).

The effectiveness of no-take sanctuary zones in increasing abundance of large lobsters (and other predators) to the point where they reduce the density of urchins and lead to the re-establishment of kelp has been demonstrated in New Zealand following decades of protection (Babcock et al. 1999; Shears & Babcock 2003; Spyksma et al. 2017).

Urchin barrens are a major feature in the heavily populated coastline between Newcastle and Wollongong (Glasby et al. 2017), and on the south coast of NSW. While the re-establishment of kelp beds *via* increases in lobster biomass would take decades to occur given the known lobster-urchin-kelp dynamics (Marzloff et al. 2016), any efforts to re-establish predator biomass are likely to have positive impacts. Conservation zones should

not be treated equivalently to Sanctuary zones given the importance of predation by lobsters as an ecological process.

We would be happy to provide further comment to MEMA as requested.

Sincerely,

Professor Peter Steinberg
Director, Sydney institute of Marine Science (SIMS)
on behalf of SIMS and the SIMS Scientific Advisory Committee

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