GB ROW 2022 IMPACT REPORT

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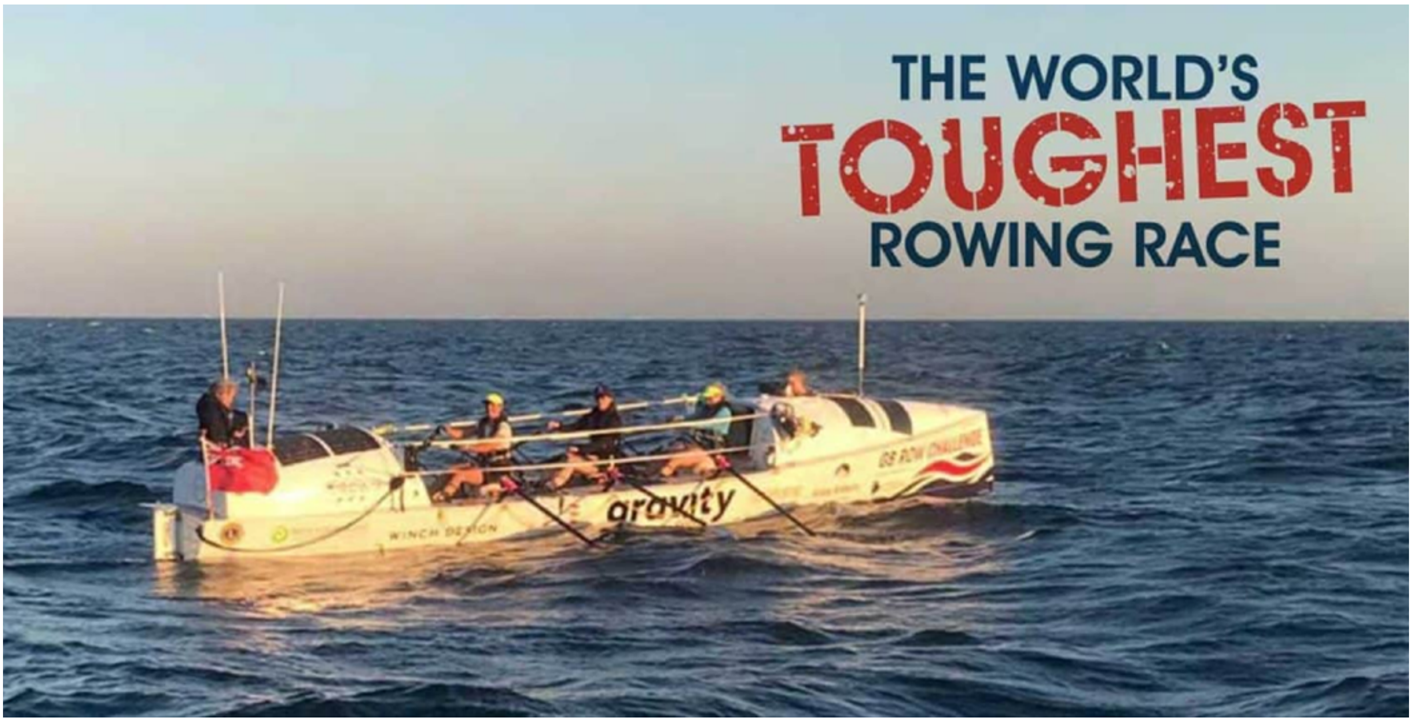
The University of Portsmouth has teamed up with GB Row Challenge for a genuinely exciting pairing of science and sport. As GB Row Challenge endurance rowers battle physical stresses, winds and tides around the British coastline, they also gather scientific data including underwater sound recordings, microplastics and biodiversity. This is then handed over to the University of Portsmouth to analyse and interpret.



