NSW SHELLFISH PROGRAM EVALUATION

NSW GOVERNMENT Food Authority

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Introduction

The NSW Food Authority regulates the harvesting of shellfish in NSW in a collaborative arrangement with shellfish producers to minimise the risks of foodborne illness associated with consumption of raw shellfish. The Food Authority employs a team of professional staff who manage the NSW Shellfish Quality Assurance Program. Shellfish regulated under this program include farm-produced oysters and mussels, and wild harvested pipis, cockles and clams. In New South Wales (NSW), bivalve shellfish aquaculture stretches along 2,000 km of coastline with a farm gate value of more than $AUD 47 million per year (Jefferson, 2018 - NSW DPI Aquatic production report 2016-17).

The NSW shellfish industry operates under a mix of State and Commonwealth legislation. NSW shellfish producers are regulated under the *Food Regulation 2015* through the Seafood Food Safety Scheme. This requires all NSW producers to be licensed with the Food Authority as a mandatory condition of operation. Commonwealth regulation consists of the Australia New Zealand Food Standards Code, export controls and the Australian Shellfish Quality Assurance Program (ASQAP) – a shellfish program operation manual. The Program is delivered under the framework provided by the ASQAP manual.

Supporting an industry that sells a raw product grown in a natural environment and impacted by population growth and urban development is a challenge for both the NSW Government and shellfish producers. The waters in which the shellfish are grown are located at the end of the catchment, where there is a mixture of upstream and ocean water. Good water quality is vital for shellfish production. However, maintaining and improving water quality is not under the direct influence nor jurisdiction of the Food Authority or shellfish producers.

The NSW Shellfish Program

The NSW Shellfish Program (program) has been managed in its current format since 2005. It is administratively complex, delivered in 27 estuaries along the NSW coastline from the Tweed River in the North to Wonboyn River in the South.

The Food Authority employs a team of five staff to manage the program, and to support enquiry lines. These enable pollution reporting and the opening and closing of harvest areas outside of office hours.

As at September 2015, NSW had 71 active harvest areas for oyster and mussel production, and 22 beaches where pipis, cockles and clams are harvested. There were also 243[1] licensed shellfish producers and 39 wild shellfish harvesters, with the area under aquaculture lease licensed by the Food Authority covering 2,665 hectares.

On average, $448,522 is collected annually in licence fees from industry. The annual program expenditure is $1,240,706. The net cost to government for delivering the program is $763,262 annually, or $2,679 to $3,073 per shellfish producer.

The Food Authority administers the licensing of shellfish producers and wild shellfish harvesters, conducts audit and compliance activities, investigates foodborne illness outbreaks and completes risk assessments and periodic end product verification testing.

Estuaries are subdivided into harvest areas from which mainly oysters are produced. There is also one mussel farm and three sites for cockle collection. Harvest area boundaries are determined if there are different environmental conditions that could affect the shellfish. These areas restrict where shellfish can be safely collected for commercial harvest. Each harvest area has a management plan which specifies the conditions and criteria under which harvest may be conducted.

In 2015 there were 71 active harvest areas, 17 of which were conditionally approved, 34 conditionally restricted, Clarence River is unclassified – provisionally restricted, Wooli River is approved – split management, Kalang River is prohibited, 18 approved dual management. Three harvest areas were inactive, and Jervis Bay had two harvest areas undergoing classification. Eight estuaries had harvest areas which were seasonally closed during the study period.

Pipis are harvested for six months of the year from approximately 22 NSW beaches. Clams and cockles are harvested by off-shore dredging from Beauty Beach Point. The program determines when the harvest area or beach can be opened or closed for harvest.

Twenty-one harvest areas were registered for export. Nine estuaries have been quarantined to prevent the spread of oyster diseases, meaning that there are restrictions on the movement of oysters from these estuaries.

The evaluation

Objectives

The evaluation's objectives were to:

- Document the implementation of the Program between 2010 and 2015;
- Compare the Program's objectives with its achievements and recommend improvements, if required;
- Determine if efficiencies could be gained through new monitoring technologies and risk analysis by location; and
- Survey key stakeholders about the Program's benefits and any areas needing improvement.

Scope

Pre-harvest and harvest activities in the shellfish supply chain, excluding storage, transport, processing and retail operations. The evaluation included oyster and mussel production and pipi and cockle collection. Data analysis focused on the financial years between 2010 and 2015.

Methodology

Internal Food Authority data and external shellfish industry data was reviewed. Internal Food Authority data included all shellfish program monitoring data, annual and triennial reviews, licence and compliance statistics, and financial data. External data included shellfish production statistics from NSW Department of Primary Industries (DPI) Fisheries, industry statistics from the Australian Bureau of Agricultural and Resource Economics (ABARE), foodborne illness statistics from OzFoodNet and shellfish product recalls from the Australian Competition and Consumer Commission (ACCC). The NSW Shellfish Industry Committee was consulted on the evaluation plan and evaluation process.

Perceptions of the current program and suggested changes were captured through face-to-face interviews with 25 harvest area coordinators and surveys completed by six shellfish industry representative members, four wild shellfish harvesters and 17 shellfish academics.

Evaluation questions

The key evaluation questions were:

- Is the Program achieving its objectives and can improvements be made?
- Can delivery efficiency of the Program be improved?
- How effectively has the Program communicated with the coastal councils and is this making a difference?
- How effectively has the Program communicated with shellfish growers?

- Is the monitoring program in use by the Food Authority appropriate?
- Are there any unintended consequences due to the Program?

Key findings and recommendations

Shellfish industry consultation revealed overwhelming support and appreciation for the Program and staff, with all local area coordinators agreeing that the Program provided good assurance of a safe product for human consumption.

Since the Program implemented ASQAP in 2005 there has only been one recall and two foodborne illness outbreaks associated with NSW shellfish.

Notwithstanding these positive findings, shellfish producers made several suggestions on how the Program could be refined, and the evaluation highlighted ways to improve program delivery.

1. Program management and delivery

The highest risk to the continued quality delivery of the Program is staff turnover. The program's delivery is complex and requires a high level of scientific knowledge covering a broad range of academic fields. It takes approximately three years to fully train a new staff member in program delivery. Staff have high workloads and frequently do overtime. Staff manually enter a large volume of information into the Food Authority's database.

The evaluation recommended that one full-time staff member be added to the Program, subject to efficiency changes and funding availability.

2. Water quality and shellfish meat monitoring

The Program manages a comprehensive water quality and shellfish meat monitoring program. There are over 630 monitoring sites, 22 beaches, and over 8,500 samples taken each year. The annual cost of testing is approximately $675,000. Its purpose is to provide data to manage the risks of bacterial, viral, biotoxin and other contaminants to shellfish which could affect human health.

The most immediate way the Program controls foodborne illness risk is to close harvest areas if the triggers in the management plan are exceeded. This process results in an average of 381 closures per year, not including seasonal closures. The factors which will close a harvest area are:

- Rainfall above the management plan limits.
- Sewage spills.
- Water quality or shellfish meat test results above management plan limits.
- Outbreak of foodborne illness assumed to be related to shellfish such as Hepatitis A or Norovirus.
- Voluntary seasonal closures.

High rainfall is the most common reason for closing harvest areas. A sewage spill assessed by the Program as having the potential to contaminate a harvest area results in a 21-day mandatory closure. Foodborne illness related outbreaks linked to a harvest area will also result in a closure and the duration of the closure depends on identifying the source of pollution and the length of time it will take to resolve the issue identified.

The monitoring program for each harvest area was designed conservatively to prevent foodborne illness outbreaks. However, with good water quality and shellfish meat data the evaluation recommended that individual harvest area management plans be reassessed to tailor monitoring requirements.

Bacterial risk monitoring program

Pathogenic organisms, including bacteria, viruses and protozoans, are associated with faecal waste and can cause a variety of human illnesses when associated with consumption of contaminated shellfish. Indicator species such as faecal coliforms are used to measure the bacterial quality in water.

The evaluation found that the Program thoroughly monitors and manages the risk of bacterial contamination of shellfish. This monitoring includes surveillance of potential risks through shoreline surveys; assessment of sewage spills for the potential to affect harvest areas; faecal coliform monitoring as an indicator of sewage in the growing environment; and testing shellfish meat for *E. coli*.

However, there is still an ongoing risk of contamination to shellfish from sewage spills or water pollution events. Closure of harvest areas because of spills impacts on the productivity of that area. Following a sewage spill, the harvest area is closed for 21 days and only reopened if the parameters of the harvest area management plan are met. The Shellfish team relies on informal communication with local councils and water utilities to notify them of sewage spills or discharges. Not reporting spills promptly creates a serious risk for contamination of shellfish.

Pollution incident response plans are required by the NSW Environmental Protection Agency (EPA) as part of councils' or water utilities' sewage discharge licence conditions.

Dry weather overflows and septic systems continue to be a risk for contamination of shellfish. While faecal coliform and *E. coli* monitoring are required after rainfall events, dry weather contamination of waterways may be missed without regular audits and reviews of septic systems and sewage systems by local councils and good observation and communication with the public, local councils and water utilities.

