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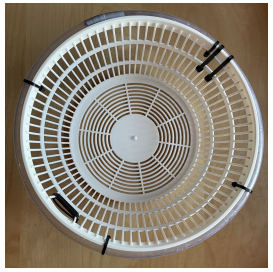
IRISH SEAWEED CONSULTANCY

Erasmus+, Macroalgae Initium
IO3.1: Seaweeds in Aquaculture, IMTA

List of materials

Note: Most of the following materials can be found around the home and classroom.
Other materials, such as a pump or bio-beads are easily available in aquarium shops and online.

Materials	**Description (materials and methods of construction)**	**Role of material in the practical**
	• One Rigid mesh bowl/basket. Use kitchen aids such as a colander/strainer, plastic bread basket or internal bowl of a salad spinner (pictured). Additional materials that *may* be required, depending on what materials are used: **cable ties**, to close up gaps in the mesh; **Foam or plastic tubing** attached near rim to provide additional flotation.	The mesh bowl represents the fish cage in an IMTA farm and holds the highest trophic level, the fish.

	• Bio-beads or similar (a handful) Bio-beads (pictured) or similar small items that float (or partially float, by preference) are placed in the rigid mesh bowl to represent a cohort of fish.	The bio-beads represent the fish in the cage.
	• Yoghurt pots (less than or equal to 100 ml) • Vaseline • Cement • Sand • Water • Twine or ‘U’ tacks or metal wire Wipe a thin layer of Vaseline around the inside of the yoghurt pots. Pour in concrete (use a standard mix, such as 1 part cement to 4 parts sand, mixed to a thick consistency with just enough water – don’t make mixture too loose). Push in ‘U’ shaped tacks or a twine loop (tied at base) into the wet concrete in the middle of the pot and allow to set (2-3 days). Tip: bending each leg of the ‘U’ outwards before setting in concrete will ensure a better grip.	Makes small anchor weights for anchoring longlines and fish cages in the tank.

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	• Plastic packaging foam (4 units) • Hole cutter drill bit (35 mm) • Drill (pillar or hand-held) • Cotton string (4 units) Cut 8-10 circles out of foam (Suggestion: keep and reuse from any packaging received). Some foams cut more cleanly than others, these are usually higher density packing foam. Once cut, add string through the central hole, and tie a loop on either end (pictured).	Makes the longline floats/buoys for both the mussel and seaweed longlines.
	• 6-8 pipe cleaners (preferably blue or black, but any colour will do). • 4-6 Foam floats and string (as previously described) • 1 m cotton string Assemble parts to make the mussel longline by tying two lengths of string together at one end to make the longline header rope (approx. 30 cm length). Add the floats, threading their loops along each of the header ropes so that these header ropes are parallel to each other. Bend the furry pipe cleaners into 'V' droppers along each header rope (one side of droppers only pictured). Make sure there is a loop tied in at either end of the header rope.	Black/Blue pipe cleaners bent into a 'V' shape on the mini longlines represent the extractive shellfish, *Mytilus edulis.*

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	• Thin plastic sheeting • 4-6 Foam floats and string (as previously described) • 1 m cotton string • Scissors Cut a rectangle (approx. 30 x 15 cm) of thin plastic sheeting (Suggestion: old plastic post/courier bags are a good source of material for recycling). Fold lengthways, then make a fringe by cutting nearly but not up to the fold. Snip the long-fringed plastic rectangle into smaller sections (pictured). Make a single header rope longline by cutting a length of string and make loops at either end. Thread foam floats onto it at regular intervals, interspersed by plastic fringe 'kelp' (these can be tied onto the string).	Plastic sheeting cut into a fringe represents seaweed (kelp) cultures on single header longlines
	• Cotton string Complete the fish cage, double mussel longline and single seaweed longline by tying cotton string 'anchor ropes' between the loops on the concrete anchors and the loops on the longline header ropes at either end. The fish cage is stable enough with just one anchor attached. Adjust the length of the string anchor ropes to suit the water level in the tank to ensure that lines aren't too loose/tight.	String is used as fish farm ropes in the longlines and fish cage.

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	• Large box or small tank or bath (e.g. 100-250 L) • Water • Hose or buckets For reference, the tank pictured is 250 L, approx. external dimensions are 100 x 60 x 66 cm. Smaller boxes are also good, but make sure they are not too shallow. Place the tank/box near a power supply as well as a source of water and a drain (Suggestion: playgrounds or outdoor spaces are good places to try this experiment as the tank can be drained quickly). Fill the tank with water and add the fish cage and longlines.	The tank is the body of water (e.g. a bay) where the IMTA farm is located.
	• Aquarium wave-maker pump Place the submersible pump into the water. This model has a strong magnet that can hold it on place on the wall. Plug pump into a socket or extension cable, ensuring there is no possibility of water getting into the socket from filling/using the tank. The students can be asked where to situate the pump to create a current of water that best moves fish waste nutrients from the cage towards the mussel/seaweed longlines.	A submersible pump that can be placed into the tank to create a current that simulates movement of water in a bay.

	• Food dye (concentrated gel) • Syringe • Beaker (100-300 ml suitable) • Water Mix a small quantity of the concentrated food gel with water in the beaker to get a strong solution of dye. Use the syringe to add a squirt of dye into the fish cage and watch where it is dispersed by the water pump. Multiple applications of dye can be added to the water before the tank of water becomes too dark to see how the dye is dispersed. The IMTA elements (cages/longlines) can be rearranged within the tank to demonstrate the most efficient uptake of nutrients from the fish.	Food dye represents the dissolved fish waste in the water.

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Tank filled with water and all materials ready for demonstration: