

NAVIGATOR product demonstration prop building instructions

Regional competitions may build product demonstration props out of materials other than PVC pipe. Your regional coordinator will inform you of any changes to materials for your regional competition. NOTE: Look for a regional information document posted on your [regional website](#). This document will list any changes to the product demonstration props.

Companies should be aware that tolerances in lengths of cut pipe and length of pipe inserted into joints can change the overall dimensions of product demonstration tasks. Except where noted, companies should expect tolerances in all product demonstration props and should build their ROVs and tools accordingly. In no case should the dimensions given in this document for a product demonstration prop be used to calibrate a measuring device.

Online links and Home Depot part numbers are given for certain construction items. However, some Home Depot stores may not carry the listed items or Home Depot may not be available in your area. MATE recommends checking other local hardware stores or online sources, such as those listed below, for the required component.

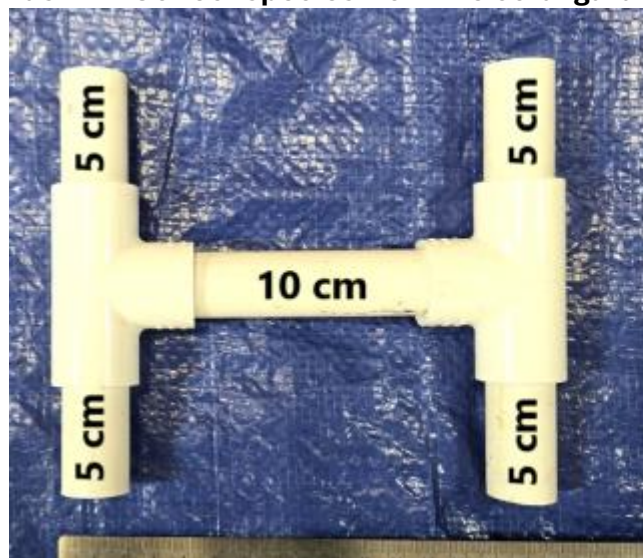
<https://www.pvcfittingsonline.com/>

<https://pvcpipesupplies.com/pvc-fittings/schedule-40-pvc-fittings/>

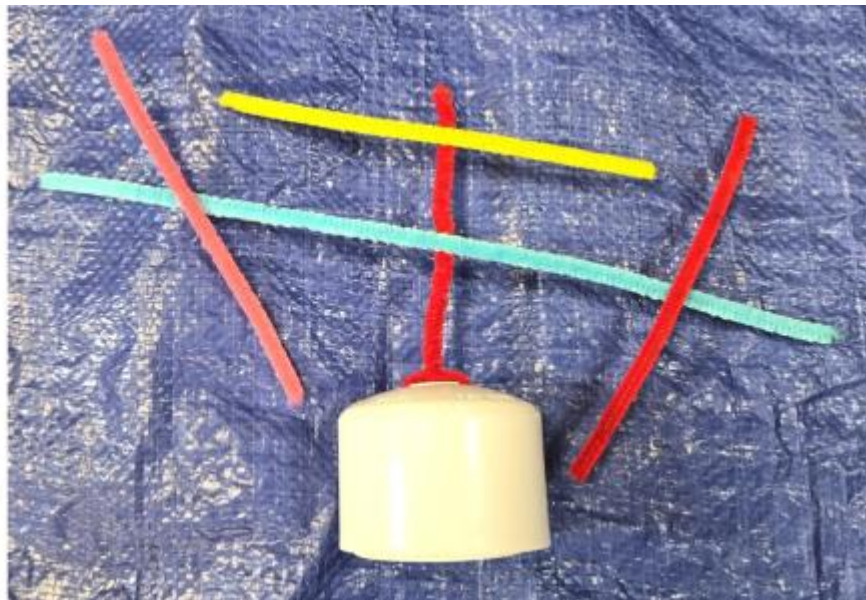
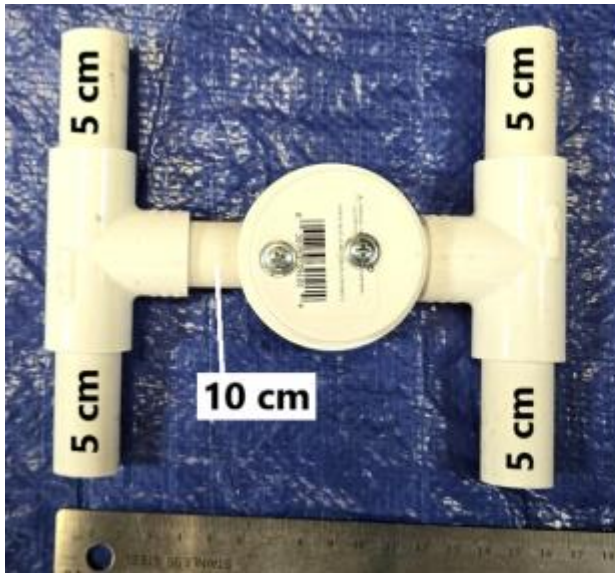
See last page for update notes (if any).

Task 1: Seabed 2020: A Kaleidoscope of Corals in Cold Water

Task 1.1 Collect species from the coral garden

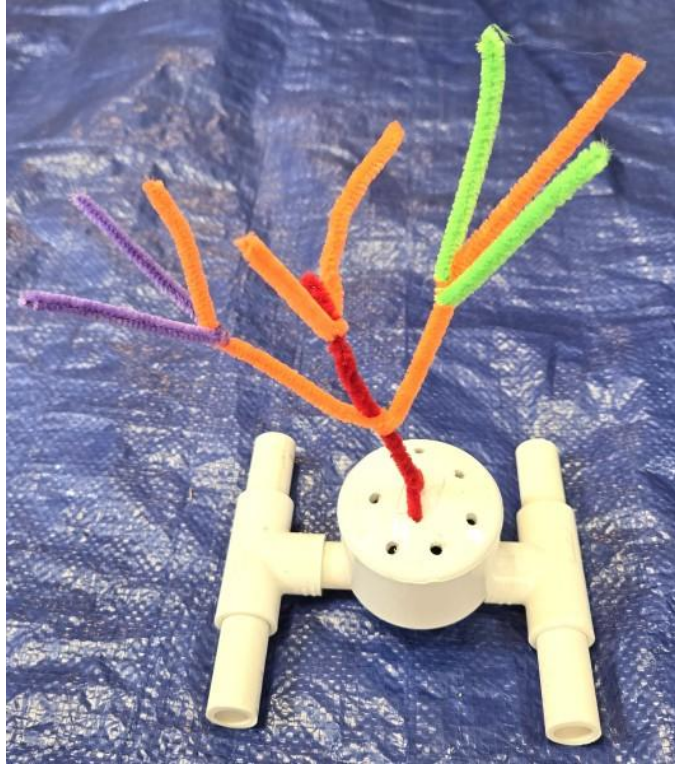


The basket star. Left: ½-inch PVC base. Right: [O-ball](#) attached by a cable tie to the PVC base.



