Managing aquaculture stock mortalities

Updated April 2019[1]

661/19: This guideline has been prepared to assist fish farmers with selecting suitable methods to dispose of aquaculture mortalities which comply with the Environment Protection Act 1993 and associated environment protection policies.

Introduction

In any primary industry, it is inevitable that stock mortalities will occur throughout the culture cycle. Mortalities can result from disease, poor fish health, mismanagement, sub-optimum water quality and a variety of other reasons. The extent of mortalities may range from day to day mortalities of a few fish[2] to large-scale mortalities resulting from disease, an environmental event (eg algae bloom) or equipment malfunction.

Fish farmers should familiarise themselves with disposal methods that are environmentally sustainable and suitable for their farm. This includes mechanisms for on-site land-based disposal and offsite disposal using commercial facilities (eg composters, rendering plants or waste depots).

It is strongly recommended that fish farmers plan for and determine the methods they intend to use to dispose of dead stock prior to the event occurring. This guideline aims to provide the aquaculture industry with suitable methods for the disposal of mortalities from aquaculture facilities.

Mortalities from aquaculture ventures must be disposed of onshore using reasonable and practicable measures to prevent or minimise environmental harm. Issues which need to be considered when disposing aquaculture mortalities include:

- leaching of nutrients from fish waste into surrounding waters, in particular groundwater
- contamination of soil
- odours associated with decaying fish
- attraction of pests such as birds, rodents and flies
- adverse effects on human health.

Under no circumstances should mortalities be disposed of at sea or into any state waters. All mortalities occurring on off-shore aquaculture sites must be taken ashore for disposal.

The Australian Government Department of Agriculture, Fisheries and Forestry (DAFF) has produced the AQUAVETPLAN which is a series of technical response plans that describes the proposed Australian approach to an aquaculture animal

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1 Updated to reflect current legislation

2 In this document 'fish' may include finfish, shellfish (molluscs and crustaceans) and any other aquatic species.

disease event. Included in AQUAVETPLAN is the Disposal Manual Version 2.0 (2009) which has guidelines on the disposal of dead stock in the event of a disease outbreak. Although this manual is mainly directed towards the disposal of dead stock resulting from disease, methods identified can be used to dispose of stock that die from any cause. Consequently, information presented in this guideline reflects the disposal methods presented in the AQUAVETPLAN Disposal Manual. More detailed information on disposal methods described in this guideline may be found in the Disposal Manual which is available from the DAFF website[3].

Additional information have also been obtained from other documents specifying methods of disposal for stock mortalities such as the *Review of on-farm disposal treatment risks and the potential for recycling of wastes produced from commercial chicken farms and processors* (EPA 1999)[4] and the *National Environmental Guidelines for Piggeries* (Australian Pork Limited 2004)[5].

Principal legislation in South Australia

The disposal of waste in South Australia is primarily controlled by the *Environment Protection Act 1993* (EP Act) and associated environment protection policies.

In accordance with section 25 of the EP Act, every fish farmer has a general environmental duty to take all reasonable and practicable measures to ensure that activities conducted on the aquaculture site do not pollute the environment in a way which causes or may cause environmental harm. This includes the appropriate management of aquaculture mortalities.

The *Environment Protection (Water Quality) Policy 2015* (Water Quality Policy) also provides measures to minimise and/or prevent the likelihood of environmental harm from occurring. The policy states that a person must take all reasonable and practicable measures to prevent or minimise environmental harm resulting from undertaking an activity that pollutes or might pollute waters. Aquaculture mortalities are considered a Class 1 pollutant under Schedule 2 of the Water Quality Policy and fish farmers must ensure that disposal of mortalities is undertaken in such a manner where they will not pollute surface or groundwater.

The Water Quality Policy also promotes the waste management hierarchy (clause 4) in relation to the management of waste. Farmers are encouraged to adopt this hierarchy when disposing of aquaculture mortalities and investigate opportunities to avoid, minimise, reuse, recycle, recover and/or treat waste produced on their farms prior to disposal.

It should be noted that farmers must also notify the Department of Primary Industries and Regions South Australia (PIRSA) if they experience unusually high mortality rates within a period of 24 hours on their farm under regulation 13 of the *Aquaculture Regulations 2016*.

