Department of Primary Industries

OYSTER CULTIVATION BEST PRACTICE GUIDELINES

Best Practice Oyster Raft Construction

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DPI Fisheries and Aquaculture Management, Management & Administration Unit

Raft cultivation systems

In NSW, rafts systems have been used for the cultivation of oysters since the early 1980's. Rafts are typically constructed of timber with floatation provided by recycled food grade 200 litre plastic "Mauser" type drums (Figure 1A); end-capped large diameter PVC pipe (Figure 1B); or large diameter end-capped polyethylene pipe (Figures 1C). Raft design is usually a function of the type of oyster growing tray that will be suspended beneath the raft and the hydrological characteristics of the lease area on which the raft will be located, such as depth and prevailing current regime.

Figure 1 Examples of oyster rafts used on oyster leases in NSW. (A) A typical drum raft constructed using recycled 200 litre plastic drum floatation (B). A typical pipe raft constructed using large diameter (300mm) PVC end-capped plastic pipe flotation (C). A marine grade aluminium raft with end capped large diameter polyethylene ribbed pipe flotation.

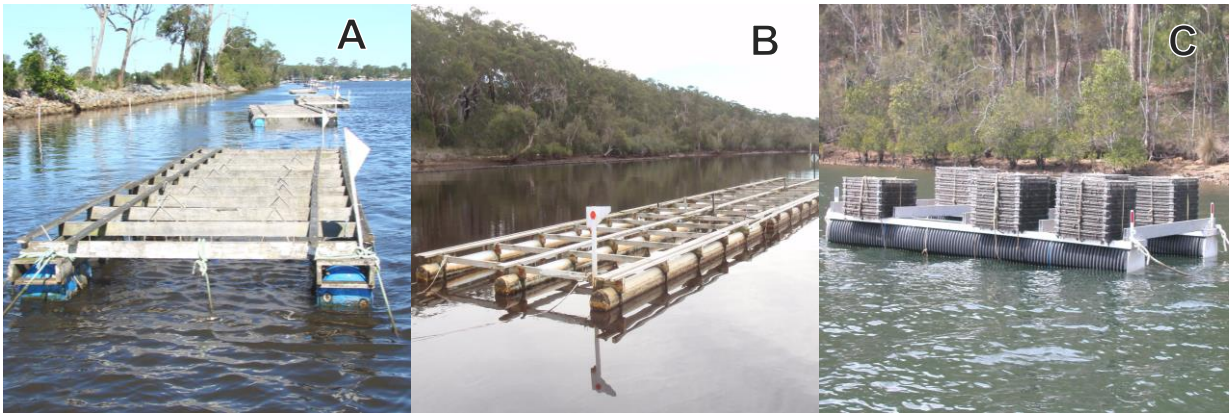


Image Source: NSW DPI – Aquaculture Management

Vertical stacks of trays (Figures 1C, 2A and 2B) are suspended beneath the raft by sets of four sling ropes, one extending from each corner of the tray stack. To ensure good water flow to the oysters within the trays, the trays are often separated vertically from one another by timber or plastic spacers. Suspended tray stacks may consist of between three and 15 trays, depending on the depth of water and current flow.

Continually submerged trays and oysters are quickly colonised by other marine organisms which are collectively referred to as biofouling. Common biofouling organisms may include barnacles, other oysters, mussels, cunjevois, sea-squirts and ascidians. To control biofouling, tray stacks are removed from the water and placed on top of the raft to air dry for periods ranging from 4 to 14 days (Figures 2A and 2B). Drying time is dependent on the time of year, weather conditions and the type of biofouling being controlled.

Figure 2 Oyster trays are regularly air exposed and dried to control biofouling by lifting and placing on the raft support rails. (A) An example of 10 tray stacks of HDPE plastic trays (930x910x100mm) being air dried to control biofouling; and (B) an example of a seven timber tray stacks being air dried to control biofouling.