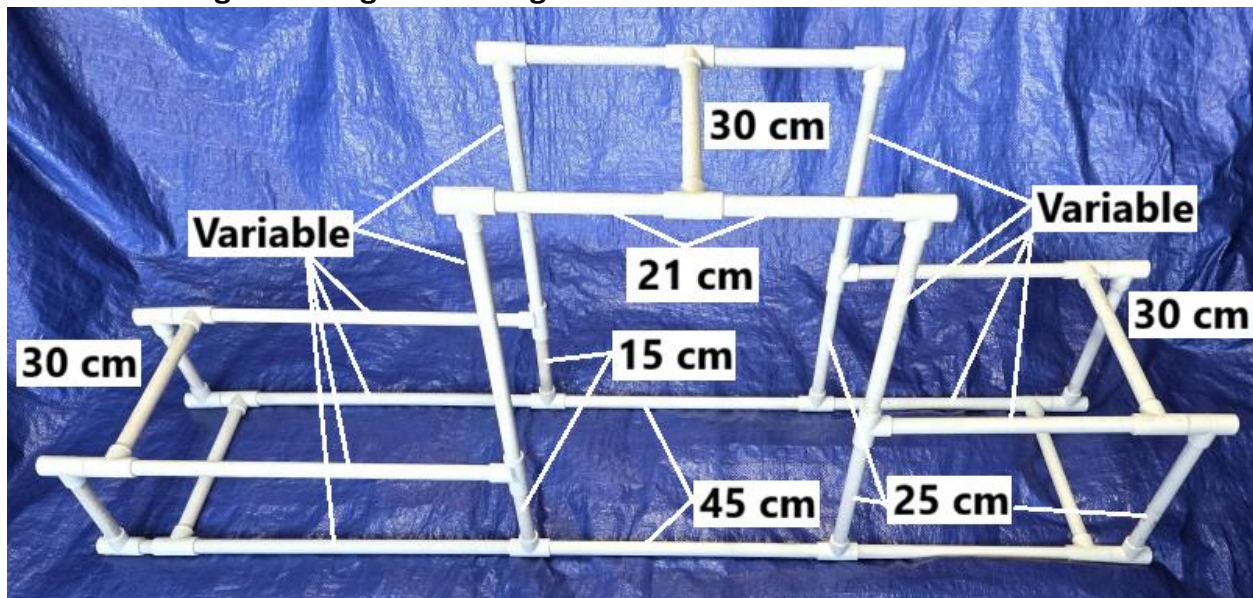
The coral species is constructed from 1/2-inch pipe, a [2-inch knockout cap](#), a 2-inch end cap and [colored chenille pipe cleaners](#). Top left: 1/2-inch PVC base with 2-inch knockout cap. Top right: 2-inch end cap with 2-inch pipe inside. Bottom left: 30 cm pipe cleaner inserted into holes in the 2-inch end cap. Bottom right: 30 cm and 15 cm chenille pipe cleaners of the coral species (colors can vary).

Video: [Creating a coral](#)



The coral species. The ½-inch and 2-inch PVC components comprise the substrate of the coral species.

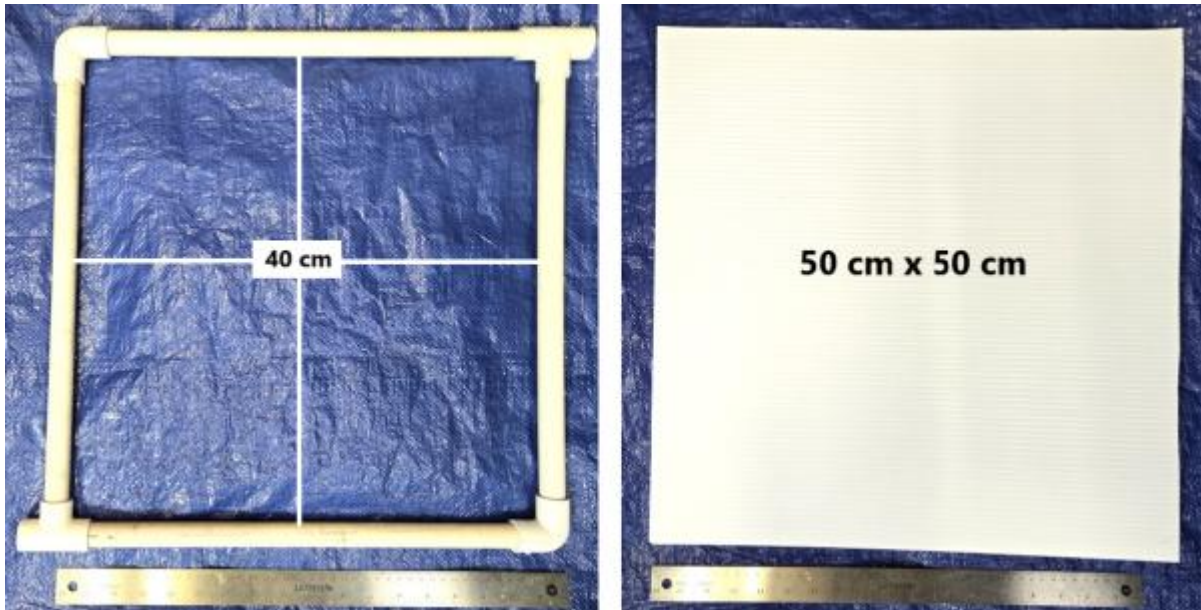
Task 1.2 Coral garden ridge modelling



The coral garden is constructed of ½-inch PVC pipe. The coral garden will be between 1 meter and 2.5 meters in length, between 50 cm and 1.5 meters in height, and approximately 36 cm wide.