Mechanisms for disposal of aquaculture mortalities

There are a number of mechanisms used to dispose of aquaculture mortalities, some of which may be suitable for small quantities resulting from everyday mortalities, and others that more suited for the disposal of larger quantities of stock resulting from fish kills. Suitable methods identified by the Environment Protection Authority (EPA) for the disposal of aquaculture mortalities in order of preference include:

1 composting

2 reusing/recycling

3 rendering

4 waste depot (landfill)

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3 http://www.agriculture.gov.au/animal/aquatic/aquavetplan/disposal

4 https://www.epa.sa.gov.au/files/8436_chickenfarms.pdf

5 http://australianpork.com.au/industry-focus/environment/national-environmental-guidelines-for-piggeries/

5 onsite burial

6 cremation/burning.

Fish farmers should consider the volume of stock they have on site and their capacity to manage both minor and major numbers of mortalities when determining the most appropriate method of disposal that is environmentally sustainable.

1 Composting

Composting is becoming an increasingly popular method to dispose of organic waste and may be utilised for the disposal of aquaculture mortalities. Some companies will supply and remove onsite composting bins. These bins can be used to dispose of everyday mortalities as well as mortalities resulting from larger fish kills. Composting bins are purpose built and usually have minimal environmental risks associated with odour and leakage, if used correctly.

Alternatively, farmers may construct their own composting system with the following recommended requirements:

- Systems must be constructed on a surface with very low permeability (eg compacted clay).
- Provisions must be made to divert stormwater away from the composting area or prevent it from leaving the composting area so that groundwater and surface water does not become contaminated. This may be in the form of bunding or drainage channels.
- The site must be located as far away from surface water as possible.
- The depth of groundwater must be at least 2 metres below the base of the compost site.
- For large-scale composting, the use of windrow composting is quick and easy (composting piles arranged in rows). Composting windrows should be approximately 2−3 m wide and 1.5−2 m high and as long as necessary to promote good airflow and accommodate fish mortalities.
- For small-scale composting, commercial or handmade composting bins can be used. Bins may be constructed out of wooden pallets, railway sleepers or other suitable materials. Containers need to provide suitable airflow and be large enough to accommodate mortalities.
- A minimum of 300 mm of sawdust or a similar alternative organic medium such as straw or woodchips should be used to cover the base of the composting area and to cover fish carcasses after each addition.
- Layers of added fish carcasses should also be approximately 300 mm thick.
- The compost should be well aerated to maximise the break down process and minimise odour.
- The composting site must also be managed to minimise odour and discourage pests.
- According to AQUAVETPLAN Disposal Manual Version 2.0 (2009), the composting pile should be left for a minimum of 180 days. Should odour emanate from the site, the covering layer of sawdust or other media used should be increased.

The EPA has prepared the *Compost guideline*[6] setting out its expectations for the appropriate conduct of composting works in accordance with the EP Act, which provides further information on the composting process (EPA 2013).

Should compost production exceed 20 tonnes per year, the fish farmer will require appropriate development approval under the *Development Act 1993*. An environmental authorisation from the EPA is also required if compost production exceeds 200 tonnes per year, although quantities of this magnitude from a single farm are highly unlikely.

If onsite composting is not an option or quantities of mortalities are too large to conduct onsite composting, commercial composting facilities licensed by the EPA may be able to accept large volumes of fish mortalities for composting.

Shells of molluscs and crustaceans may need to be crushed prior to composting to facilitate their breakdown during the composting process.

6 www.epa.sa.gov.au/files/4771342_compostguideline.pdf

2 Reusing/recycling

Fish carcasses and shells from shellfish may be used to create other useful products, for example fishmeal products and fertilisers. Fish farmers are encouraged to investigate options for reusing or recycling fish/shellfish waste or identify companies that may accept carcasses. This option however, may not be appropriate if the fish kill was the result of a disease. The reuse or recycling of aquaculture mortalities must also not result in environmental harm.