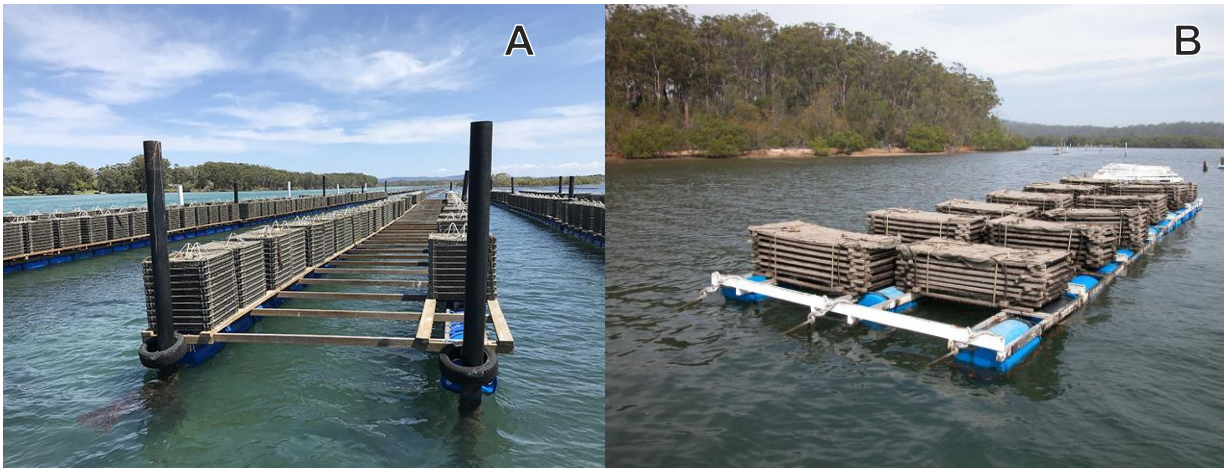


Image Source: NSW DPI – Aquaculture Management

The most common oyster tray used in conjunction with oyster rafts is a 930 x 910 x 100mm black high-density, polyethylene (HDPE) tray. This UV stable tray is made exclusively for oyster aquaculture (Figure 2A) and has open mesh sides and floor to enhance water flow through the tray. In some instances, trays designed for use on intertidal post and rail support systems are used for raft cultivation, these include 1800 x 900 x 75mm and 2400 x 900mm x 75mm timber sided trays with a HDPE mesh bottom (Figure 2B) or commercially available 1800 x 930x 50mm HDPE trays.

Typically stocking density for a 930 x 910mm tray is approximately up to 10kg of oysters (approx. 20 litres of oysters); a 1800 x 900mm tray is approximately up to 20kg; and a 2400 x 900mm tray is approximately up to 30kg of oysters (clean dry weight).

Given the value of the crop that may be grown beneath, or supported on the raft during drying, it makes good sense to ensure that the raft is securely moored, stable and sufficiently durable to cope with the prevailing environmental conditions at the lease site when under load either from subtidal culture or air drying of stock. The rafts also need to serve as a safe work platform for the loading, unloading, drying and other activities to manage of stock.

Standard raft design and construction

Oyster rafts need to be designed to withstand structural stresses caused by a wide range of environmental conditions, including tidal and flood currents, strong winds and wind and boat generated waves. They also need to be designed to withstand these stresses while the stock is either, submerged and growing, or supported on the top of the raft while being air dried to control biofouling.

When constructed of timber, rafts must be constructed using good quality structural grade hardwood. All timber cross members should also have a minimum cross-sectional dimension of 150 x 50mm and be constructed of a single continuous length of timber.

Where possible, longitudinal raft timbers should also be of a continuous length. Where longitudinal raft timbers need to be joined, they should be braced on either side by similar timber of the same dimension, bolted together with a minimum of six bolts, three each side of the join (Figure 3A). All structural cross members and longitudinal raft timbers should be fixed using good quality galvanised bolts or stainless steel having a minimum diameter of 10mm. Good quality heavy gauge galvanized or stainless steel washers should also be used wherever possible.

In areas subject to periodic flooding, cross timber should be attached to longitudinal timbers using aluminium brackets (Figure 3B) to improve structural integrity as vertical through-bolt holes may cause timbers to fail in extreme conditions.

Figure 3 (A) An example of timber bracing system used to join cross timbers to longitudinal raft timbers. (B) An example of aluminium bracing bracket for areas subject to periodic flooding.

Image Source: NSW DPI – Aquaculture Management

Technical tip: *Galvanised bolts should be greased over their full length with a marine grade grease prior to installation to assist their removal during raft maintenance or repair.*

Technical tip: *It is essential that the raft design allows for some raft flexibility while still maintaining a square configuration without compromising the overall strength of the raft. The use of a shallow (15mm deep) mortise notch in the raft cross timbers at their points of attachment to longitudinal raft timbers greatly assists in maintaining the raft in a square configuration under normal conditions.*

Important note: Nails should never be used to secure or join structural raft timbers.

Common raft designs and dimensions

The following is a guide to the common raft designs used in the NSW oyster industry. In practice these basic designs will vary between farms to suit the needs and preferences of the individual farmers.

Important note: Novel raft designs that differ significantly from the designs described in this document MUST be approved by NSW DPI before they can be deployed on an existing oyster lease.

When designing a raft, considerable savings can be made by restricting the raft timbers to standard commercially available timber lengths and dimensions. In most cases hardwood timber is readily available in lengths of up to 6m (usually supplied in multiples of 0.3m). While lengths longer than 6m can be obtained, they are usually considerably more expensive.

When designing a raft, a farmer also needs to pay close attention to the prevailing and potential environmental conditions that exist at the location where the raft will be moored, particularly the depth of water, wind exposure and potential tidal and flood current. The depth will also obviously limit the number of trays suspended below the raft and the current regime will often determine the overall raft design and size.

In areas of low current flow, a four-bay raft design (Figure 4A) with a larger inter tray stack spacing may be more suitable than a five-bay design (Figure 4B). The use of a four-bay design in areas of low current flow will reduce the likelihood of overstocking the raft. In areas with good water flow a five-bay, or a six-bay design (Figure 4C), may be suitable.

