Comments in regard to the Environmental Impact Statement (EIS) "Marine finfish cage trials – Providence Bay

Application number:	SSI 5118
Location:	Providence Bay, Port Stephens
Proponent:	NSW Department of Primary Industries

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General comments

The proposed lease falls within a documented white shark nursery area (Bruce and Bradford 2011, 2012a) and will specifically be in an area that has a known, high level of white shark activity. The nursery area footprint extends from approximately the middle of Stockton Beach, north - including Bennett's Beach (Hawks Nest - Providence Bay) to waters off Mungo Brush north of Broughton Island and over depths ranging from the inshore surf zone to the 120 m depth contour approximately 15 – 20 km offshore (Figure 1). Juvenile white sharks are most common in the nursery area from spring to mid-summer although individuals may visit the area at various other times of the year. Most white sharks recorded from the area are 1.8-2.6 m in length; occasional visits by larger sharks to the region have also been reported. This high level of white shark activity will occur regardless of the presence of an aquaculture lease. However, interactions between white sharks and aquaculture cages have been recorded in a number of areas (eg South Australia, Tasmania, Mexico, Libya – see Malcolm et al. 2001, Galaz and de Maddalena 2004) and thus it would be inevitable that a lease in the area north of Cabbage Tree Island would see some level of interaction and a resultant influence on the behaviour of white sharks in the region. The significance of such impacts to sharks in the surrounding area is difficult to determine at this stage and the EIS correctly points to the need to establish research actions to identify and if necessary reduce such impacts.

White shark interactions have been recorded in South Australia around cages containing each of the main species listed under the DPI proposal (Bruce 1998) and these interactions have resulted in a variety of responses to operations including the observed presence around cages and entry of sharks into similarly designed cages, despite the presence of anti-predator nets. The results of such entry have ranged from the killing of the shark for removal (http://www.portlincolntimes.com.au/news/local/news/general/officers-kill-shark-farmers-praised/398728.aspx) to examples of successful release (eg http://www.scmp.com/article/419643/great-white-swims-shark-heaven-south-australia). In each of these examples, the size of sharks interacting with finfish cages have been greater (3.5 – 4.5 m) than the size range most commonly present in the Port Stephens region. It is thus hard to predict what the full nature of interactions of smaller sized sharks may be with the proposed finfish aquaculture activities in the area.

At least some juvenile white sharks return to the Port Stephens area on an annual basis (Bruce and Bradford 2012b) Although interactions may be seasonal and intermittent, repeat interactions by individuals over the five year life-time of the research lease is likely. There is some evidence for long-term changes in the residency patterns of white sharks at sites where a regular anthropogenic source of attraction is provided, even in the case where such sharks are only temporary residents and where they receive little measurable reward (Bruce and Bradford *in press*).

