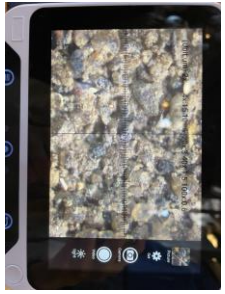
Scientist in Residence Report

Olivia Yorke-Dunne

SEAS YOUR FUTURE

My Project

The Sediment Grab and sediment examined under the microscope



My project for this voyage was to to find the Secchi depth (a measure of clarity) of the water in different locations, including: Dublin harbour, Isle of Man, Garlieston harbour, Molefry harbour, and Whitehaven. I also measured turbidity (murkiness), chlorophyll and phycoerythrin (PE) concentrations (both indicating concentrations of suspended microalgae) in surface waters and took samples of the bottom sediment, recorded the weather, state of tide, boat movement etc, to investigate whether these parameters affect the Secchi depth in coastal locations.

To find the Secchi depth I used the Secchi Disk, a white disk of 30 cm in diameter with a lead weight attached to the bottom of it. The Secchi Disk is lowered into the water on a tape measure and at the depth at which the faint outline of the disk disappears from view is the Secchi depth: the greater it is, the clearer the water. I found that in the more industrial ports, such as Dublin or Bristol, the Secchi depth was very shallow, at around 1.9 m or less, whereas the less busy or industrial areas, such as Whitehaven, reached a Secchi depth of around 4.4 m. This difference shows how boats and human activity affects the water by disturbing the sediment or creating pollution.

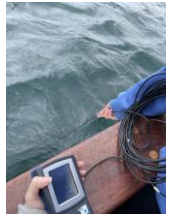
I determined turbidity, chlorophyll and PE with an optical sensor, the Trilux by Chelsea Technologies Ltd. and a Hawk data logger. After making sure the sensor is clean, it is lowered into the water along with the Secchi Disk, and data is recorded at specific depths. This information is then uploaded to the computer, corrected for instrument drift, the average and standard deviation are calculated, to enable data quality evaluation. Unfortunately, a fault on the cable of the Trilux occurred half way through my project, so I was unable to collect all the data I wanted.

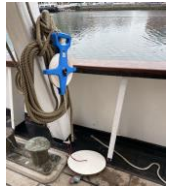
S.R. Olivia Y.D. 2022 project

	date	time	sechi depth (m)	Chloro	SD	turbidity	SD	PE	SD	distance from shore metres//miles	depth to sea bed (m)	sediment type (coarse/sand/rock)
1	29/07/22	11:00	1.9	21.8	±5	2.2	±5	1.5	±20	5m	-	-
2	02/08/22	10:15-	~~3.3~~	4.09	6.78	0.68	±4	0.2	±0	1450m	12.7	
3	04/08/22	6:00	3.9	-		-		-		-	-	Sand/mud
4	09/08/22	10:30	4.4	-		-		-		0.6mile	13	