While five- and six-bay designs can potentially enable a higher raft stocking density to be achieved, care needs to be taken to ensure the raft is not overstocked. Raft overstocking, apart from causing poor and

variable oyster growth and condition, may also stress the oysters rendering them more susceptible to diseases and increase mortality when drying. Overstocking may also lead to an increased variation in oyster growth rate within individual trays, increasing the need for more frequent grading.

While water depth is an important consideration, the size and number of the tray stacks permitted will ultimately be determined by the total weight of the biofouled trays being supported by the raft floatation during drying.

Figure 4 An example of standard raft designs used in NSW. (A) An example of a four-bay design suitable for low current flow conditions (this design also allows an individual single attachment point (Figure 5) on each tray stack so that a single tray stack can be lifted without the need to lift adjacent tray stacks). (B) An example of a five-bay raft design suitable for good current flow conditions with various possible tray module configurations. (C) An example of a six-bay raft design suitable for good current flow conditions (this design is also suitable for use with 910 x 930mm trays hung with a double attachment point configuration).

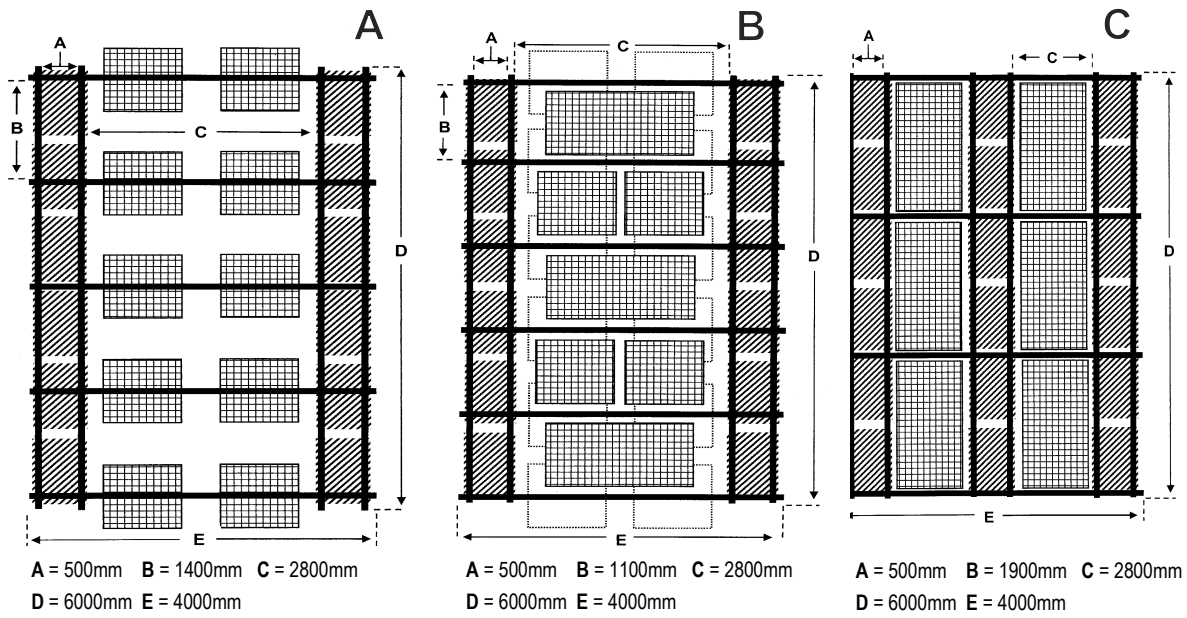


Image Source: NSW DPI – Aquaculture Management

Technical tip: *In areas of significant tidal flow the prevailing current may cause tray stacks to slew in the direction of the prevailing current making it difficult, if not impossible, to vertically lift the tray stacks out of the bays without snagging the cross timbers. In such conditions suspending the tray stacks from a single cross timber (Figure 4A and 6B) using a non-spin hook, or increasing the bay width may provide a solution.*

