Australian Government

MARINE PESTS

National biofouling management guidelines for the aquaculture industry

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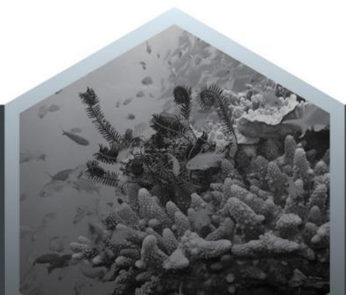
Nationally agreed guidance material endorsed by the Marine Pest Sectoral Committee



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Contents

Photographs

Introduction

Overview

A key aim of biofouling management is to minimise the spread of marine pests to new areas. Marine pests can be introduced to and spread around Australia in many different ways. These seaweeds, fish, invertebrates, parasites and pathogens can be spread by:

- release of ballast water from commercial ships
- biofouling of vessels and equipment
- accidental or deliberate release of imported species
- translocation of biofouling on aquaculture stock and equipment.

Along with other maritime industries the success and growth of aquaculture has resulted in additional activities that can accelerate the spread of marine pests. These pests can have a significant effect on the marine environment, human health and the economy. Subsequent destruction of marine habitats by marine pests will have negative effects on tourism, fishing, coastal industries and coastal value.

Australian governments, in collaboration with industry, have developed this voluntary set of guidelines to help manage biofouling hazards associated with aquaculture operations and equipment. Similar documents have been developed for other sectors, including:

- commercial vessels
- non-trading vessels
- recreational vessels
- the petroleum production and exploration industry
- commercial fishing vessels.

These guidelines and further information about marine pest threats and management strategies can be found on the Marine Pests website.

Purpose and scope

These guidelines provide recommended approaches for control of biofouling to minimise the spread of exotic species associated with moving aquaculture stock and equipment. The guidelines can be applied to most aquaculture sectors, and involve a wide variety of farming methods which can be affected by a broad range of unwanted and damaging organisms. Aquaculture sectors should adopt practices based on the most relevant approaches recommended for their operational requirements.

These guidelines provide practical management options that can:

- reduce the risk of marine pest infestations
- reduce the costs associated with managing an incursion or with quarantine measures if a marine pest is discovered

- reduce the possible translocation of a marine pest.

These guidelines aim to help aquaculture operations in estuaries and seawater limit the movement of marine pests capable of biofouling vessels, infrastructure and products.

These guidelines do not apply to:

- aquaculture operations in freshwater environments, although many elements are similar
- marine pests that may occur in the soft tissue, mantle cavity or digestive tract of aquaculture species
- marine pests that are capable of being moved by other means (such as bacteria in ballast water)
- aquatic animal disease risks. Separate state and territory requirements are in place for managing the disease risks associated with intrastate or interstate movement of stock and equipment and may need to be applied concurrently.

Operators in sectors that use vessels for daily operations should also refer to the National biofouling management guidelines for commercial fishing vessels.

These guidelines will be reviewed from time to time to ensure they remain current, practical and of benefit to operators and the industry.

Specific biofouling management guidelines have been developed to cover most aquaculture sectors, according to culture method:

- bag, rack and tray culture
- long line culture
- sea cage culture.

Delineation of responsibility

Operators using these guidelines should also take into account local conditions and comply with state and territory regulations. This information is intended as a guide only and is not intended to cover all possible situations. Users should obtain appropriate professional advice to evaluate their own circumstances and develop appropriate biosecurity procedures for their own operations and location.

1 Biofouling risk management

Biofouling management options when moving aquaculture stock and equipment should be practical, cost-effective and encourage good hygiene (for example, cleaning equipment before transporting stock). On-farm cleaning and hygiene measures often focus only on visible marine pests. When assessing the biofouling risk posed by aquaculture equipment and operations consider:

- immersed aquaculture equipment (such as sticks, racks, ropes and livestock containers) that can provide shelter for marine pests at various life stages
- cleaning of stock and equipment, and other routine practices (such as grading and harvesting) undertaken on board a vessel or onshore, which can generate a slurry of biofouling waste that may contain marine pests and contaminants
- movement of equipment and stock that has not been cleaned of biofouling, which may result in new infestations and seriously affect the sectors that rely on movement of live aquatic organisms between growing areas/zones
- regulations aimed at preventing movement of marine pests.