Task 2: SmartAtlantic Alliance: Better Information, Better Decisions

Task 2.1 Mitigate invasive species

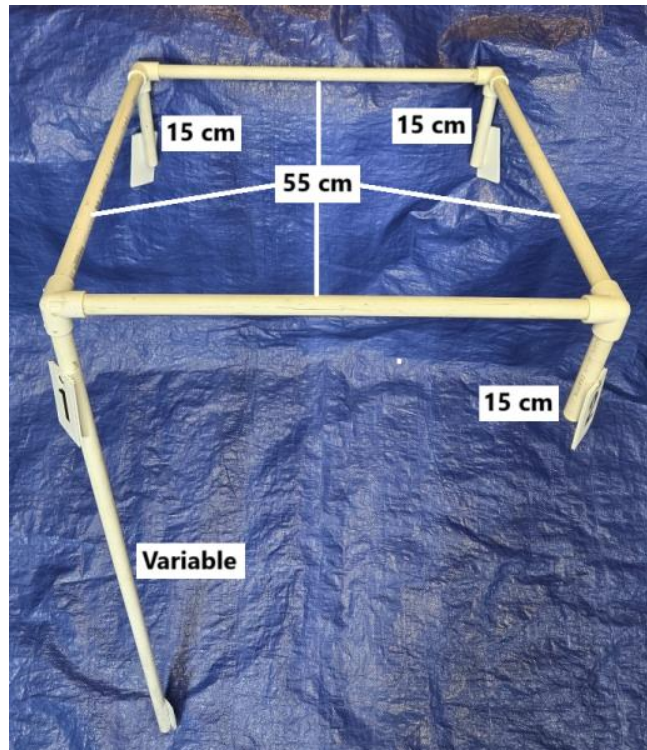


Left: The PVC framework for the invasive crab sample. Right: Corrugated plastic sheeting for the PVC framework.

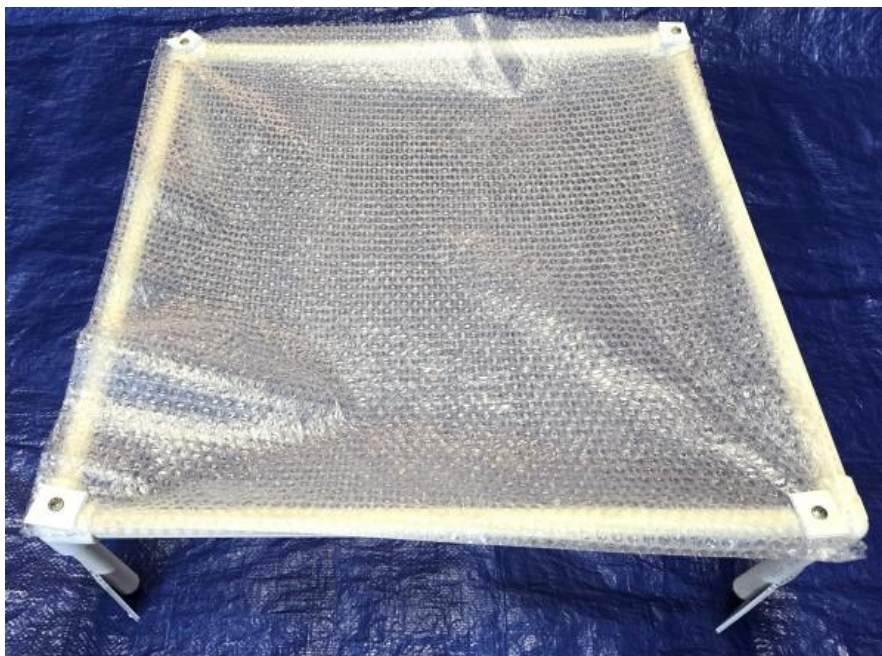


Invasive and native crab species on the sample. Crab images are laminated and secured with clear tape.

Task 2.2 Iceberg tracking



The iceberg is constructed from ½-inch PVC pipe.

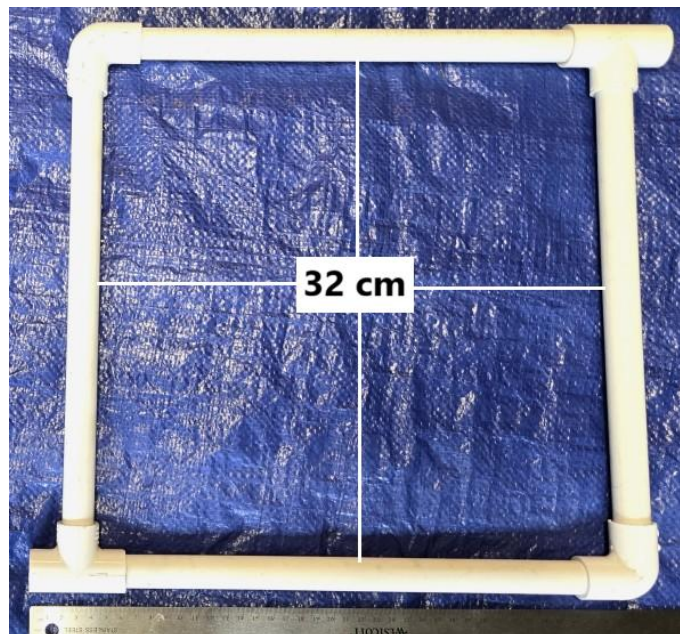


Bubble wrap or clear plastic covers the top of the iceberg. Design note: 2 cm x 2 cm squares of corrugated plastic sheeting will prevent the bubble wrap from tearing when screws are inserted.



The five survey points around the iceberg will be constructed from [2-inch vinyl numbers](#) on a 10 cm x 5 cm rectangle of corrugated plastic sheeting.