Find out where in the UK we detected rare, ecologically important and commercial fish species, listen to some dolphins having a chat, find out what a snapping shrimp sounds like and what their movement north might mean, and find out just how many microplastics might be in the sea near you…

Scientific data from the 2022 GB Row Challenge race

Lead: Fay Couceiro

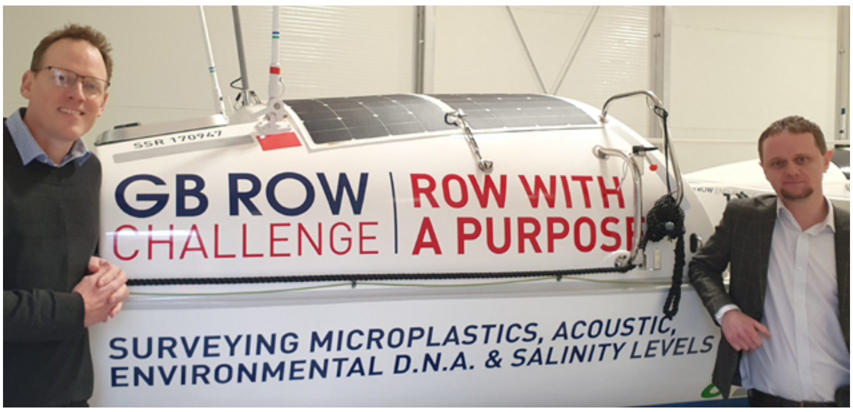
This report has been a team effort and particular thanks go to James Trayford, Andy Lundgren, Alex Ford, Kat Bruce and Anita Carey for all their time and help in data analysis, Jon Churchill and Alex Mair for their engineering skills and of course a huge thanks to the teams who collected the samples and the GB Row Challenge support team, especially Jim Bastin

While the rowers faced the physical challenge at sea, our engineering partners took on a significant challenge of their own. It's not simple to design a system that meets the needs of the eDNA sampling, sound recording and microplastics collection without one part affecting the others. For example, the pump used for microplastics collection creates noise that interferes with the sound recording, while plastic components needed for eDNA sampling could increase the amount of microplastics captured, so these two sampling systems need to be kept apart. The team also had to avoid interfering with critical equipment like the desalination pump used to provide drinking water for the crew, using space on the boat that's needed for solar panels, or demanding lots of battery power that could compromise the crew's navigation or communication ability, and of course they have to keep weight down and avoid adding drag that would make it harder for the rowers to make progress. It's lucky that we have a team of amazing engineers from our partners at Harwin, Porvair Plc and RS Aqua, who love putting their innovative minds to solving these sorts of thorny challenges!

Ms Anita Carey, microplastics analysis

Dr James Trayford, acoustic analysis

Dr Ryan Mowat, RS Aqua



Left to right: Dr Andrew Lundgren, Reader in Gravitational Wave Science, Professor Alex Ford, Professor of Biology and Dr Fay Couceiro, Reader in Biogeochemistry and Environmental Pollution

Background

GB Row Challenge began in 2005 as the ultimate rowing challenge in which crews attempt to row continuously around the coastline of Great Britain - a distance of over 2000 miles.

This requires much more than just strength, stamina and endurance. To be able to successfully circumnavigate Great Britain, teams need to understand navigation and the sea's tidal flow, which is why tactical ability and making the most of weather and sea conditions can be as important as the crew's rowing strength.

In 2022, GB Row Challenge teamed up with the University of Portsmouth with the aim of developing an event that combined the physical challenge with a scientific purpose. Our team of scientists first needed to devise a sampling strategy that did not impact on the speed of the boat- we had to remember that the rowers are already taking on enough of a physical challenge! It was decided to focus on three main areas: **microplastics**, **underwater sound** and **biodiversity**, as well as collecting data on temperature and salinity for reference data. The aim is to collect these datasets for each GB Row Challenge event between 2022 and 2025, which will give us a great baseline for the entire UK and also highlight any changes happening over that time.

This is the report for the 2022 Challenge.

In 2022, three teams set off from Tower Bridge, London on June 12th: Albatross (5 men, 1 woman), Sea legs (3 men, 2 women) and All system Row (5 women). Due to some of the worst summer storms in 50 years only 1 of the teams made it all the way round the UK, but scientific data from all teams was gathered and has contributed to these first maps of their kind for UK waters.