This chapter sets out the recommended approaches for managing biofouling pests in the aquaculture industry.

Information about decontaminating aquaculture equipment is in the [Operational Procedures Manual – Decontamination (AQUAVETPLAN)] (DAFF 2008).

1.1 Desiccation in air

Most marine organisms, with some exceptions such as *Perna viridis*, Codium fragile spp. (syn. *C. fragile tomentosoides*) and *Undaria pinnatifida*, cannot tolerate prolonged desiccation. This can therefore be an effective way of reducing the risk posed by marine pests. As a general guide, most marine organisms exposed to the air will die within seven days but some will survive for longer. Suitable treatment times need to be considered on a case-by-case basis, and advice should be sought if unsure.

Survival will be affected by:

- the type of species
- the life cycle of the species
- temperature
- humidity
- sunlight (Ricciardi, Serrouya & Whoriskey 1995).

Caution should be taken when using desiccation to eliminate biofouling in the oyster sector (Photo 1). For example, prolonged exposure of Sydney rock oyster and Pacific oyster seed stock is likely to cause significant mortality, unacceptable stress and/or loss of condition. The oyster sector should therefore use alternative treatment methods.

Photo 1 Oysters on trays, exposed to air at low tide

Image: NAC Archives.

1.2 Freshwater treatment

A freshwater bath is a simple treatment, particularly for silt trap residue, and is an effective way of destroying many marine pests that have infested seed stocks and equipment.

Freshwater can also be used to treat some other aquaculture species and equipment to reduce the threat from marine pests. Immersion for more than three hours in freshwater (less than 0.5 per cent salinity) is the minimum time needed to kill some species, such as *Caulerpa taxifolia* (Theil et al. 2007), but not all marine pests. For example, up to two days of immersion is necessary to completely kill all life stages of Japanese seaweed (*Undaria pinnatifida*) or green-lipped mussels (*Perna canicula syn. P. canaliculus)*.

The European shore crab (*Carcinus maenas*) can also survive prolonged immersion in freshwater (O'Loughlin et al. 2006) and other treatments should be used at the same time. All treatments should be followed by a visual inspection for any remaining live crabs.

1.3 Combining treatment methods

Combining treatment methods is a highly effective way to kill marine pests and can reduce the time that aquaculture stocks are exposed to each individual method. The most cost-effective and environmentally friendly combination of treatments is freshwater immersion for at least two hours followed by at least 12 hours of desiccation (Gunthorpe et al. 2001).

1.4 High pressure blasting

High pressure water blasting is an environmentally friendly way to clean aquaculture stock and infrastructure. This technique can be used with freshwater, saltwater or hot water on a wide variety of species. It is also effective against a variety of biofouling pests and therefore has wider management benefits.

While high pressure water blasting can be used underwater, it is not generally used for marine pest control when equipment is in place. Underwater blasting may not completely kill the target pests and therefore could increase the spread of certain pest species. Where possible, it is more effective to remove stock and structures from the water for land-based treatment which allows safe containment of pests and fragments (Photo 2).

Water pressure and distance from the target will influence the effectiveness of this method. It is recommended that water pressure of at least 2000 psi at a distance of 100 mm for two seconds will be sufficient to remove species such as *Undaria pinnatifida* from mussel shells (Forrest & Blakemore 2006).

Photo 2 High water pressure cleaning machine being used to clean pearl oysters

Image: Ellies Pearling.

