Abalone Industry Reinvestment Fund (AIRF)

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Risk Profile for the paralytic shellfish toxins (PST) from *Alexandrium cantenella* in Tasmanian sea urchins

Lead Agency: Institute for Marine and Antarctic Studies (IMAS)
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Aims and Objectives:

- Determine PST levels in two species of commercially harvested urchins on the east coast of Tasmania during blooms of PST producing algae
- Complete a risk profile on PST accumulation in *Heliocidaris erythrogramma* and *Centrostephanus rodgersii* on the east coast of Tasmania as a result of *A.catenella* blooms to support public health and market access risk management activities.

Final Report:

Executive summary

This risk profile aims to determine if there is a human health risk associated with paralytic shellfish toxin accumulation in Tasmanian sea urchin roe that requires management.

The urchin industry in Tasmania has been processing and marketing roe on a small scale for decades, based mainly on the native species *Heliocidaris erythrogramma* (Shortspined Sea Urchin). The industry has expanded in recent years, as a result of the incursion of the introduced pest urchin species *Centrostephanus rodgersii* (Longspined Sea Urchin), which causes large-scale urchin barrens on the east coast of Tasmania, and concomitant impact on valuable fisheries and marine biodiversity.

An impediment to the growth of this industry is the risk of biotoxin accumulation during the recurrent blooms of paralytic shellfish toxin (PST) producing microalgae *Gymnodinium catenatum* in south-east Tasmania and *Alexandrium catenella*, which occurs generally between July and November along the east coast of Tasmania.

Little is known about PST accumulation by sea urchins, and a conservative management approach has been taken thus far to protect both public health and market access. In such scenarios, risk managers will commonly outsource a preliminary risk assessment (known as a risk profile).

Risk profiles provide a summary of all information pertinent to food safety associated with the specific hazard/food combination. The purpose of a risk profile is to assist initial risk management activities, such as identifying future actions required (if any), and the options for food safety management programmes. They also inform the level of resourcing required to control the hazard/food pairing.

The consequence of human exposure to PST through consumption of seafood varies with the concentration of toxin in the seafood, the amount of seafood consumed, and the body weight (bw) of the consumer. Illnesses from paralytic shellfish poisoning range from mild to severe, with fatalities a rare end point.

A survey of 228 Tasmanian urchin roe samples consisting of at least 353 individual urchins (71 of these sampled when adjacent bivalve molluscs exceeded the regulatory level and a further 30 when PST were detected in bivalves below the regulatory level), found only one confirmed detection of PST above the laboratory level of reporting (0.1 mg STX equiv. /kg) in a pooled sample of *H. erythrogramma* roe taken during a *Gymnodinium catenatum* bloom (0.12 mg STX equiv. /kg). Trace levels of PST below the laboratory level of reporting were found during confirmatory analysis of an additional two urchin samples (<0.03 mg STX equiv. /kg). A further 14 urchin samples returned low level PST screen results and confirmation of PST levels did not occur. Thus all samples were well below the regulatory level for bivalves of 0.8 mg STX equiv. /kg).

There is some evidence from overseas that some urchin species can accumulate PST. The maximum PST level reported is 8.34 mg STX equiv. /kg in all viscera (internal organs including roe) of a non-commercial, Chilean sea urchin *Pseudichinus magellanicus*.

A review of serving sizes determined a range of 6 – 170 g of roe per meal.

A small adult consuming a large portion of roe at the maximum PST concentration reported in the present risk profile will consume 0.34 μg STX equiv. /kg bw. This exposure level is less than both the European Food Safety Authority and Food and Agricultural Organisation/World Health Organisation acute reference doses (ARfD) of 0.5 and 0.7 μg STX equiv. /kg bw respectively, and considerably lower than the ARfD estimated by Finch et al. [5] of 7.3 μg STX.2HCL equiv. /kg bw.

Tasmanian sea urchins are exposed to PST on a regular basis as they are harvested from coastal areas that support regular blooms of toxic algae. There is considerable evidence that Tasmanian urchins do not accumulate PST to levels of concern in the roe (the consumed tissue for urchins) during *A. catenella* blooms. Whilst this may also be the case during *G. catenatum* blooms, we cannot rule out PST accumulation in this circumstance due to a lack of sampling effort during these blooms.

On the basis of the results presented in this risk profile, the probability of Tasmanian urchin roe accumulating concerning levels of PST during *Alexandrium catenella* blooms is low. Risk during *G. catenatum* blooms is currently unknown due to limited sampling during these blooms. The current control measures are highly conservative. There is no evidence that controls are needed to mitigate PST risk during low to moderate *A. catenella* blooms, although monitoring during more extensive blooms may be appropriate, as few urchin samples (n=5) have been collected during *A. catenella* blooms when PST in bivalves exceeded 10 mg STX equiv. /kg. This is based on extensive sampling (101 sea urchins) during risk periods, where PST in bivalve shellfish exceeded 0.1 mg STX equiv./kg at the time and location of urchin sampling. Among the urchin samples collected during these periods, 70% were collected when bivalve PST levels had exceeded the ML (i.e. 71 urchins, including 45 *H. erythrogramma*, 7 *C. rodgersii* and 19 urchins where species was not recorded). These animals were collected on 15 different sampling occasions and analysed for PST as 42 individual and 4 pooled samples.

We recommend a review of the current risk controls based on the information presented in this risk profile. In particular:

1. Consideration of when risk controls are necessary;
2. De-linking urchin testing from PST results in abalone on east coast;
3. Using risk monitoring results from other seafood biotoxin monitoring in Tasmania to indicate potential PST risk associated with *G. catenatum*, considering both where and when harvest activity is occurring.

We also recommend consideration of the following activities to address the current knowledge gaps:

1. Testing of urchins for PST during elevated PST activity associated with *G. catenatum* and during high *A. catenella* blooms when PST in bivalves exceed 10 mg STX.equiv. /kg, with consideration given to more frequent (e.g. weekly monitoring) during and after these blooms.
2. Testing urchin viscera during all toxic algal blooms to ascertain why some international and local results differ, maintaining a record of where urchins were sampled (healthy reef vs. urchin barrens).

Full Final Report