The ambitious goals of this partnership can only be achieved if we have enough rowers to take part in GB Row Challenge itself. If you're looking for an adventure, excel at teamwork and want to contribute to protecting our precious coastal environment for generations to come, get in touch with Jim Bastin to find out more about joining a crew for 2024 or 2025

GB Row Founder William De Laszlo says "Scientific Research, Adventure, Collaboration and Endurance are at the heart of this ground-breaking project. At the core however is understanding the human impact on our most precious resource - our oceans... with data comes evidence, evidence becomes action and, we hope, behavioural change: Keep striving and help us protect our seas".

Microplastics

Microplastics are pieces of plastics smaller than 5mm. They may be plastics made that size on purpose (e.g. nurdles) or small pieces of plastic that have broken off from larger pieces (e.g. fragments or fibres). Scientists began to notice microplastics in the oceans almost 20 years ago. Since then methods for detecting them have improved and studies have been conducted to determine if they are harmful. Most of these studies have taken place in sea animals and unfortunately the results are troubling. In many species, eating large numbers of microplastics has negative impacts ranging from reduced growth, to aberrant development, to cell toxicity.

Images of microplastics

Considering the possible negative impacts, it is essential that we have a better understanding of how many microplastics are in our waters and that we have a way to monitor them.

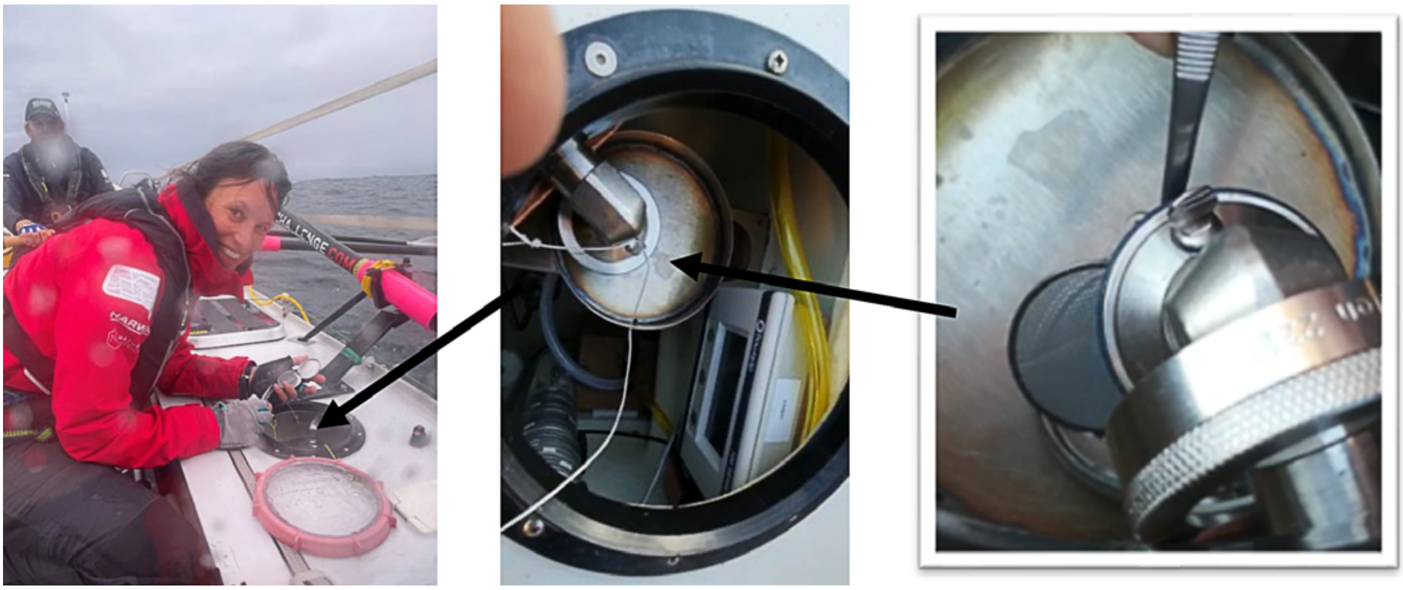
The collaboration between University of Portsmouth and GB Row Challenge is hugely beneficial in this respect as the rowers are already circumnavigating the UK each year. This provides an ideal opportunity to collect samples all around the UK in one go AND to look at that data year on year to spot changes.