3 Rendering

Rendering is a heating process that extracts useable ingredients such as protein meals and fats, and must be undertaken by a professional rendering plant licensed by the EPA. Rendering has been used on other products for many years and may be an option for disposing fish carcasses provided they can be processed soon after mortality. Should a rendering plant be conveniently located and the fish farmer chooses to use a rendering plant to dispose of mortalities, they are likely to need suitable areas to store carcasses prior to disposal and arrange the transportation of carcasses to the plant. This is discussed later in this guideline.

4 Waste depot (landfill)

Depositing fish carcasses in a licensed waste depot may be a practical option for large quantities of mortalities. The waste depot receiving the fish must be licensed under the EP Act and be endorsed to accept fish waste or similar wastes of this nature. It is recommended the waste depot dispose of mortalities within a trench designed to accept organic wastes. The farmer will need to ensure that dead stock is stored and transported appropriately, which is discussed later in the guideline.

5 Onsite burial

Burial of small quantities of aquaculture mortalities is often the preferred option for farmers as it is generally quick, cheap and can be achieved easily. The EPA discourages the disposal of fish mortalities on site but recognises there are circumstances where this may be the most practical option. Should a pit be used to dispose of large quantities of stock resulting from a large fish kill, the facility or site may need to obtain an environmental authorisation as a waste depot under Schedule 1 Section 3(3) of the EP Act, or an emergency authorisation or exemption depending on the nature of the situation. Considering this, the EPA must be contacted before burial is considered for large volumes of aquaculture mortalities. Disposal of small quantities of stock resulting from everyday farm mortalities may not necessitate an environmental authorisation under clause 10(1)(f) of the *Environment Protection (Waste to Resources) Policy 2010*.

A number of factors however need to be considered if burial is to be an option for disposal of dead stock. These include:

- quantities of dead stock that need to be disposed
- proximity to surface water and groundwater
- location of the site (floodplain, proximity to built-up areas)
- permeability of soil.

The EPA will request this information should burial be considered for large volumes of mortalities.

The size of the burial pit will vary depending on the farmers' requirements and the quantities of fish carcasses that need to be buried. However to minimise the potential for environmental harm, the following requirements are recommended:

- The site must be located as far away from surface water as possible.
- The base of the pit must be at least 2 metres above the water table. For large volumes of mortalities, the separation distance between the base of the pit and the level of the groundwater may need to be greater depending on the salinity of the groundwater. Contact the EPA for further information.
- The pit must be located in an area with low permeable soils or must be lined with material of low permeability (e.g. compacted clay) to minimise seepage.

- Provisions must be made to divert stormwater away from the pit or prevent it from leaving the pit so that groundwater and surface water does not become contaminated. This may be in the form of bunding or drainage channels.
- For disposal of large volumes of mortalities, additions of fish carcasses should be covered with unslaked lime (CaO) at a rate of 8.5 kg per 100 kg of fish and at least 300 mm of soil to assist with the decomposition process, discourage pests and prevent emanating odours.
- With each addition of fish, soil or other suitable material should be added to cover the fish to prevent odour issues, flies and attraction of pests.
- Once the pit has been filled, it should be covered and compacted with at least 500 mm of soil.
- For disposal of large volumes of mortalities resulting from a mass kill, the pit should be covered with at least two metres of soil.

It is important to note that burial is not the preferred option of the EPA for disposal of aquaculture mortalities and other options must be considered before burial is used as a method. The EPA may also require monitoring to be undertaken of large scale burial sites.

6 Cremation/burning

Cremation or burning should only be considered if disposal using other mechanisms is not an option as it is ineffective compared with other disposal methods and creates highly visible air pollution and odours from burning carcasses. Burning of fish can be difficult due to the moisture content in the carcasses therefore other materials such as saw dust, paper and timber off cuts may need to be added to assist with the burning process. It should also be noted that shellfish are not suitable to burn due to their hard shells.

Burning of small quantities of aquaculture mortalities may be appropriate in certain circumstances, however the fish farmer would need to ensure the process will not create environmental nuisance from air pollution and odours to neighbouring properties. Licensees are encouraged to speak with their local council regarding any proposal, including compliance with fire restrictions relevant to their area.