Attaching tray stacks to a raft using tray hooks

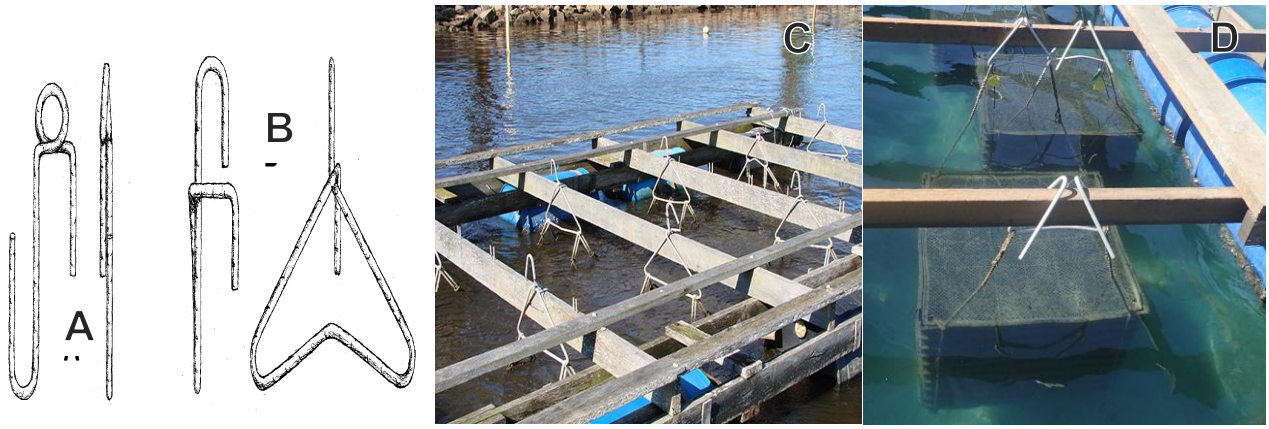
Tray stacks are supported by four diagonally opposed sling ropes, usually one at each corner of the tray stack. The individual ropes pass though the tray stacks and are either attached to the bottom tray or to a cross timber support beneath the trays. There are obviously a number of options for the attachment of tray stacks to a raft, the most widely used method is to attach the tray stacks to a raft cross timber member using a galvanised steel tray hook (Figure 5). The use of a tray hook enables the tray stacks to be quickly deployed and retrieved using common lifting devices installed in oyster punts. A properly designed and well fitted tray hook will also securely lock the tray stack in place on the raft cross member.

Unless a non-spin tray hook (Figure 5B and C) is used, tray stacks should be attached to the raft cross timber member by at least two sling hooks (Figure 5A). Non-spin tray hooks (Figure 5B) separate pairs of sling ropes on an individual tray stack and thus prevent the stack spinning and also provides a single pick up point when used with 910 x 930mm plastic tray stacks. Non-spin tray hooks can also be used in pairs to stabilise tray stacks in areas of high current flow. Tray hooks can be made on farm with the aid of a bending jig using 12mm galvanised steel rod or reo-bar.

Technical tip: *A single point of attachment to raft cross timbers for the four tray stack sling ropes should be avoided. A single point of attachment for the four sling ropes can lead to tray stacks slowly spinning in tidal or flood currents, often resulting in sling rope failure and trays being spilled from the raft.*

When deciding on an attachment method a farmer also needs to give consideration to the weight and shape of the tray stack, the configuration of their lifting gear and whether they wish to have the ability to lift individual tray stacks without the requirement to move other tray stacks. To reduce mechanical stress on the raft it is important to ensure that the tray stack loading is balanced and evenly spaced.

Figure 5 Examples of tray hooks used to suspend tray stacks beneath oyster rafts. (A) A standard sling hook used with trays for single or double sling rope attachments; or (B) an anti-spin tray hook for double or quadruple sling rope attachments; (C) an example of an anti-spin hook that is suitable for a single point of attachment for two pairs of sling ropes used to attach 910 x 930mm tray stacks; and, (D) an example of two anti-spin hooks used to attach 910 x 930mm trays to two cross members in a high current flow area.



Raft stability

Oyster rafts need to be stable when a full load of trays is being air dried on the raft. Where rafts are located in areas subject to strong winds and wind and boat generated waves, it is important to ensure that the individual tray stacks are secure to prevent slipping, slewing or tipping. Unstable tray stacks could lead to dangerous situations when loading or unloading the rafts and may result in trays being lost from the raft during adverse conditions.

To assist the stability of tray stacks when being dried in areas subject to strong winds and wind and boat generated waves it is recommended that tray stack girth straps be used (Figure 1C and 2B). The use of girth straps not only reduces the risk of trays being lost from the raft when being dried, but also oysters being spilled from a tray stack should individual sling ropes fail. Straps will also enable the tray stacks to be recovered intact, in many instances without significant loss of oyster stock.

Technical Tip: *The use of one or more tray stack girth straps will assist in: preventing tray stacks breaking up and spilling stock should a tray stack sling rope or sling hook fail; the recovery of tray stacks should they be lost from the raft; and, stabilising tray stacks during loading, unloading and air drying.*

Raft stocking density

Due to variations in the availability of suspended planktonic oyster food, the optimal carrying capacity of the raft will also fluctuate. It is important to determine a stocking regime for each raft that will return optimal seasonal oyster growth and condition. The farmer will need to fine tune the biomass or volume of oysters per tray as well as the inter tray and tray stack spacing to suit the specific raft areas growing conditions. It is good practice to start at a low stocking density and gradually increase the stocking density over time until an optimal stocking regime for the raft or group of rafts is determined.

Floatation

It is essential that a raft has sufficient floatation to securely support the total weight of the tray stacks when they are being air dried on the raft to manage biofouling. Sufficient floatation should be provided to ensure the raft does not exceed a half-submerged drum condition when a full load of trays is being air dried on the raft. This will provide an available floatation safety margin to deal with unplanned events such as the loss or puncture of a floatation device, a moderate accumulation of biofouling, or an accumulation of river-born debris against the raft. Table 1 provides a guide to assist in the estimation of the amount of floatation required when designing a raft.

Table 1 A guide to the displacement and floatation capacity of various floatation devices used in the construction of oyster rafts. Calculations based on floatation in fresh water. *Calculated per meter of pipe.