Viral risk monitoring program

Monitoring bacterial levels in oysters is used as a surrogate indicator for viral risk (e.g. Norovirus and hepatitis A). Virus testing is not a requirement under the current program due to high cost, time delays and the lack of an established acceptable limit for virus levels in live bivalves. *E. coli* contamination of shellfish is not always a good indicator of viral contamination because of the ability of shellfish to isolate virus in their blood cells. Viral testing is not routinely undertaken under any International shellfish quality assurance program.

Results from a survey undertaken by the South Australian Research and Development Institute (SARDI) showed that the estimated prevalence of Norovirus and hepatitis A in Australian oysters to be less than 2% and recommended that the results could be used in a scientific risk-based argument against mandatory virus testing. However, some foodborne illness outbreaks have been associated with viral contamination, not bacterial contamination. Occurrences have occurred in Tasmania and in New Zealand.

The evaluation recommended that the Food Authority considers some form of viral surveillance in NSW.

Biotoxin risk monitoring program

Marine biotoxins are poisons that are produced by certain microscopic algae. When shellfish eat toxin-producing algae, the toxin remains in their system. Biotoxins do not harm shellfish but they can accumulate in shellfish to levels that can cause illness or death in humans.

The evaluation found that the Program manages the risk of biotoxin contamination in a meticulous and stringent manner. In NSW shellfish aquaculture production areas, significant phytoplankton blooms have been infrequent. Phytoplankton monitoring acts as a cost-effective early warning system for the potential of biotoxin accumulation in shellfish.

Biotoxin levels have only once exceeded the regulatory limit. There was no associated foodborne illness outbreak and the occurrence was related to an extreme climatic event.

The annual cost of phytoplankton monitoring is approximately $175,950, which is funded by industry and the Food Authority.

Phytoplankton species and toxicity can change over time and blooms are unpredictable. The phytoplankton monitoring program identifies new species. This information is important to determine the risk of foodborne illness and classification of harvest areas.

Phytoplankton data is the dataset most widely used by shellfish academics and provides vital information about the main food source for oysters. It is used for investigation of oyster disease, which is the main risk to the sustainability of the oyster industry, and in the sudden death of oysters and oyster productivity. No other government or private organisation is collecting this information at this scale or detail. Therefore, the evaluation recommended that the frequency of phytoplankton monitoring is reviewed, considering external uses of the data, and the biotoxin monitoring program continue in its current structure,

Although biotoxin exceedance is rare in NSW, biotoxin testing provides a direct measurement of the toxins in shellfish meat and is therefore an important indicator of potential risk to human health.

3. Wild harvested shellfish

Implementation of the wild shellfish harvest program is not well documented and monitoring data (e.g. phytoplankton testing and shellfish testing for biotoxins and *E. coli*) is not available on the Food Authority's database, which made program evaluation challenging. Therefore, making decisions on the efficiency of the program was also difficult.

The evaluation recommended that:

- A procedures manual be written for the wild harvest program, monitoring data be entered into the Food Authority's database (particularly regulatory exceedances), and information regarding opening and closing of beaches already in the database is reviewed and organised, and
- An annual summary for the wild harvest program be written that states which beaches have been harvested from in that year, the volume harvested and any exceedances.

4. Communication

The Shellfish team communicates well with shellfish producers. This is aided by technology, such as text messaging and the internet, to notify producers when harvest areas are opened or closed. The team provides executive support to the NSW Shellfish Industry Committee, which has representatives from different harvest areas across NSW. Communication with local governments and the EPA is also important to prevent, monitor and manage the consequences of spills. Communication with other government bodies, researchers and policy makers could be enhanced.

To enhance communication, the evaluation recommended that annual and triannual reported be published; monitoring data be published via an interactive web mapping application; estuary and state-wide summary products be written; formal communication pathways be developed with local councils which can be audited later; and strengthen links to the EPA including triaging "environment line" pollution report calls to the Food Authority when sewage spill events happen in shellfish growing estuaries.

5. Administrative efficiencies

The administration of the Program is complex and resource intensive. The evaluation identified efficiencies for the collection of licence fees and administration of local levies and product record book data entries.

NSW DPI Fisheries collects production information from producers, which is a duplication of the information collected by the product record books. There is potential for the product record books to be modified to collect the information NSW DPI Fisheries requires, therefore streamlining the reporting of production figures for producers.