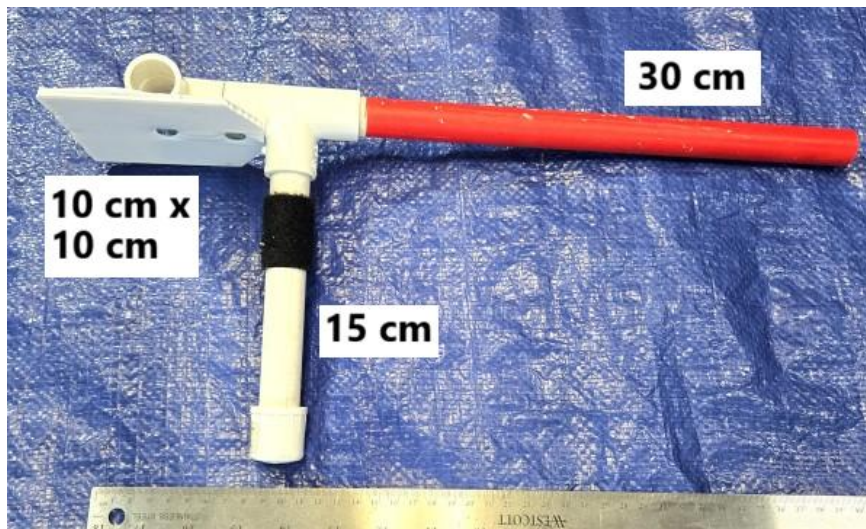
Task 2.3 Testing whale safe fishing gear



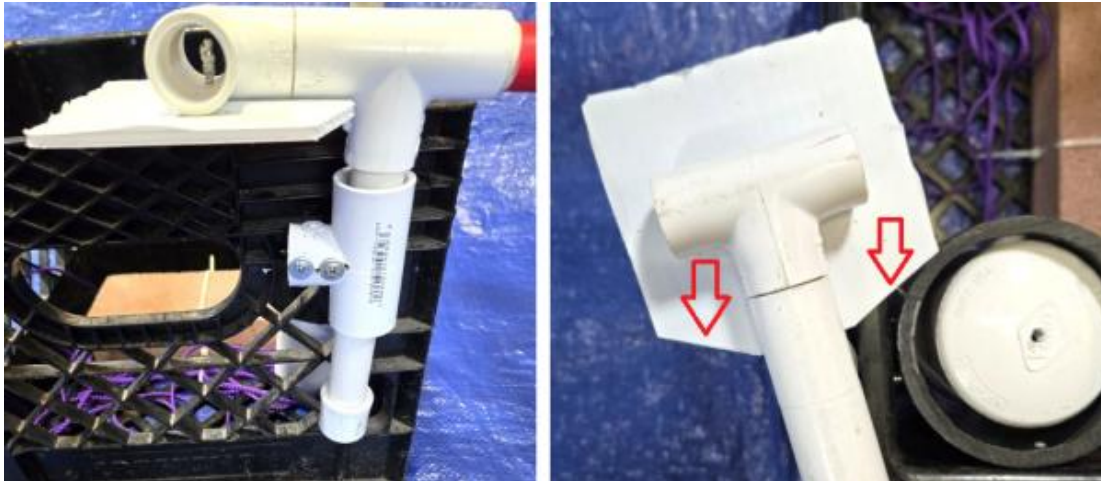
The lobster pot fits within a weighted framework constructed from $\frac{1}{2}$ -inch PVC. The size may be adjusted for a larger or smaller milk crate; the milk crate should fit just inside this framework. Adding rebar inside the $\frac{1}{2}$ -inch pipe or securing the PVC pipe to [bricks](#) will ensure the framework and the milk crate do not move when the handle is pushed.



The lobster pot is constructed from a [milk crate](#), 3-inch pipe, ½-inch PVC pipe, and corrugated plastic sheeting. The milk crate fits just within the PVC framework. Two 25 cm lengths of rebar inside the milk crate act as weight. The entire lobster pot should be slightly negatively buoyant.



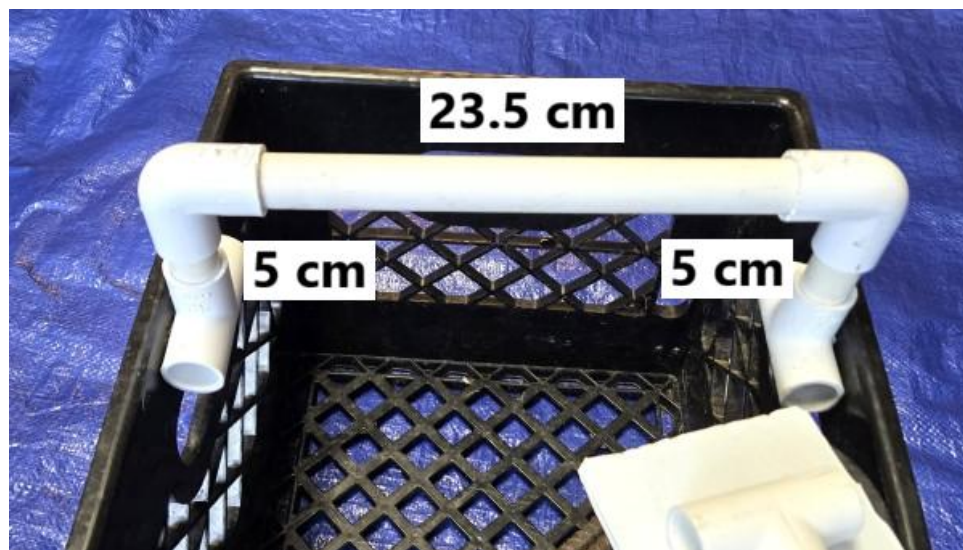
Left: The sonar release mechanism is constructed from ½-inch PVC pipe. A 10 cm x 10 cm piece of corrugated plastic sheeting holds the buoy inside the milk crate. Right: The 15-cm length of pipe spins inside a [¾-inch to ½-inch reducing tee](#).



Left: The simulated sonar release mechanism is attached to the milk crate through a $\frac{3}{4}$ -inch to $\frac{1}{2}$ -inch reducing tee. The $\frac{1}{2}$ -inch pipe spins inside the tee. Velcro loops around the pipe provide friction to hold the handle in place until pushed by the ROV. Right: The plastic sheeting's corners are cut to facilitate the buoy release.