Floatation Type	Float Displacement (Litres)	Half Submerged Loading (kg)	Sinking Loading (kg)
Drum	200	100	200
Drum	220	110	220
Pipe 250mm	49*	24.5*	49*
Pipe 300mm	60*	30*	60*

To calculate the maximum tray stack load of a raft, the total weight of raft timbers and all hardware also needs to be considered. The weight of hardwood timber is a function of its density and moisture content. Table 2 provides a guide to calculating the weight of timber used in a raft design and will assist the calculation of the maximum tray stack load that the specific raft design can accommodate.

Table 2 Guide to the weight of hardwood timber. Weight based on the density of Spotted Gum *Corymbia citriodora* (740kg/M3).

Dimension	Weight kg/m	Length 4.0m	Length 6.0m
100 x 50mm	3.7	14.8 kg	22.2 kg
150 x 50mm	5.55	22.2 kg	33.3 kg
200 x 50mm	7.40	29.6 kg	44.4 kg

When making this calculation it is important to factor in the increase in weight gain of the growing oysters as well as the accumulated biofouling and silt that deposits on the raft stacks. As a rule of thumb, an increase in weight due to biofouling should, at the very least, be estimated at 40% of the initial total weight of the stocked raft.

Sealing floatation devices

Failure of floatation devices, particularly raft drums, can lead to raft instability and partially flooded floatation devices can considerably increase loading and stresses on the raft during wave and wind action.

Due to their flexible nature, raft drums are subject to considerable internal pressure variations caused by loading and unloading of the raft, tidal currents, wave action, direct heating by sunlight and diurnal temperature changes. These variations can cause raft drum to expand and contract and the variations in internal drum pressures can act as a pumping mechanism that will cause the drum to slowly flood or collapse if it is punctured, cracked or not properly sealed. To reduce the risk of raft drums flooding it is essential that all drums bung ports are kept above the water line and that they are sealed with silicon-based sealants. Raft drums can also be pressurised using compressed air via a valve placed in the top of the drum to reduce the risk of the drum flooding. All raft drums and other floatation devices must be checked regularly for cracks or abrasion damage and replaced if they are suspected of leaking. Walking on the attached drums should be avoided to prolong the life of the drum.

Securing floatation devices

The loss of a floatation device from a raft can also lead to raft instability. Drifting floatation devices such as partially submerged drums can also pose a threat to safe navigation and have other detrimental environmental impacts. To minimise the mechanical damage to round floatation devices (such as plastic drums), caused by the longitudinal raft timbers above the drums, two cushioning top shoulder straps are recommended for each drum (Figure 6A).

To reduce the likelihood of loss of a partially flooded drum or other floatation device from a raft, each floatation device must be secured to the raft. In the case of drum floatation, each drum must be secured to the raft's longitudinal timbers above the drums by at least one girth strap (Figure 6B). A girth strap or other floatation fixing system should be of sufficient strength to retain a partially flooded drum or other floatation device in situ preventing it from floating from beneath the raft or being dislodged from the raft from wave action or strong tidal or flood currents.

Figure 6 (A) A 200 litre plastic drum secured to longitudinal raft timbers by two cushioning top shoulder straps and a drum girth strap; and (B) a 200 litre plastic drum secured to longitudinal raft timbers by two drum girth straps.