Holding and transporting of fish mortalities prior to disposal

Fish carcasses must be stored prior to collection so not to create environmental harm or nuisance that may result from waste leachate contaminating ground or surface waters, attraction of pests and offensive odours. A number of factors when storing and transporting aquaculture mortalities must be taken into consideration:

- Carcasses should be removed from the site as soon as possible. Carcasses on site for more than 24 hours should be stored within a prepared storage area.
- The storage areas must be adequately sheltered with appropriate bunding to prevent stormwater runoff polluting nearby surface or ground water.
- The site for storing mortalities must be impervious and as far as possible from nearby surface water.
- Mortalities must be stored in a manner that does not create environmental nuisance in the form of odour and attraction of pests.
- Mortalities kept on site for any period of time should be kept refrigerated or frozen.
- An EPA licensed waste transport company should be used to transport mortalities to composting and waste depot facilities.
- Should the licensee transport the waste using their own vehicles, fish waste must be stored in bins or similar storage equipment that prevents leakage and odours.

Summary

Mortalities in aquaculture facilities are inevitable and can range from being occasional or small in number, to large quantities resulting from disease or environmental factors. Disposal of mortalities is a key environmental concern and must be undertaken appropriately so as not to cause environmental harm.

Suitable methods of onsite disposal of aquaculture mortalities include composting, burial and cremation/burning. These methods, along with rendering of product, can also be undertaken by offsite commercial facilities. The practicality of offsite disposal of mortalities will depend on whether commercial disposal facilities exist nearby to the aquaculture farm.

The EPA strongly recommends that fish farmers identify environmentally sustainable methods of disposal of both occasional and mass mortalities prior to the event occurring. It is recommended that fish farmers discuss proposed disposal methods of aquaculture mortalities with the EPA to facilitate uptake of the best environmentally sustainable practices for mortality disposal.

In circumstances of sudden large-scale mortalities, Fish farmers mustensure appropriate advice and approvals are obtained from the EPA to enable the lawful disposal of mortalities. It is likely approvals can be managed via the issuing of an ‘emergency authorisation’. To seek an emergency authorisation for the disposal of large scale aquaculture mortalities, contact the EPA on 1800 623 445

Fish farmers are also reminded to advise PIRSA of any mass mortalities that occur on their fish farm as part of their legislative responsibilities, in addition to potential biosecurity issues that may need to be considered for disposal.

References

Australian Pork Limited 2004, *National Environmental Guidelines for Piggeries*, APL, Deakin, viewed 16 April 2019, http://australianpork.com.au/industry-focus/environment/national-environmental-guidelines-for-piggeries.

DAFF 2009, *Operational procedures manual: Disposal (Version 2.0), Australian Aquatic Veterinary Emergency Plan (AQUAVETPLAN)*, Department of Agriculture, Fisheries and Forestry, Canberra, viewed 16 April 2019, http://www.agriculture.gov.au/animal/aquatic/aquavetplan/disposal.

EPA 2013, *Compost guideline*, South Australian Environment Protection Authority, Adelaide, viewed 16 April 2019, https://www.epa.sa.gov.au/files/7687_guide_compost.pdf.

—1999, *Review of on-farm disposal treatment risks and the potential for recycling of wastes produced from commercial chicken farms and processors*, consultation draft prepared by PPK Environment and Infrastructure Pty Ltd, South Australian Environment Protection Authority, Adelaide, viewed 16 April 2019, https://www.epa.sa.gov.au/files/8436_chickenfarms.pdf

Disclaimer

This publication is a guide only and does not necessarily provide adequate information in relation to every situation. This publication seeks to explain your possible obligations in a helpful and accessible way. In doing so, however, some detail may not be captured. It is important, therefore, that you seek information from the EPA itself regarding your possible obligations and, where appropriate, that you seek your own legal advice.

Further information

Legislation

Online legislation is freely available. Copies of legislation are available for purchase from:

Service SA Government Legislation Outlet
Adelaide Service SA Centre
108 North Terrace
Adelaide SA 5000

Telephone: 13 23 24
Facsimile: (08) 8204 1909
Website: <https://service.sa.gov.au/12-legislation>
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General information

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