Review: Effectiveness of the Great Australian Bight Marine Park in protecting the Australian sea lion (*Neophoca cinerea*) from by-catch mortality in shark gill-nets.

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This is an excellent report that directly addresses the limited terms of reference defined for the project. The authors are all highly competent and professionally appropriate to undertake such a review. Indeed, it would be hard to establish a more authoritative group on this topic. The authors appear to have used all relevant and available data, and have utilised the best tools for determination of foraging spatial effort.

As the authors note in their assessment, many of the analyses were conducted on the basis of few, and often difficult data. Population trend data lack informative time-series, estimates of bycatch rates could only be based upon a relatively small sub-set of fishing effort, and PVA analyses had to use proxies for some variables. The authors were clear about these difficulties, and their conclusions and recommendations reflect their caution.

In many scenarios, assessments with limited data such as these would yield a low power of making a clear determination of the effectiveness, or otherwise, of a management action (in this case the limitations to gillnetting in the GAB Marine Park). This is not the case for this review. Although extrapolations of impact of bycatch are based on few observed events what is clear is that:
- Bycatch of Australian sea lions, including reproductive females, does occur at some level inside and outside of the limits of the Marine Park.
- Estimates of bycatch used in the report may well be biased downwards as animals fall from the nets during the haul.
- The small populations of sea lions breeding in the vicinity of the Marine Park are, by any measure, highly vulnerable to even very low rates of mortality from fishing.

While captures of sea lions in fishing nets are relatively infrequent, they are not rare. The scale of effort and the small number of sea lions breeding and feeding in the region mean that the most plausible scenario is that unsustainable numbers of animals are killed in the fishery.

Given the scale of uncertainty around some of the estimates the authors were required to use in their assessment, there remains a great deal of potential for technical arguments about how some of these estimates might be varied. In my view the estimates selected are well founded and plausible, and even substantial variations in these are highly unlikely to alter the ultimate conclusion that the Marine Park does not currently protect sea lions.

One of the biological assumptions that conclusions are likely to be highly sensitive to is the determination of the sea lions population trend. Consideration of this should most appropriately be done in the broader context of what we know about the population over its entire range. PVA analyses in the analysis saw times to extinction being relatively short if populations were currently declining or where stable. Only with high rates of

growth were these times extended, or were 'sustainable' removal rates achieved. Given the low fecundity of this species, its extreme natal fidelity, and historic data of population trend from the whole range, the most parsimonious conclusion that could be defended for this population is that numbers are stable, and possibly decreasing.

I differ in my view from the authors on only one of their conclusions and recommendations. They attest a need to establish a rigorous program for monitoring pup abundance in GAB. While this is of course desirable and may even be appropriate, I believe any decisions on monitoring should be made in the context of management decisions that may flow from this review – as well as the broader context of the future management of the shark fisheries. Any management decisions made should have measurable objectives (e.g. reduce bycatch rates to x/unit of effort, where x might be 0), and monitoring should then be designed on the basis of that decision. It is logistically unfeasible to monitor every sea lion breeding colony over the species full range, so decisions on which colonies to acquire meaningful time-series data should be made in a whole population framework.