1.5 Physical separation of liquid and solid biofouling waste

Slurries generated at on-shore facilities custom built for net washing should be treated by separating solids from liquid. Solids should be disposed of appropriately (for example, at a land-based facility that has approval to receive the waste), while the liquid should be further treated in line with local regulations governing environmental discharge. Local environmental regulations must be followed when disposing of waters contaminated with any chemical treatments. Properly designed screens and silt traps can help retain material above 0.5 mm in size and are recommended for rapid concentration of waste contaminated with marine pests.

Untreated biological waste should not be returned to the marine environment at a different location to where biofouling was acquired (such as in a different bay or inlet).

1.6 Chemical treatment

Chemical treatments, such as chlorine or hydrogen peroxide, can be effective but their use in the aquatic environment is strictly governed by the Australian Pesticides and Veterinary Medicines Authority (APVMA). The APVMA maintains the national Public Chemical Registration Information System database of agricultural and veterinary chemicals, including the product name, active ingredients and details of the registering company. In addition to the national registration system, direct or indirect use of any chemical for controlling an animal disease is also governed by relevant control-of-use laws in each state and territory. Such laws require that chemicals be used only for the purpose for which they are registered and that appropriate instructions are given on the label for their safe use. The APVMA website provides information on chemical handling and use (APVMA 2013).

All state and territory laws require that use of chemicals should in no way harm the natural environment. This means dumping of chemicals, silt or organic matter into natural waterways or other environments may be deemed an offence. People using chemicals should receive appropriate training and use correct safety equipment. If in doubt, talk to local government authorities.

1.7 Heat treatment

While not common, hot water has been used in the aquaculture industry to successfully deal with marine pests. The effect of heat depends on exposure time and temperature, and these factors will vary depending on the species being treated. For example, immersion in 70 °C for 40 seconds will not raise the core temperature of Pacific oysters above 24 °C but will kill unwanted sabellid and spionid polychaetes (Leighton 1998; Nel, Coetzee & Van Niekerk 1996). However, immersion in 42 °C for one hour will kill 100 per cent of Pacific oysters (Rajagopal et al. 1995). Laboratory experiments (Forrest & Blakemore 2006) demonstrated that exposing green-lipped mussel seed stock to hot water (55 °C) for about five seconds killed all juvenile stages of Japanese seaweed while the survival rate of the treated mussels was comparable to untreated seed stock.

Heat treatment is also affected by surrounding temperatures and is generally more effective if there is a large difference between the surrounding and treatment temperatures. For this reason, heat treatment is most effective during winter when pests are conditioned to colder temperatures. Heat treatments are also likely to be more effective on soft-bodied pests and species with thin shells. Pests with thicker shells need higher temperatures and/or longer exposure.

2 Bag, rack and tray culture

2.1 Sector overview

Pacific oysters (*Crassostrea gigas*) and Sydney rock oysters (*Saccostrea glomerata*) make up the majority of species farmed using bag, rack and tray techniques (Photo 3). Small commercial quantities of Akoya pearl oysters (*Pinctata inbricata*) and flat oysters (*Ostrea angasi*) are also produced in New South Wales using these techniques. Pacific oyster production occurs mainly in South Australia, Tasmania, and to a lesser extent, New South Wales. Sydney rock oyster production occurs in New South Wales and, to a lesser extent, Queensland and Western Australia.

The production cycle involves wild-catch of spat or a hatchery phase (induced spawning in land-based hatcheries), a nursery phase (either pumped water systems or sea-based containers) and a grow-out phase (either sub-tidal or intertidal systems).

Intrastate and interstate movement, usually of juvenile-sized oysters, is governed by translocation protocols and legislation in each jurisdiction.

Photo 3 Farmer tending oyster lease

Image: Department of Agriculture.

2.2 Biofouling management guidelines for bag, rack and tray culture

Translocation of marine pests associated with biofouling can occur at all stages of the production cycle, therefore appropriate measures should be applied to all applicable areas of production to minimise the risk of introducing or spreading a marine pest.

These guidelines apply to land-based facilities, such as hatcheries, as well as open-ocean facilities, where applicable.

- Ensure intake water for hatcheries meets or exceeds the minimum recommended filtration level of 20 microns. The larval stages of most biofouling organisms will be excluded by this level of filtration.
- Routinely remove biofouling on the shell and loose debris from stock in the grow-out phase. Stock should be visually inspected for marine pests, both at dispatch and on arrival, before deployment at a new location.
- Pressure-clean oyster baskets and cultivation trays to at least 2000 psi if biofouling and/or marine pests related to that locality are present. Ensure adequate airing through sun drying of trays and baskets that have not been pressure cleaned before relaying stock.
- To control mudworm, Sydney rock oysters can be air dried for four to five days, followed by a two-to-three-hour iodine bath (0.1 g iodine / 1 L of seawater) (Nell 2007).
- To kill adult flatworms, 15-minute freshwater baths can be used (Nell 2007).
- Train staff to identify marine pests relevant to that locality when inspecting and cleaning livestock, vessels and equipment either through a hands-on course or by using marine pest identification cards (NSPMMPI 2011).
- Regularly remove farm vessels and associated equipment from the water, rinse inside and out with fresh water and allow to dry. Regular air-drying reduces opportunities for biofouling to take hold.
  - For guidance on managing internal and external biofouling on vessels and information on and recommendations for vessel maintenance see the National biofouling management guidelines for commercial fishing vessels (NSPMMPI 2009).
- If an exotic marine pest is detected, immediately notify the responsible agency and try to contain all infected material to prevent the marine pest re-entering the water. Stock and equipment should not be translocated until permission is obtained from the relevant authority.

2.3 Intrastate and interstate movement of livestock

- For sub-tidal systems, after removing the biofouling material the simplest and recommended method is to move stock to clean equipment before translocation.
- For intertidal systems, rearing units can be raised for a nominated period (often species specific) prior to translocation, so that units and stock are exposed to air for a longer time on the low tide, and wave generated tumbling at high tide.
  - The primary aim is to expose the unwanted material to the air and sun and thereby allow some natural desiccation to reduce risk. Where possible and if the age of the stock permits, allow four hours of drying per day for the nominated period before shipment, to dislodge biofouling species from oysters and equipment.
- Some oyster farmers immerse their stock in hot water baths of 82°C for three seconds. This not only reduces over-catch but also kills biofouling and some pests.
- Place rearing units out of the water and in the shade for 10 days to kill biofouling.
- Place equipment in a freshwater bath for 12 hours to effectively kill species of biofouling that have life stages susceptible to changes in salinity.
- In addition to a freshwater bath or air drying, inspect the oysters for motile pest species (such as European shore crab) and remove these pests (Photo 4)

Photo 4 Manual inspection of oyster shell

Image: Natalie Moltschaniwskyj.

3 Floating long line culture

3.1 Sector overview

The pearling and mussel industries are the two main sectors that culture livestock suspended from surface floating long lines. There is some use of this system in the Sydney rock oysters industry however for biofouling management guidelines for rock oysters please refer to section 2

3.1.1 Pearling industry

The silver-lipped pearl oyster (*Pinctada maxima*) is the dominant species used for pearl culture in Australia; other species include *P. margaritifera*, *P. albina*, *P. imbricata* and *Pteria penguin*. Regardless of the species, the process of pearl culture is generally similar. Most Australian pearl culture is undertaken in Western Australia and the Northern Territory with a small sector in New South Wales and Queensland.

The pearl production cycle involves individual seeding of mature animals harvested from quota-managed fisheries or sourced from hatcheries. Hatchery produced oysters are on-grown in on-farm nurseries until the oysters are large enough to be individually handled. Pearl oysters are filter feeders, feeding on microscopic algae and detrital particles carried on the tide. To maximise their access to food, oysters are grown in panels suspended from horizontal surface long lines with floatation buoys. Usually long lines hold up to 100 panels each containing six or eight oysters, allowing up to 800 oysters to be grown per long line.