Left: The buoy is constructed from 2-inch PVC pipe and a 2-inch end cap. Flotation inside the pipe makes the buoy positively buoyant. Right: The buoy holder is constructed from 3-inch pipe.



The lobster pot can be lifted by the $\frac{1}{2}$ -inch PVC pipe, which is screwed into the milk crate.

Video: [Testing whale safe fishing gear](#)

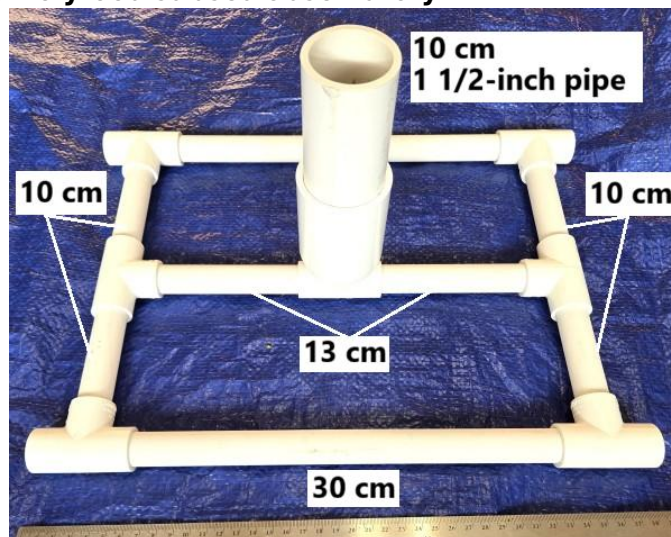
Task 2.4 Recover the buoy anchor



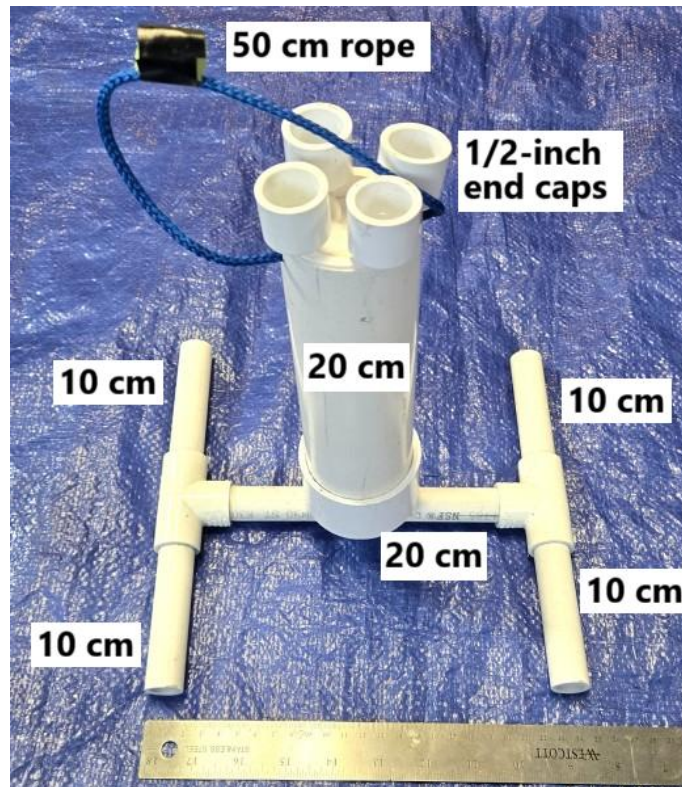
The buoy anchor is constructed from a 2-gallon bucket. A [#310 U-bolt](#) is the attachment point on the anchor. Weight inside the bucket holds it securely to the bottom of the pool.

Video: [Attaching a recovery line to the buoy anchor](#)

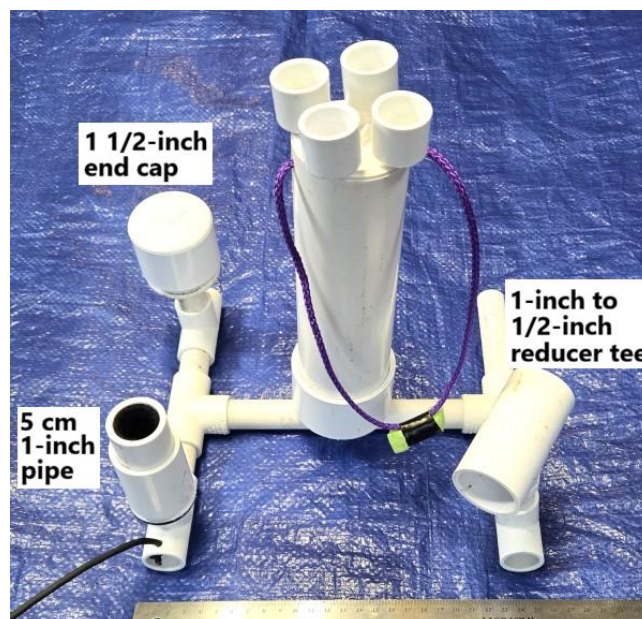
Task 2.5 Service the Holyrood subsea observatory