An extract from my project data log

The Trilux instrument and Hawk data logger and data output

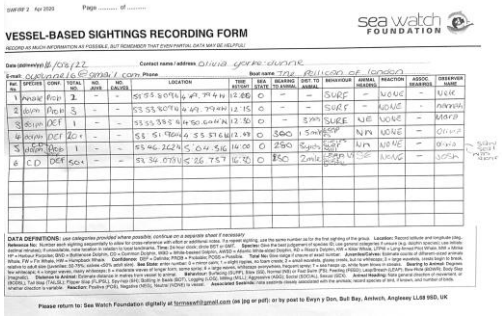




Secchi disk

Cetacean watches

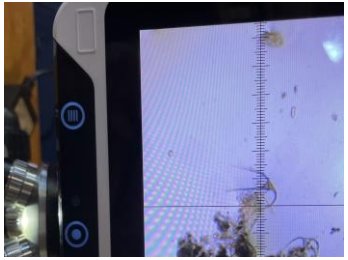
When the weather conditions and sea state were right we carried out cetacean surveys for the Sea Watch Foundation. These are line transects while at sea, during which we searched the sea for dolphins and whales. On both, port and starboard, 2-3 trainees who were on watch duty, but not occupied, kept a lookout for cetaceans. Every 15 minutes during the two hour long surveys, I recorded on the ‘effort based survey sheet’ if there had been: a sighting, our longitude/latitude, boat course, speed, sea state, swell height, visibility and boat activity. Often we didn’t see any cetaceans during the watch, however no sightings are also valid data. When we did see them, they came in abundance, and I believe this was because we mainly saw them in feed zones. The species we saw most was the common dolphin, usually riding the bow wave and breaching, as they are very social animals. We also saw bottlenose dolphins, riding in the wake. Whales were also spotted, however they are less playful than dolphins, therefore they were very distanced from the ship and we could not determine species of whale.

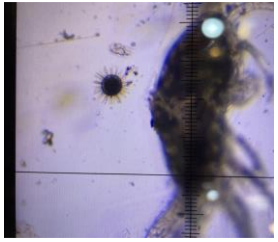


VESSEL-BASED SIGHTINGS RECORDING FORM

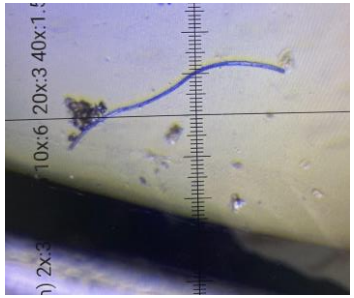
sea watch FOUNDATION

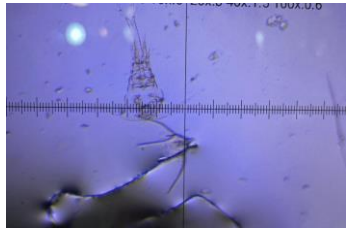
Plankton trawl



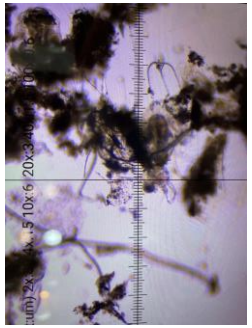


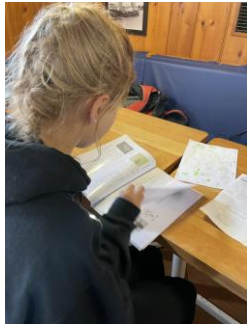
When we were anchored in Scotsmans Bay, Ireland, I decided to do a plankton trawl! I asked a few students to help gather the plankton, by yo-yoing the 100 micrometer net in and out of the sea. After a few minutes of doing this, we took the net over to the fresh water tap and washed the plankton out into a beaker, we then transferred a sub-sample over to a Petri dish with a pipette.
I wasn't expecting to find much, however when I looked at it under the ships microscope I was astonished by the amount and diversity of life within just a few small samples! We used plankton identification guides to examine our samples and found different types of zooplankton (animals), including copepods and other crustaceans and microscopic algae (phytoplankton), including dinoflagellates. We even found what looked like a small fingerling (baby fish)!

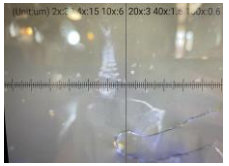


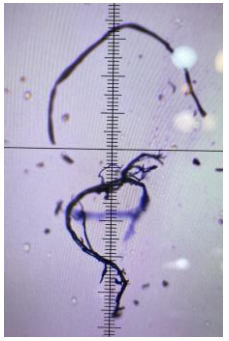


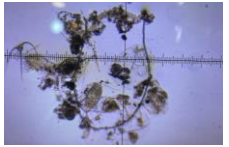
The dark blue strands are microplastic fibres, which may come from fishing nets or our clothing, for example fleeces.
I was distraught to find them in every sample we had had taken: it just shows the full effect we're having on the environment.