Mature oysters no longer viable for pearl production are killed and processed on board vessels at the lease site. The meat (adductor muscle only) is harvested and frozen for human consumption and the oyster shell is cleaned before bulk packing for sale as mother-of-pearl.

Most pearl farming leases are in relatively remote locations, providing a natural buffer against inadvertent translocation of marine pests. Despite this remoteness and the sub-surface nature of pearl oyster culture, the risk of introduced species being present within the biofouling on both pearl oysters and farming equipment is still possible. The pearling industry routinely removes biofouling from oysters and equipment to reduce competition for food, to remove the threat of suffocation and to reduce the overall weight on the long lines (Photo 5). This husbandry technique also reduces the risk of an introduced marine pest establishing.

The Queensland, Western Australian and Northern Territory pearling (*P. maxima*) industries operate in clearly defined zones. Considerable movement of stock occurs within these zones and between Western Australia and the Northern Territory. Movement of stock and equipment is subject to strict protocols and health certification requirements.

Photo 5 Biofouling on the supporting poles and ropes for pearl oyster panels

Image: Maarten Terwal.

3.1.2 Mussel industry

The blue mussel (*Mytilus galloprovincialis planulatus*), the only mussel species farmed in Australia, is produced in New South Wales, Victoria, South Australia, Western Australia and Tasmania.

The production cycle is relatively straightforward, with spat seeded onto five to seven metre long vertical dropper ropes (Photo 6) attached every one to four metres, depending on site conditions, to horizontal long lines supported by floating buoys. As mussels grow, stock density may be adjusted by means of mechanical stripping, grading and re-socking of mussels. At harvest, mussels are stripped off the dropper lines, mechanically graded for size, cleaned of gross biofouling and dispatched to market. Spat can be reared in hatcheries or wild-caught. Wild-caught spat is generally stripped off catching long lines, de-clumped and re-socked at a stocking density appropriate for on-growing.

Intrastate and interstate movement of spat with these stock movements is governed by translocation protocols and legislation in each jurisdiction.

Photo 6 Juvenile mussels growing on long dropper

Image: Department of Agriculture.

3.2 Biofouling management guidelines for long line culture

Pearl oysters and mussels can neither survive out of water for extended periods (desiccation, section 1.1), nor can they tolerate freshwater immersion (section 1.2) and therefore require alternative biofouling management methods. The measures listed in these guidelines should be applied to all applicable areas of production in order to minimise the risk of introducing or spreading a marine pest.

These guidelines apply to land-based facilities, such as hatcheries, as well as open-ocean facilities, where applicable.

- Ensure intake water for hatcheries meets or exceeds the minimum recommended filtration level of 20 microns.
- During routine cleaning of livestock, long lines, panels and ropes visually check for any sign of unusual marine growth and for marine pests (Photo 7, Photo 8).
- Train staff to identify marine pests when they are inspecting and cleaning livestock, vessels and equipment, through a hands-on course or by using marine pest identification cards (NSPMMPI 2011).
- Pressure-clean all livestock, panels, ropes and associate equipment before moving livestock and/or equipment to a different geographic zone.
- Regularly flush and disinfect transport vessel live holding systems and engine cooling systems before each transport.
- Conduct monthly hull inspections of transport and accommodation vessels. Where possible physically cover niche areas to discourage biofouling establishment.
- Increase use of sealed cooling systems in vessels.
- Regularly inspect smaller vessels moving in-water from site to site for fouling material on hulls and motors before each movement.
- Rinse inside and out of trailer-mounted vessels with fresh water and allow to dry.
  - The National biofouling management guidelines for commercial fishing vessels (NSPMMPI 2009a) provide guidance on managing internal and external biofouling on vessels and information on and recommendations for vessel maintenance.
- Immediately notify the responsible agency if a marine pest is detected and try to contain all infected material to prevent the pest from re-entering the water.

Photo 7 Biofouling on mussels

Image: Department of Agriculture.

Photo 8 Light biofouling and heavy biofouling on pearl oyster panels

Image: NT Government.