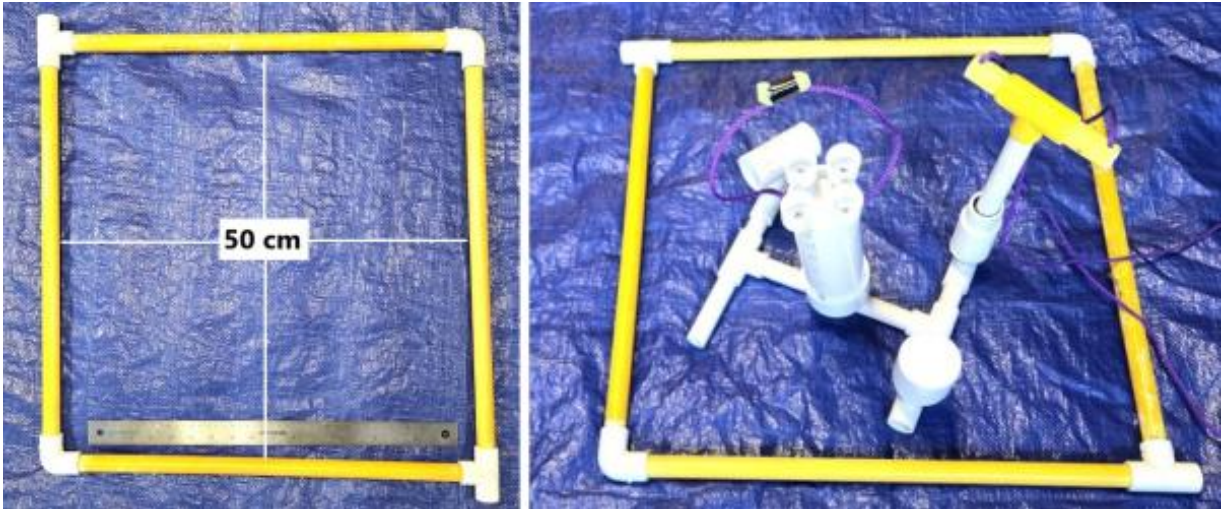
The Holyrood subsea observatory is constructed from $\frac{1}{2}$ -inch and $1\frac{1}{2}$ -inch PVC pipe. The connection port of $1\frac{1}{2}$ -inch pipe is connected to the $\frac{1}{2}$ -inch framework by a $1\frac{1}{2}$ -inch to $\frac{1}{2}$ -inch reducer bushing and a $1\frac{1}{2}$ -inch coupling.



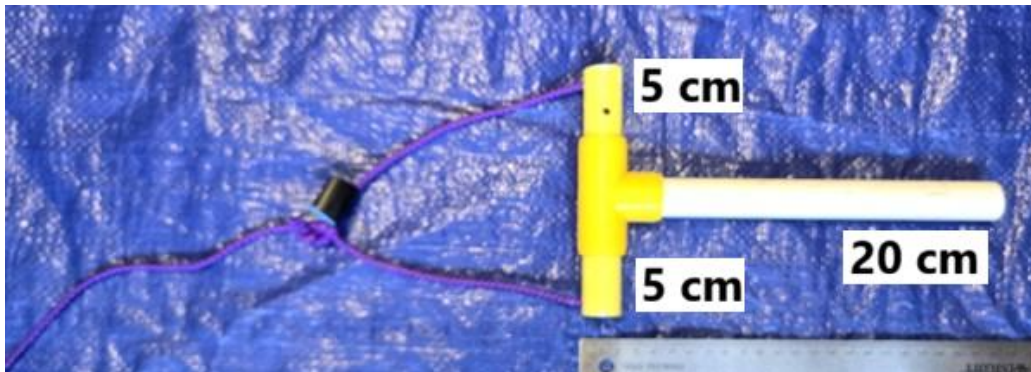
The old eDNA sensor is constructed from 2-inch PVC and 1/2-inch PVC pipe. The sensor can be carried by a 50 cm length of rope located at the top of the sensor. Four 1/2-inch end caps are secured to a 2-inch knockout cap at the top of the eDNA sensor.



The new eDNA sensor is also constructed from 2-inch and 1/2-inch PVC pipe. Additional elements include a 1 1/2-inch end cap, a 1-inch to 1/2-inch reducing tee, and a holder for the sensor connector constructed from a 5 cm length of 1-inch PVC pipe, a 1-inch coupling, and a 1-inch to 1/2-inch reducer bushing.



Left: The designated area for the installing the new eDNA sensor is constructed from ½-inch PVC pipe painted yellow. Right: The new eDNA sensor successfully installed in the designated area.



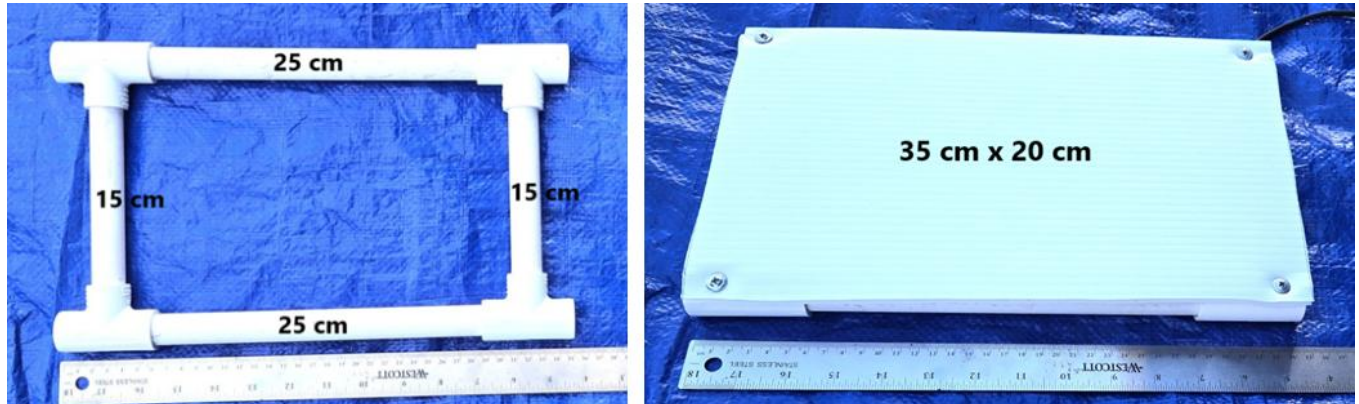
The eDNA sensor connector is constructed from ½-inch PVC pipe. 2 meters of cable attach the connector to the new eDNA sensor.