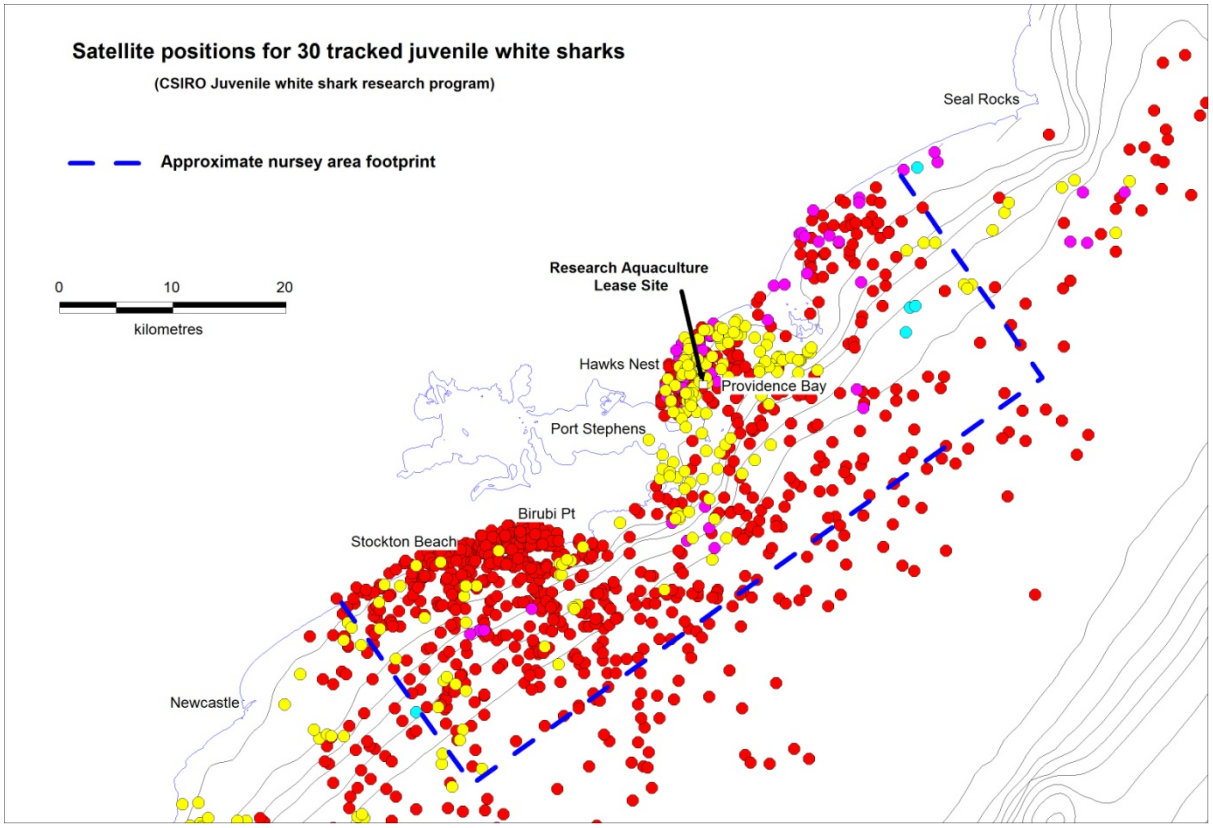

Figure 1: Recorded positions of white sharks satellite-tracked under CSIRO tagging programs (2007 -2012) in the Port Stephens region. Data are combined from 30 individual shark tracks; colours indicate different data files held by CSIRO rather than individual shark tracks. The proposed lease site is located in an area of high white shark 'traffic' [Data from Bruce and Bradford (2012) and held by CSIRO Marine & Atmospheric Research].

There are few reports of white shark sightings at recreational dive sites in the overall region of Providence Bay. However, given that white sharks are relatively common in the area (compared to other similar waters in NSW) it is possible that sharks currently visit, or at least pass through, these sites. The lack of sightings suggests that this is either infrequent behaviour or, more likely, that the sharks remain cryptic in the process. Thus the significance of any sightings of white sharks made by recreational divers after the introduction of the lease will be hard to interpret (ie whether it is a chance sighting event, or represents a change in shark behaviour). Similarly, not all interactions between sharks and vessels/infrastructure are easily observed (Huveneers *et al.* submitted), thus surface-based observations from aquaculture cages or support vessels are unlikely to detect all such behavioural responses.

Although the reporting of sightings of sharks and interactions will be a valuable source of data after the lease is established, interpreting the implications of any sightings in terms of a resultant impact from the presence of finfish cages and associated operations will be difficult. The above indicate that it will be crucial to establish a shark monitoring program that is independent of visual-based observations. The use of acoustic receivers and acoustic tags is an obvious candidate for monitoring shark behaviour and has been used successfully on white sharks in the Port Stephens area (Bruce and Bradford 2008, 2011, 2012a + b). This is correctly noted in the mitigation measures described in the EIS.

In order to monitor any impacts on shark behaviour (including residency, movement patterns and visits to areas used by recreational divers, etc) it would be crucial that sharks continue to be tagged in the area and that acoustic receivers are deployed at a variety of sites starting from before the commencement of operations at the lease site. Monitoring should occur over a sufficient time period

to establish the current ‘pre-lease operations’ behaviour of sharks for comparison to during and after the operational period. Receiver deployments and the tagging of sharks should continue throughout the lease period to assess any behavioural responses. CSIRO acoustic receivers are currently present in the Providence Bay area and provide some information about white shark residency and behaviour in the region. However, these existing deployments are part of research projects with different objectives to that specified in the EIS and are not designed to specifically identify the patterns of white shark habitat use and residency at the lease site, nor at other sites where recreational water activities occur (e.g. SCUBA diving). The deployment of additional receivers dedicated to questions regarding the impact of the lease on shark behaviour in the area should be deployed under an appropriate experimental design. CSIRO tagging programs, to date, on white sharks in the area provide a basis for designing an appropriate acoustic receiver deployment strategy for monitoring these effects.

References

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