4 Sea cage culture

4.1 Sector overview

Sea cage culture more generally involves the grow-out stage for Atlantic salmon (*Salmo salar*), yellowtail kingfish (*Seriola lalandi*), Southern bluefin tuna (*Thunnus maccoyii*), barramundi (*Lates calcarifer*) and other fish species. Atlantic salmon is the dominant species used in salmonid farming in Australia, with almost all operations located in Tasmania. Southern bluefin tuna and yellowtail kingfish farming occur in South Australia and barramundi farming in Queensland and Western Australia.

Southern bluefin tuna is a sea ranching operation where juveniles are penned live, transferred to sea cages and fattened to harvest with pilchards and in some cases pellet feed. Hatchery bred culture of Southern bluefin tuna from Arno Bay (South Australia) is at an advanced research stage.

Salmonids, yellowtail kingfish and barramundi are spawned in land-based hatchery systems, grown to fingerling stage and transferred to sea cages to be on-grown to harvest size.

Most sea cages consist of a floating collar moored to anchor lines secured to the sea floor. A netting bag containing the fish is suspended from the floating collar (Photo 9). These nets provide a substrate to which various forms of biofouling can attach; this biofouling must be cleaned off regularly to maintain water flow.

Depending on the level and type of biofouling, many operators use specialised antifoulants to reduce biofouling and increase the interval between net cleaning/changes. As the fish grow they are transferred to larger pens and to different areas of the lease site. In many cases entire pens of fish may be towed from one lease site to another, potentially translocating marine pests between leases. Sea cages destined for harvest may be towed to a shore facility some distance from the farming lease, in which case cleaned nets are generally fitted before towing to minimise hydraulic drag caused by excess biofouling.

Photo 9 Salmon cages

Image: NAC Archives.

4.2 Biofouling management guidelines for sea cage culture

- Train staff to identify marine pests when inspecting equipment (Photo 10) by using marine pest identification cards (NSPMMPI 2011) or a hands-on course.
- Report any occurrences of marine pests to the relevant authorities. If possible, samples of suspected pests should be collected for identification. Disposal of marine pests should follow relevant protocols, as specified by the jurisdiction.
- Follow strict cleaning and disinfection protocols before moving equipment between sites.
- Assign all equipment to individual leases and, where possible, do not move between sites.
- Use clean equipment (free from biofouling) for moving livestock and clean all equipment after use.
- Soak all net cages and other equipment used during grow-out stages of production in fresh water for at least two hours or wash in a specialised net-washing machine (Photo 11**Error! Reference source not found.**). This should be followed by at least 12 hours of air drying.
  - In-situ high-pressure saltwater blasting and manual cleaning may also be necessary. In-situ cleaning must only occur in permitted areas within the marine farming lease and in line with any relevant regulations.
- Fit cleaned nets, where possible, before towing net pens between farms and to land-based harvest facilities.
- Clean netting coated with an antifoulant in line with the ANZECC Anti-fouling and in-water cleaning guidelines and any criteria the Australian Pesticides and Veterinarian Medicines Authority sets.
- Re-coat equipment with antifoulant before re-use in accordance with current guidance on antifouling practice relevant to your jurisdiction and any criteria the Australian Pesticides and Veterinarian Medicines Authority sets.
- Refer to the National biofouling management guidelines for commercial fishing vessels (NSPMMPI 2009a) for applicable vessels.
- Air dry and appropriately dispose of equipment withdrawn from service, on land.

Photo 10 Net partly lifted for inspection

Image: John Purser.

Photo 11 Large net washing machine

Note: This large net washing machine uses fresh water to clean biofouling off cage nets and other fouled equipment. Image provided by John Purser.

5 Recording and reporting

Operators have an obligation to report and record the presence of marine pests. This will help both industry and government regulators understand and improve control measures and further minimise translocation of marine pests.

5.1 Reporting

In most jurisdictions, licence conditions and other management mechanisms require reporting of marine pests.