The evaluation recommended that only one process be used to collect money to fund the Program, reducing administration costs; that product record books be redesigned and simplified so that the numbers of sheets the producer submits and then entered by the Food Authority are reduced; and an online system be developed so that data entry of product records is available for producers.

Response

The Food Authority has already taken on board many recommendations including:

- Developing a manual for the entire program.
- Transitioning the program's 1 FTE administrative role to a 1 FTE technical role, which will allow the team's workload to be more effectively distributed.
- Continuing the biotoxin monitoring program in its current structure.
- Assessing whether another survey for shellfish viral contamination should be initiated.
- Collaborating with the Food Agility CRC on real-time monitoring of environmental conditions to determine the potential to adjust management plans.
- The completion of a risk assessment of phytoplankton and biotoxins in NSW shellfish aquaculture areas (published in 2017: http://www.foodauthority.nsw.gov.au/_Documents/scienceandtechnical/phytoplankton_and_biotoxin_risk_assessment.pdf).

The Food Authority will also undertake the following additional actions by 2021:

- Review the frequency of phytoplankton and biotoxin monitoring for the wild harvest sector based on a risk assessment.
- Develop a procedures manual for the wild harvest program. Monitoring data is already entered in the internal database particularly for regulatory exceedances, and information regarding openings and closures of beaches is already reviewed and organised.
- Prepare an annual summary for the wild harvest shellfish program which states which beaches have been harvested from in that year and any exceedances. Work in this area is contingent on moving current data capturing and recording systems to an online format.
- Develop a proposal and seek funding for an interactive web mapping application for harvest area monitoring data.
- Strengthen communication pathways with local governments and water utilities regarding pollution reporting.
- Strengthen links with the EPA including triaging "environment line" pollution report calls to the Food Authority when sewage spill events happen in shellfish growing estuaries.
- Investigate the merits of a single process to collect the money to fund the quality assurance program, therefore reducing administration costs to government and saving industry time.

- Consider further review of the design of the product record books so the number of sheets a producer submits, and the number entered by the Food Authority are minimised. A review of the format of product record books was undertaken in 2015.
- Develop a proposal and seek funding for an online system so that data entry of product records is available for producers.

Appendix 1: Definitions

Conditionally Approved means the classification of a shellfish harvest area which meets Approved harvest area criteria for a predictable period. The period depends upon established performance standards specified in a management plan. A *Conditionally Approved* area is closed when it does not meet the *Approved* harvest area criteria.

Conditionally approved – dual management - when the area meets approved criteria some of the time but does not during certain periods. During these periods the area may be closed for harvesting based on the amount of rainfall, the salinity and results of water and shellfish sampling. However, in some instances the area may be open for harvest provided the shellfish are depurated for a certain period prior to sale for consumption. The harvest and depuration condition are based on the level of faecal coliform and *E. coli* present in the water and shellfish flesh respectively.

Conditionally Restricted means the classification of a shellfish harvest area that meets *Restricted* area criteria for a predictable period. The period depends upon acceptable performance standards specified in a management plan. A *Conditionally Restricted* harvest area is closed when it does not meet the *Restricted* harvest area criteria.

Depuration means the process that uses a controlled aquatic environment to reduce the level of certain pathogenic organisms that may be present in live shellfish.

Growing area means a marine or enclosed body of water (i.e. bay, harbour, gulf, cove, lagoon, inlet, estuary or river) in which commercial species of bivalve molluscs grow naturally or are grown by means of aquaculture. A growing area may consist of one or more harvest areas.

Harvest area means an area that has been designated by a competent authority for the purpose of growing and/or harvesting commercial quantities of shellstock and may include wildstock or aquacultured shellstock.

Marine biotoxins means toxic compounds produced by some species of phytoplankton.

Off-shore means at least three nautical miles from the nearest land mass and practicably free from the risk of contamination by pollution sources.

Phytoplankton are photosynthesing microscopic organisms.

Sanitary survey means the (written) evaluation of all actual and potential pollution sources and environmental factors which may affect shellfish harvest area water quality and hence the shellfish.

Shellfish means all edible species of bivalve molluscs such as oysters, clams, scallops, pipis and mussels, either shucked or in the shell, fresh or frozen, whole or in part or process, and harvested for human consumption. The definition does not include spat, or scallops and pearl oysters where the consumed product is only the adductor muscle.

Shoreline survey means a survey conducted by a competent authority to identify and record pollution sources within the catchment of a shellfish growing area which contaminate or have the potential to contaminate the water quality of a shellfish harvest area.

Spat means non-marketable juvenile shellfish which are taken for the purposes of on-growing.

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