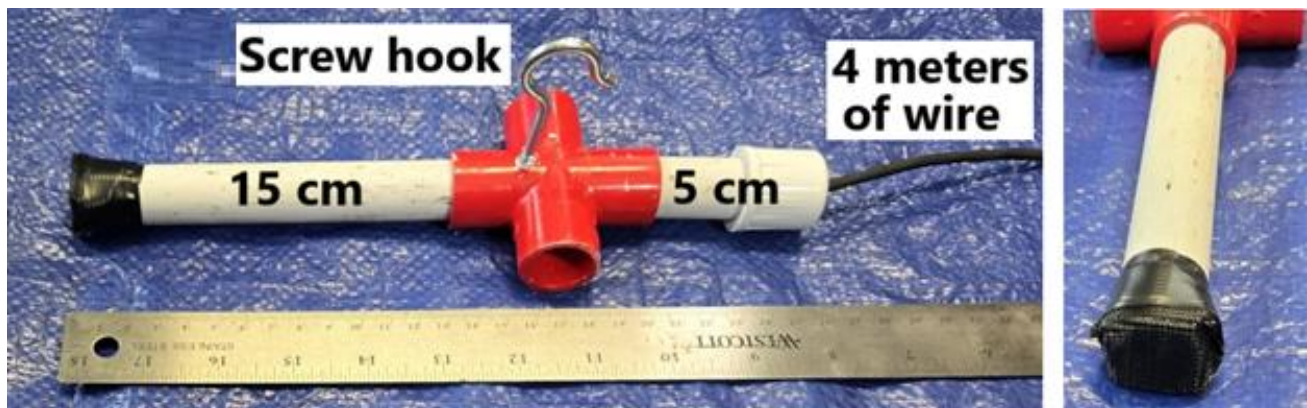
The sensor connector successfully installed into the observatory connection port.

Task 3: Wind-Powered Offshore Oil Platform: Scalable Solutions for Global Energy Needs

Task 3.1 Powering an oil platform from a wind turbine



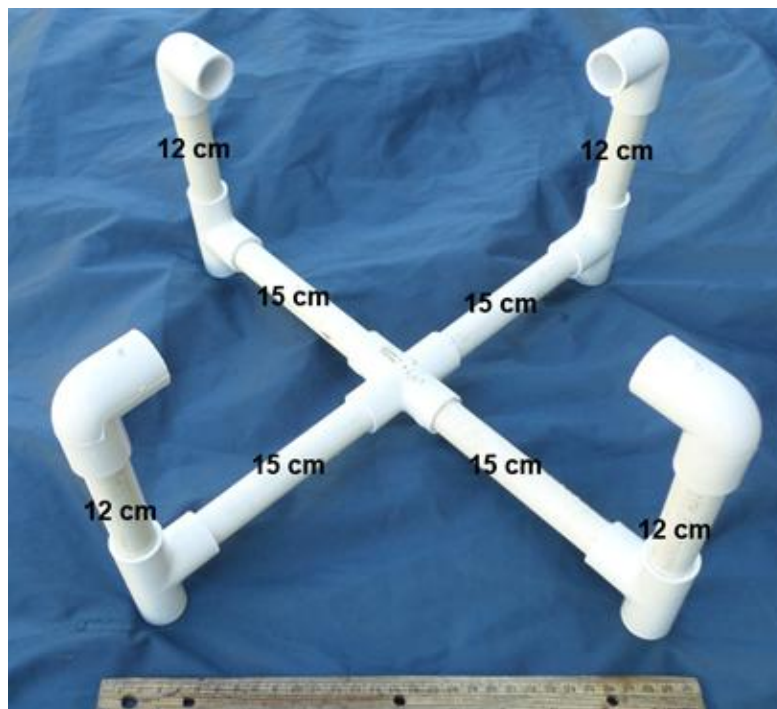
The wind farm power connector stand is constructed from ½-inch PVC pipe and corrugated plastic sheeting. Left: The framework for the stand is constructed from ½-inch PVC pipe. Right: A 35 cm x 20 cm rectangle of corrugated plastic sheeting tops the wind farm power connector stand.



Left: The power connector is constructed from ½-inch PVC pipe. A [screw hook](#) can be used to carry the connector. A 4-meter length of wire connects the power connector to the array's sub-surface structure. Right: A 6 cm x 4 cm rectangle of Velcro hooks covers the open end of the 15 cm length of pipe.



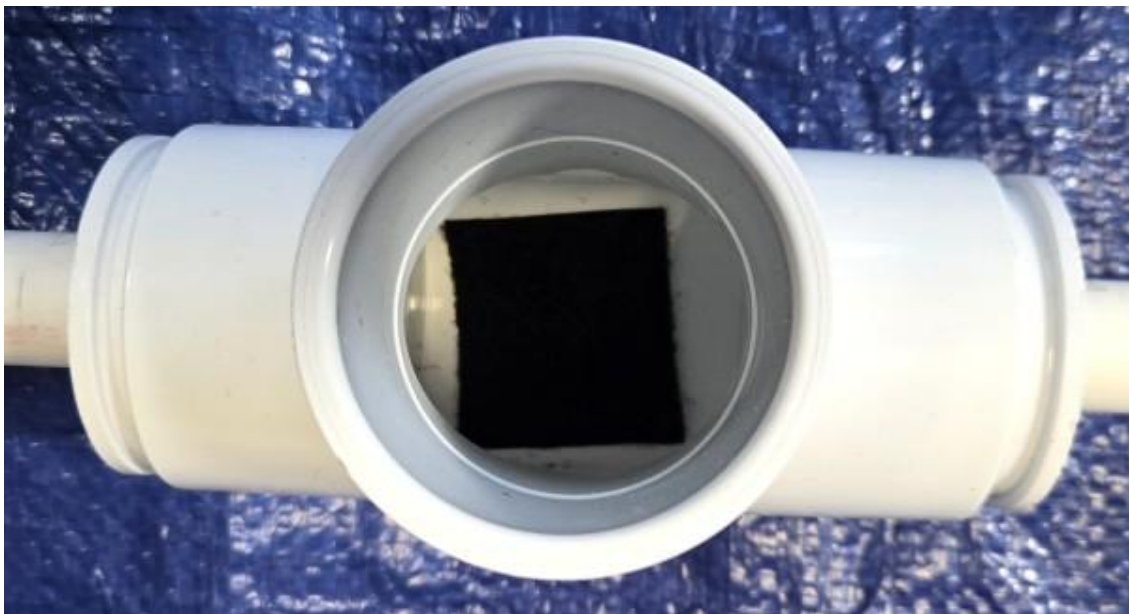
The power connector resting on its platform.



The waypoint is constructed from ½-inch PVC pipe.



The oil platform port is constructed from ½-inch and 2-inch PVC pipe.