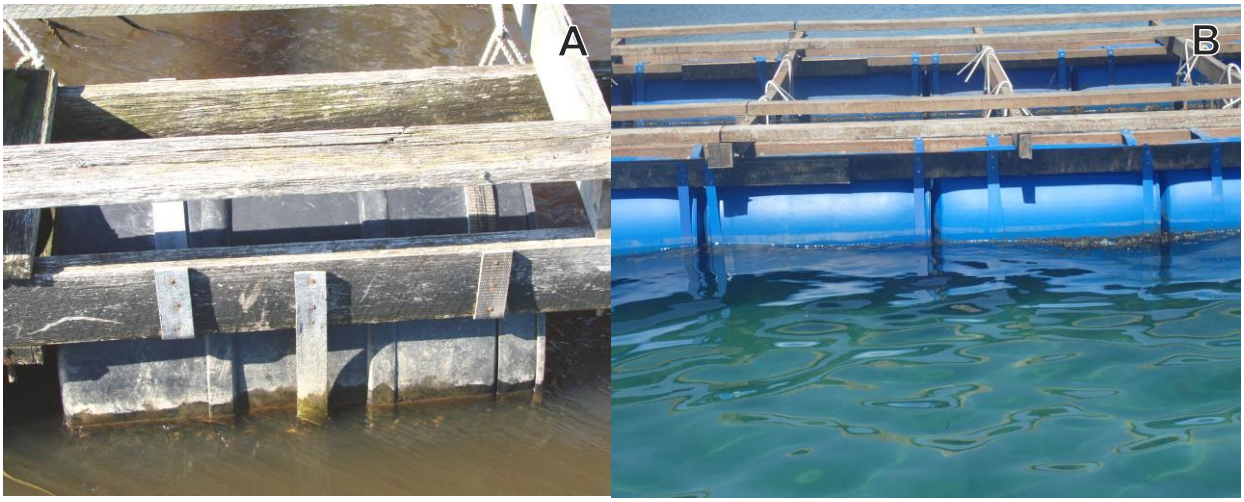


Image Source: NSW DPI – Aquaculture Management

Marking floatation drums to identify their use in oyster aquaculture

In many instances, floatation drums that break free from a raft may be partially flooded. Where an unmarked drum containing liquid is found in the environment, concerns may be raised as to its contents and may result in a hazardous material (HAZMAT) response by Fire and Rescue NSW. Over the years there have been several instances where drums have been found in mangroves following floods that have been found to contain dangerous substances. To prevent oyster raft floatation drums that have broken free from an oyster raft instigating a HAZMAT response, all raft floatation drums should be marked in a way that clearly identifies them as an oyster aquaculture floatation device. It may also be advantageous to mark or tag the drum with the aquaculture permit number of the owner to enable the drum to be returned.

Drums may be easily marked by a printed plastic cattle tag identifying it as an "Aquaculture Floatation Device" attached to the bung port by a good quality UV stable cable tie.

NSW DPI intends that all raft drums used as an oyster floatation device be clearly marked to indicate that they are an "Aquaculture Floatation Device" by 2025.

Mooring systems

The movement of water through a raft system can generate enormous pressures on the raft structure and its moorings, particularly when the raft system is fully stocked with submerged tray stacks with a high level of fouling. It is essential that moorings are adequate to secure the raft in position wholly within the surveyed lease boundaries under adverse loading as well as adverse environmental conditions such as those experienced during storms or floods.

The following is a guide only for the moorings for rafts, or raft complexes (a series of rafts joined together) that are less than 20m in length. Where rafts or raft complexes exceed 20m, particular attention needs to be given to providing additional adequate moorings to secure the raft within the lease area at all times.

Important note: Where doubts arise as to the adequacy of moorings the advice of a marine mooring contractor should be sought.

Ropes and fixings

Ropes used for mooring rafts must be of good quality, have a minimum diameter of 24mm, have a high abrasive resistance and should be UV stable. While cheap rope is often available, it is often of inferior quality with an unknown or unrated tensile breaking strain. Good quality rope of 24mm should have a rated breaking strain of at least 6 tonne.

In some instances, floating ropes are an advantage. Floating ropes have less tendency to entangle suspended raft infrastructure than sinking ropes such as nylon. Alternatively, where navigation or boat manoeuvring is an issue ropes may need to sink to reduce the risk of propeller entanglement. This can be achieved by the attachment of a small cement block to the mooring rope a few metres from its point of attachment to the raft. Silver rope or black polypropylene rope is the preferred choice for raft moorings.

Standard marine mooring practices should be used when attaching raft mooring lines to mooring blocks and/or anchors. All knots and splicing should show good seamanship and wherever wear is expected appropriate metal thimbles, shackles or rope abrasion protectors should always be used.

Important note: Mooring ropes should be attached to major longitudinal raft timbers behind one or more major horizontal raft timbers. Mooring ropes should not be attached solely to the leading horizontal raft timber, which may fail and detach from the raft in high adverse load conditions.

Mooring blocks and anchors

Due to the enormous pressures that may be exerted by the raft on mooring gear, insufficiently anchored rafts can drag their moorings into other rafts, deeper water where the mooring gear is less effective or, in extreme situations, break free posing a serious navigation hazard and cause damage to other rafts, boats and, other marine infrastructure.

Important note: All floating cultivation and all associated moorings must at all times remain wholly within the surveyed oyster lease boundaries.

A rope moored raft, or raft complex, must be attached at the very least at the four corner points to suitable mooring devices. Where current flows are such that a raft needs to be attached to single serial chain of mooring blocks, a minimum of three blocks must be used, and each leading corner of the raft must be attached to the first mooring block by an independent mooring rope. Depending on the size of the raft, mooring blocks should be between 0.5 to 1.5 tonne each. To ensure that the mooring block operates properly the length of all mooring ropes should be at least three times the depth of water under the raft. In moderate flow regimes this should be increased to five times the water depth and in strong current velocity areas this should be increased to at least seven times the water depth. In areas that are subject to periodic flooding, the calculated length of the mooring rope should be increased to account for the expected flood water depth.

Important note: A raft must not be moored at either end via a single mooring rope to a mooring device.

Flood safety moorings and flood posts

In areas that are subject to periodic flood events special care must be given to the design of raft mooring systems. In areas that are at risk of a build-up of flood debris or high flood current velocities or both, flood safety mooring systems should be used.

A flood safety mooring system, often known as “dead man anchors”, are substantial mooring systems located on the lease area close to the shore on the upstream side of the raft complex that are capable of pulling the raft closer to shore and out of the debris or current steam in the event of either the raft dragging or breaking free of its moorings during a flood event. A flood mooring post must have a minimum diameter

of 200mm and be driven deeply into the substrate to which a substantial raft mooring rope capable of holding the raft in adverse conditions should the normal mooring system fail to hold the raft at its location. The flood safety mooring rope should be attached to the post as close to the bottom as possible.

Important note: All lease mooring blocks, mooring anchors and mooring posts must be located within the surveyed lease boundaries.

Post moorings

Large diameter posts may be used to moor a raft within a lease area (Figure 7A). Mooring posts must be located within the lease boundary and, unless approved by NSW DPI, must be independent of lease boundary marks.

Posts may also be part of the raft superstructure and allow the raft to move freely vertically with the rise and fall of the tide with the aid of an adequately secured friction collar (Figure 7B). Posts used to moor rafts within a lease boundary must have a minimum diameter of 200mm and a pair of parallel posts should be installed at least every 25m. Post mooring systems are not suitable for use in areas prone to flooding or in areas deeper than 2m at low tide.

Figure 7 (A) An example of a post moored raft complex that has been approved by NSW DPI to incorporate white navigation marking on a raft directly adjacent to a navigation channel (see navigation marking requirements below); and (B) a car tyre sliding collar on a post mooring system suitable for use in shallow areas (note: tyre double bolted internally through a reinforcing plate and reinforced raft module end plate)

Image Source: NSW DPI – Aquaculture Management

Linking raft modules

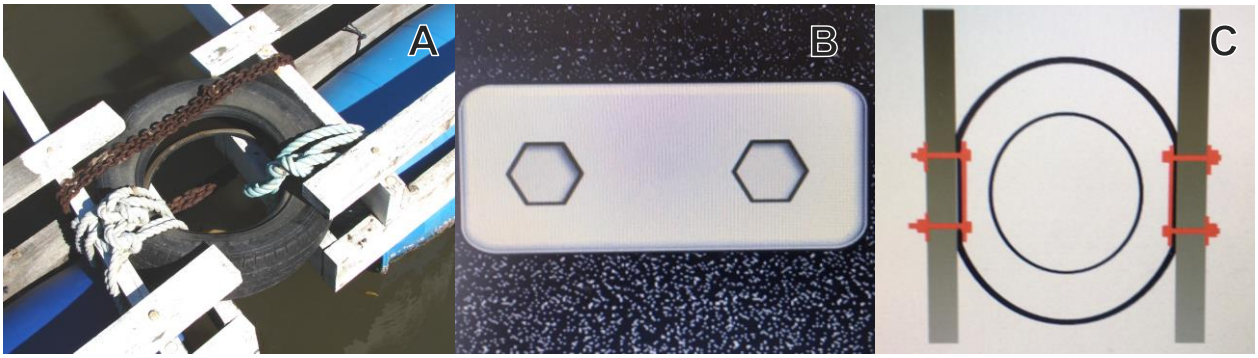
In some instances, it may be appropriate to join two or more individual raft modules to form a single raft complex. Due to the stresses placed on moorings in areas subject to periodic flood flow events, no more than three six metre rafts should be joined together in line to form a single raft complex without additional compensatory moorings being installed. In such areas all moorings must be appropriately adjusted to accommodate for the increased stress loadings caused by flood flows and flood debris accumulation and strikes.

Where individual rafts are joined, each raft should be separated by a shock absorbing device such as a small car tyre fitted at the end of each set of longitudinal timbers on either side of the raft (Figure 8A). When fixing car tyre shock absorbers to rafts, the tyres should be attached to the raft cross timbers by galvanised through-bolts with a reinforcing plate installed internally within the tyre (Figure 8B and 9C).

Shock absorbing devices should be capable of returning the raft to a “straight” state after conditions cause the set of rafts to flex. The use of shock absorbing devices also prevents the individual joined rafts from climbing on top of one another under differential adjoining raft load conditions.

Where small car tyres are used as shock absorbing devices or sliding mooring collars they should be securely attached to the raft timbers and a series of large diameter holes should be drilled though the lower side wall of the tyre to allow water to drain easily from within the tyre.

Figure 8 (A) An example of a small car tyre shock absorber fitted between consecutive raft modules in a raft complex; and diagrammatic examples of galvanised through-bolts on a reinforcing plate (B) bolted internally between rafts (C). In practice each tyre should be attached at four diagonal points two in each adjoining raft timber to minimise side slip.



Source: NSW DPI – Aquaculture Management

***Technical tip**: It is good practice to install a secondary safety chain or large diameter safety rope between the modules in conjunction with each shock absorbing device to prevent the raft separating should a cushioning device or its fixing fail.*

Important note: Single ropes without a fixed shock absorbing device should not be used to join raft modules.

Environmental issues

The following environmental issues should to be considered in the use of oyster raft cultivation systems.

Use of recycled plastic drums

The inappropriate use of recycled plastic drums as floatation on an oyster raft poses a number of environmental issues. Plastic drums are used to store and transport a wide range of products, some of which can pose a serious threat to human health and the environment.

As plastic drums used on oyster rafts can often leak it is essential to ensure that, prior to their installation on an oyster raft, there are no potentially dangerous residual products within the drums.