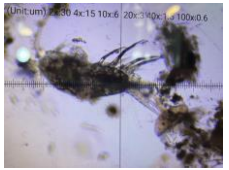








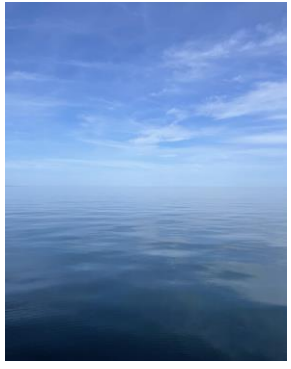




Cloud observations

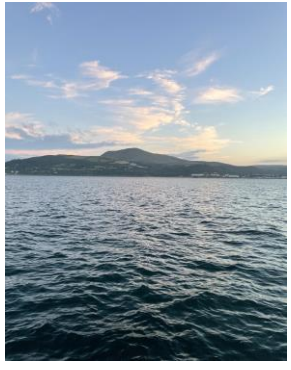
Each day a few students and I set out to observe the clouds using the NASA Globe Observer app, recording the different types: stratus, cumulus, cirrus, etc. We also reported how much of the sky was covered at each altitude (low, mid and high) in the sky and whether this would bring precipitation or not, however much of the voyage the sky was clear blue with little to no clouds.

Here are a few images I took of the clouds, with examples of their names:



Cirrus

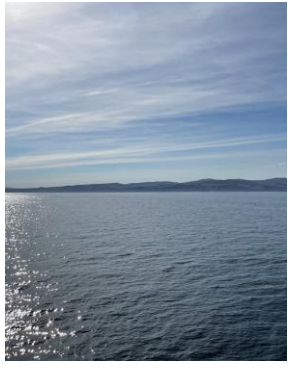
Cumulostratus
Cirustratus



Cirrus
Cumulus

Cumulus

Cumulus



Cirrus

Once in range of a mobile phone signal, I submitted our observations to NASA and within a day or so, NASA scientists reported back via email, showing their satellite observations within the the same time window (+/- 15 minutes) and area. The table on the right shows low altitude clouds (there were no mid- and high ones at that time) seen by the satellites Meteosat-11 and Modis and by us from the Pelican of London.

Latitude Range Longitude Range	53.06 to 53.7 -6.32 to -5.68	52.97 to 53.77 -6.38 to -5.58	**Latitude 53.376200** **Longitude -5.995800**
LOW Cloud Cover Cloud Altitude Cloud Phase Cloud Opacity	Broken 60.71% 1.46 (km) Water 280 (K) Translucent	Overcast 98.45% 1.73 (km) Mixed 278.39 (K) Opaque	Stratocumulus Overcast (>90%) Opaque
Corresponding NASA Satellite Images. Click to view image --->	***METEOSAT-11*** Visible Infrared	***MODIS*** Rapid Response Worldview	Sky Visibility : no report Sky Color : no report North East South West Up Down

Conclusion

I was overjoyed to be a part of the crew onboard The Pelican, providing citizen science data, for ORCA, NASA and other environmental foundations such as the Sea-Watch Foundation.

I learned that at sea, not everything goes to plan, whether it's the weather, the boat, the science equipment or people on board. We had a few incidents whilst I was on board,which affected the research I could or couldn't carry out. For example, I couldn't do any of the shore based surveys, such as the beach clean, litter and seaweed-searches. Despite this, the crew and the students on The Pelican supported me where possible to carry out my projects.

I most enjoyed the Cetacean watches, as it was amazing to see the dolphins, whales and seals in their natural habitats; to see their behaviours in their surroundings, whether they were breaching, diving or riding the bow wave. Often, we were very lucky to see them whilst doing the Cetacean survey. However, even if there were no sightings, I knew this was also vital data for the organisations, such as ORCA. To find out the main areas they populate and the areas that may be sparse.

The bit I found most challenging was the sediment drop: using the sediment grab, to try and collect sand, rock, mud or whatever was on the the seabed, to then investigate it under the microscope. By finding out what the seabed was constructed of I could then interpret how this affected the turbidity of the water. I found this most challenging as a huge amount of it was trial and error, as it often failed to pick up sediment for one reason or another. It closed before it hit the bottom, opened before we retrieved it out of the water or it drifted too much with the waves and tide, each of these things I took into account, and made adjustments to the equipment, we tried and tried again until it finally worked! (*you can see images of the largest sediment sample we retrieved, and it under the microscope, on page 2 of this report)*

This was one of the most amazing experiences of my life, one I will never forget. I hope it will help lead me onto a career in marine biology or related subject and I would welcome any opportunity to join The Pelican crew in the future!