ADVICE TO:	**PIRSA FISHERIES AND AQUACULTURE (PROF. GAVIN BEGG – EXECUTIVE DIRECTOR)**
FROM:	**DR BEN STOBART (SARDI AQUATIC SCIENCES)**
SUBJECT:	**POTENTIAL IMPACTS TO GIANT AUSTRALIAN CUTTLEFISH POPULATION FROM SHOCK WAVES CAUSED BY LIVE FIRING**
DATE:	**8 JUNE 2022**

KEY ISSUES

- The Giant Australian Cuttlefish spawning aggregation at Point Lowly is unique.
- There has been public concern that military activities in the Cultana Training Area located North of Point Lowly may generate significant sound that could impact the cuttlefish aggregation. The Cultana Training Area has been in operation for several decades, during which the cuttlefish population has both increased and decreased.
- Defence does not fire ammunition into the sea and does not currently use the Cultana Training Area for marine or amphibious training activities.
- High level sound is likely to negatively impact cuttlefish senses, as demonstrated in both in situ and tank trials, and therefore represents a potential risk to cuttlefish. However, land-based explosions at the firing range occur several kilometres from Point Lowly and resultant sound waves would likely be significantly reduced before reaching the cuttlefish breeding area and expected to be well below the level demonstrated to harm cuttlefish.
- Given Defence does not fire into the sea and the long distance from the land-based firing range to the cuttlefish aggregation area, it is likely that the risk posed by Defence generated sound to the Point Lowly cuttlefish population is low.

BACKGROUND

The Giant Australian Cuttlefish is an iconic species of South Australia and the spawning aggregation at Point Lowly is unique. The Australian Ministry of Defence conducts regular live firing exercises at the Cultana firing range north of Whyalla (Figure 1). PIRSA Fisheries and Aquaculture have requested advice on the potential impacts to cuttlefish from shock waves caused by live firing.

RESULTS/DISCUSSION

Sound in water travels faster, covers greater distances, and attenuates less than in air (Kunc et al. 2016), and there has been growing concern over the potential impacts of anthropogenically generated sounds on marine life (Hawkins et al 2015). Very little is known about the detection of sound and vibration by aquatic invertebrates, but there is evidence from an *in-situ* study (Solé et al 2017) that superseded and confirms the results from a previous tank study (André et al 2011). Both studies showed that high sound levels can adversely affect cuttlefish by causing direct damage to statocysts and that acoustic trauma can be triggered at approximately 140dB. Statocysts are sac-like structures that may allow cephalopods to detect particle motion associated with sound waves in water and assist orientation.

There has been public concern that military activities in the Cultana Training Area located North of the Point Lowly area (Figure 1) may generate significant sound that could impact the annual cuttlefish aggregation. Of particular concern would be explosions within the marine environment,

as these are known to generate seismic waves that may travel relatively large distances and be detected by animals with particle motion detectors, including invertebrates (Hawkins et al. 2015).

The Range Control Officer for the Cultana Training Area has confirmed that Defence does not fire into the sea and does not currently use the Cultana Training Area for marine or amphibious training activities and there are currently no plans to use it for these purposes in the future. In addition, Defence has identified that “There have been no marine impacts of Defence’s land-based training identified to date”. Defence has also stated, regarding land-based activity at Cultana, that “This training may comprise of infantry manoeuvres, armoured vehicle training or artillery live firing, as well as a number of supporting activities”. While these activities potentially generate a lot of sound, they take place several kilometres from the Point Lowly cuttlefish aggregation and are intermittent.

The volume and extent of the Defence land-based sound reaching the marine environment from the Cultana Range is unknown. However, it is reasonable to assume that the land-based sound generated by Defence will be greatly reduced in intensity given its transmission over several kilometres and transfer between media (land/air and the sea). Residual sound reaching the aggregation area is therefore highly unlikely to be at a level sufficient to be detrimental to the cuttlefish. The Cultana Training Area has also been operational for decades, during which the cuttlefish populations at Point Lowly have increased and decreased. The largest cuttlefish counts on record occurred recently in 2020. There is no evidence that military activities in the Cultana Training Area have had a negative impact on cuttlefish during this time period.

Overall, it is likely that the risk posed by sound generated at the Defence Cultana Training Area to the Point Lowly cuttlefish population is low.

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Disclaimer

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Figure 1. Location of Cultana training area (information provided on Whyalla City Council website https://www.whyalla.sa.gov.au/our-city/cultana-training-area). Location of Point Lowly cuttlefish breeding area shown in red.

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CULTANA TRAINING AREA