For example, licence holders in Tasmania must notify the Tasmanian Department of Primary Industries, Parks, Water and the Environment of the presence of any introduced marine pests within the lease area. These species include, but are not limited to, the northern Pacific seastar (*Asterias amurensis*), the European shore crab (*Carcinus maenas*) and Japanese seaweed (*Undaria pinnatifida*).

Operators need to meet reporting requirements concerning marine pests, as stipulated in the marine farming licence conditions applicable to their jurisdiction.

Operators can use marine pest identification cards (NSPMMPI 2011) to help identify pest species.

5.2 Recording and identifying marine pests

It is essential to notify the relevant authorities (see the Marine Pests website) of suspected marine pest outbreaks.

To help authorities and the industry manage the problem:

1) Collect a sample or take photos for identification. Where possible, collect one or two samples of suspected pests. Place samples in separate plastic bags along with a little seawater and freeze as quickly as possible. Do not attempt to collect samples if it is unsafe to do so or if they are in a marine protected area (a marine park, national park or aquatic reserve) or any area closed to fishing.
2) Make a note of the exact location. As well as recording the geographical location (that is, GPS coordinates), record as many other details as possible, including shore markers, water depth, and the substrate or infrastructure upon which the organism was found. Note the date, the number of pests (if possible) and any other useful facts.
3) Check the marine pests interactive map, marine pest identification cards (NSPMMPI 2011) or the National Introduced Marine Pest Information System to see if the organism is already known to be a pest in the area and to make sure it is not a native species.

Glossary

Term	Definition
ANZECC	Australian and New Zealand Environment and Conservation Council
aquaculture	Cultivation of aquatic animals and plants (such as fish, shellfish and seaweed) in natural or controlled marine or freshwater environments.
biofouling	Unwanted accumulation of marine organisms on both natural and artificial substrates, including aquaculture stock and products (such as biofouling of mussel or oyster shells), artificial infrastructure (including vessel hulls, rudders, propellers and other hull appendages), internal seawater systems (including sea chests and pipe work) or any submerged equipment used in the industry.
biofouling organisms	Any species that attaches to natural or artificial substrates (sea cages, ropes, nets or hulls of vessels) or other organisms living on or between the attached biofouling
desiccation	Complete drying out of an organism.
equipment	Tools and gear associated with the aquaculture industry, including anchors, nets and sea cages, mooring chains, pontoons, ropes and long lines.
exotic marine	Any species not native to Australia's marine environment. species
hull	The wetted surfaces of a vessel, including its propulsion and steering gear, internal cooling circuits, sea strainers, bow thrusters, anchors, anchor chains and bilge spaces.
internal seawater systems (ISS)	The plumbing in a vessel that draws and carries seawater for machinery cooling and other purposes.
marine pest	Any exotic marine species that poses a threat to Australia's marine environment or industry, if introduced, established or translocated.
niche area	Protected or refuge areas on a vessel that allow settlement and survival of marine biofouling organisms.
re-socking	Re-attaching mussels to a fresh rope.
seeding	Inserting a piece of donor mantle tissue and a nucleus into an oyster, to allow subsequent deposition of pearl nacre around the nucleus to form a pearl. If a suitable pearl is produced, an oyster may be re-seeded with another nucleus. About two years is needed to form each pearl.
sessile	Permanently attached; not free moving.
stock	A group of individuals of a species occupying a well-defined spatial range independent of other groups of the same species, which can be regarded as an entity for management or assessment purposes.
translocation	Movement of organisms or equipment from one location to another. When referring to organisms, the movement can be intentional (that is, moving stock from one zone to another, release of species into the wild) or accidental (that is, moving marine pests present as biofouling). Translocation of equipment refers to movement of, for example, pontoons and nets from one location to another.
vector	The physical means, agent or mechanism which allows translocation of organisms from one place to another.

Contacts

For more information about marine pests and biofouling management guidelines contact your local state/territory fisheries officer or visit the Marine Pests website.

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