To ensure that drums are safe to use, drums must only be sourced from licensed drum recyclers and manufactures that produce aquaculture floatation devices. Licensed drum recyclers are required by law to flush and wash drums to an approved standard before they can be offered for sale. Under no circumstances should used drums that have been acquired direct from the agricultural or the manufacturing sectors be used.

Important note: Only plastic drums sourced from a licensed drum recycling company or manufactured for this purpose may be used for oyster raft floatation.

Good neighbour policy

The NSW oyster industry is an integral part of many NSW coastal communities. Oyster farming businesses not only generate economic benefits, but also make a positive and constructive contribution to the social fabric of these communities.

Oyster farmers appreciate the wider social responsibilities of their businesses and aim to be recognised in their communities as good corporate citizens and environmentally responsible, professional primary producers. Safeguarding water quality is a primary driver for oyster farmers.

Oyster farmers recognise that the land adjacent to leased areas is either community owned public land or private land. In either case, this land is treated with respect and oyster farming activities are conducted to minimise any existing and potential impact on this land.

Responsible NSW oyster farmers:

- do not abandon infrastructure and equipment as it can cause a hazard to watercraft, land vehicles and the environment
- ascertain ownership of adjacent lands and liaise with 'neighbours'
- recognise that Crown Land or National Park is land owned and managed for the public good, and is not vacant land
- acknowledge the responsibility that goes with the right of access to public waterways and infrastructure
- operate so as not to interfere with the reasonable peace, comfort or privacy of other estuarine and foreshore neighbours
- minimise noise, especially in the vicinity of residences and during the quiet times of the day or night
- treat neighbours and the community cordially and with respect
- actively participate in community forums
- give preference to purchasing local products and employing local people
- develop and maintain good relationships with their communities, building mutual trust and respect
- acknowledge community concerns and co-operate with neighbours to resolve them.

Visual impact and prohibited materials

The general neat and tidy provisions that apply to all aquaculture leases in NSW are specified in the NSW Oyster Industry Sustainable Aquaculture Strategy (OISAS) which can be found at: www.dpi.nsw.gov.au/fisheries/aquaculture

The following OISAS neat and tidy provisions apply specifically to oyster rafts:

- oyster rafts must be designed and constructed to float horizontally to the water surface
- oyster rafts must be designed to have a low height above the waterline
- oyster rafts must not be used to store infrastructure, cultivation materials or any waste materials
- plastic drums and floats fitted to oyster rafts must be adequately secured at all times and replaced if broken or leaking
- the use of steel or concrete raft pontoons is prohibited.

Navigation marking requirements

The full requirements for the marking of an aquaculture lease are specified in the Fisheries Management (Aquaculture) Regulation 2017 and are also outlined in OISAS Chapter 7.

Important note: Where an oyster farmer wishes to incorporate lease boundary marks into a raft structure an application must be made to NSW DPI to vary the lease marking conditions of the lease.

Important note: In some areas Transport for NSW may require that the location of raft mooring blocks be identified by a clearly visible float attached to the mooring block and may also require other navigation aids to be fitted to an oyster raft. When in doubt contact your local Transport for NSW Marine Safety Officer.

Areas deemed unsuitable for raft cultivation

The following areas are deemed to be not suitable for raft cultivation:

- where the depth of water under the raft footprint is less than 0.5m at low tide

- where the bottom substrate will not allow the raft and all mooring devices to be maintained wholly and securely within the lease area, particularly in areas prone to flood scour
- where the dimensions of the lease and the available lease footprint are insufficient to maintain the raft and its moorings wholly within the lease area at all stages of the tide and in all wind conditions
- where rafts would pose an unreasonable risk to safe navigation
- where raft cultivation would not be in the public interest.

Routine maintenance

A poorly maintained oyster raft can:

- pose a significant threat to safe navigation
- drag their moorings or break free and cause significant damage to other rafts, marine infrastructure and property
- result in significant loss of stock
- attract compliance action from both NSW DPI and Transport for NSW
- reflect poorly on the environmental credentials of the NSW oyster industry.

It is therefore important that regular maintenance checks be carried out by all owners of oyster rafts.

Regular three-month checklist

The following checks should be carried out whenever a raft is attended or at a minimum of every three months:

- the location of the raft within the lease boundary, with reference to a known shore position or shore feature
- missing, flooded or popped drums (forced up between the longitudinal timbers due to deflation
- abrasion, cracks, general damage or leaks in floatation devices
- mooring rope attachments to rafts for UV damage, abrasion or cuts
- the structural integrity of timbers and timber fixings at the point of attachment of all mooring ropes
- all navigation aids and signs are in place
- three months after initial construction, check timbers for shrinkage and adjust bolts and other fixings where necessary
- the degree of fouling on raft components.

Annual check list

The following checks should be carried out at least annually:

- the structural integrity of all raft timbers and metal fixings
- all mooring block and flood safety anchors at their points of attachment for wear or corrosion
- all mooring ropes from their points of attachment at mooring blocks or flood safety anchors to the point of attachment to the raft for damage or fouling by submerged objects.

More information

Contact: Fisheries NSW, Aquaculture Management on (02) 4916 3900 or at aquaculture.management@dpie.nsw.gov.au.

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