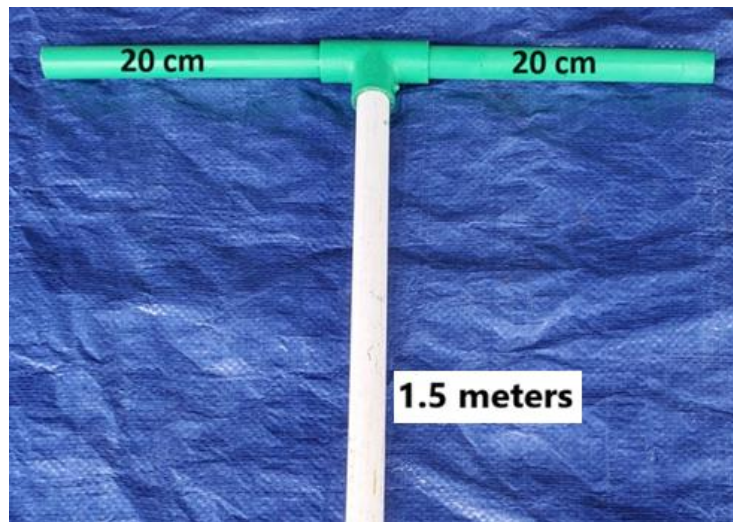


The inside of the oil platform port is covered with Velcro loops.



The power connector successfully installed into the oil platform port.

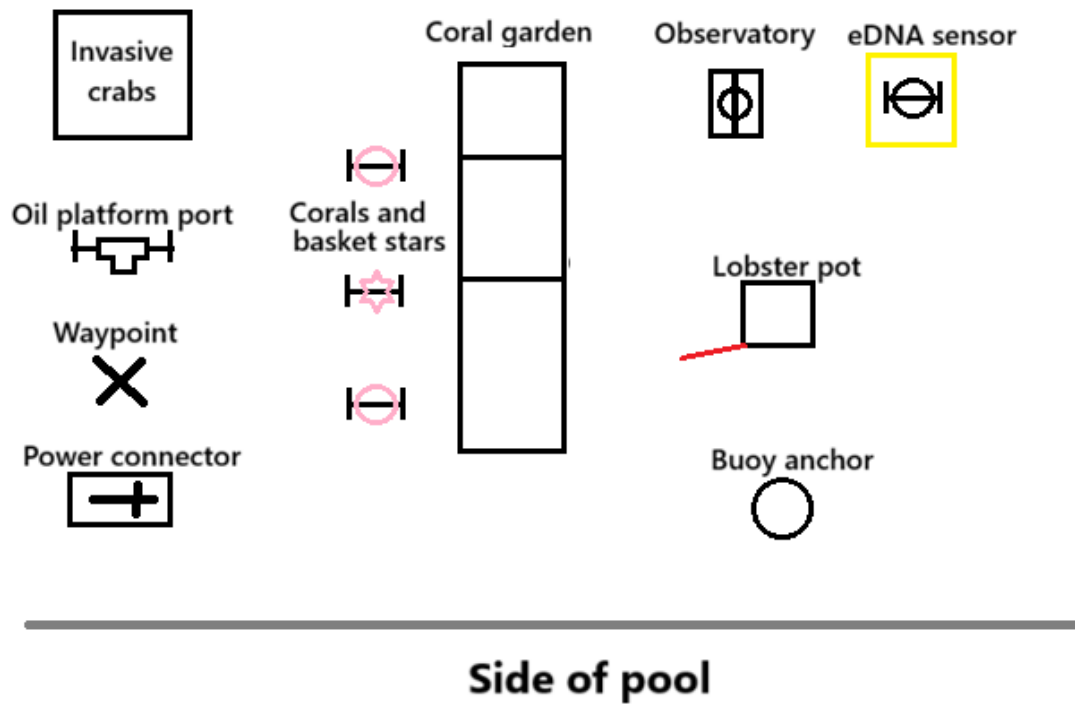
Task 4: MATE Floats Under the Ice!



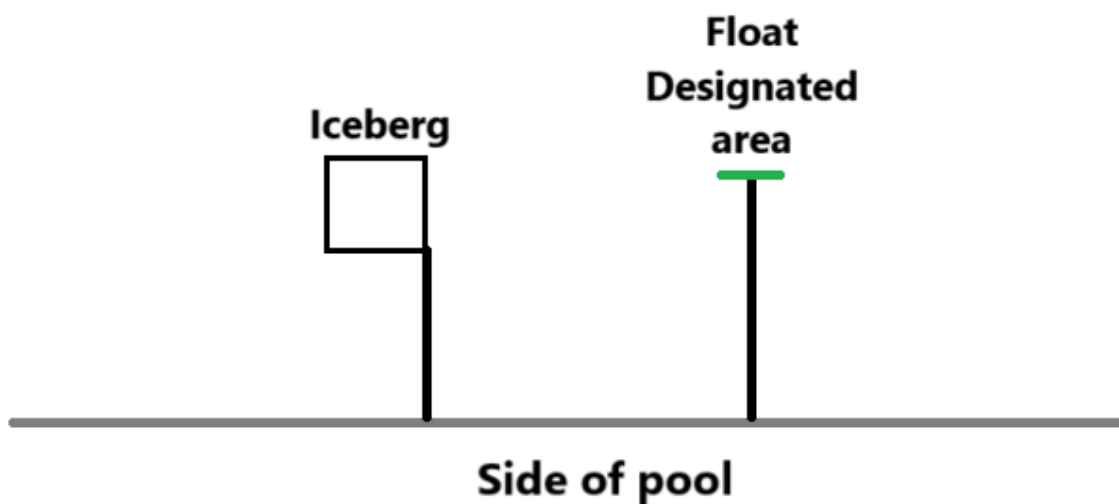
Companies must deploy their float anywhere beyond the green mark, which is constructed from $\frac{1}{2}$ -inch PVC pipe and set 1.5 meters out from the side of the pool.

NAVIGATOR class product demonstration set up:

The following is a possible underwater set up for the NAVIGATOR class product demonstration at regional competitions.



The following is a possible surface set up for the NAVIGATOR class product demonstration at regional competitions.



Update Notes:

Updates are highlighted in yellow.

NAVIGATOR prop building instructions.

None