Firstly though, we had to engineer a way to collect the microplastics that didn't impact the boats racing performance. Traditionally, to collect microplastics, a large net is towed slowly across the water by an engine driven boat. This is known as a manta trawl and usually collects anything (including plastics) that is larger than 0.3mm in size.

Manta trawl, a traditional way to collect microplastics at sea

The drag this would produce meant it would not be feasible for a rowing boat. Instead a custom sampling system was designed and developed through an innovative collaboration between University of Portsmouth scientists and engineers from Harwin and Porvair plc. Harwin are specialists in high-reliability engineering for demanding applications and Porvair plc are a specialist filter manufacturer. The sampling system was developed to both survive the harsh environment at sea, and work around the limited physical space and power available on the boats, using materials and a sampling process selected to minimise the risk of contamination. There was a fixed power budget of 1000W for the entire journey- that's about enough to run a hair dryer for 30 minutes- and the race can last up to 35 days. There was no ability to recharge the microplastics battery during the race. Any energy captured through the solar panels was kept for powering essential boat navigation and water making systems.

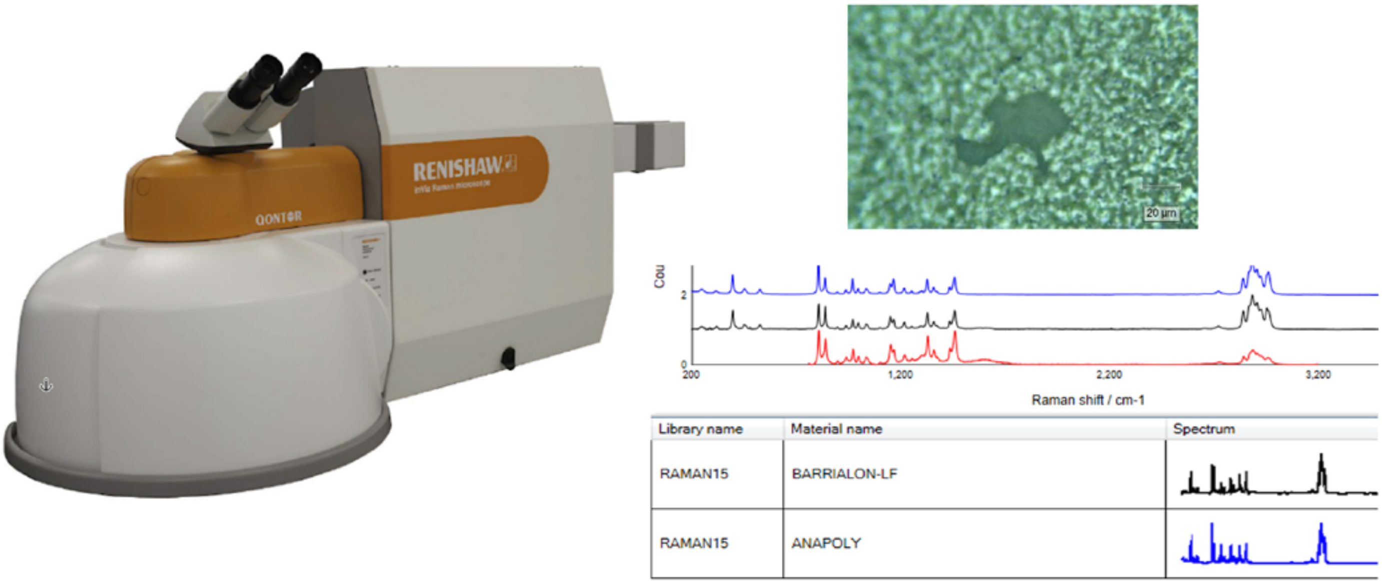
Between 100-150 litres of water was pumped through a stainless-steel filter on each day of the race. The filter allowed us to collect microplastics bigger than 0.04mm in size- at the lower end of this size range the microplastics would be microscopic (invisible to the naked eye). The system was programmed to run for three hours (12- 3 pm) each day during the race. We had to limit the time that the pumps were running since the noise of the pump interfered with the sound recording devices elsewhere on the boat. The filters were changed by the crews daily, protectively encased and then stored until the boats' returned. The samples were then delivered to the University of Portsmouth's School of Civil Engineering and Surveying for analysis.



Microplastics collection with GB Row

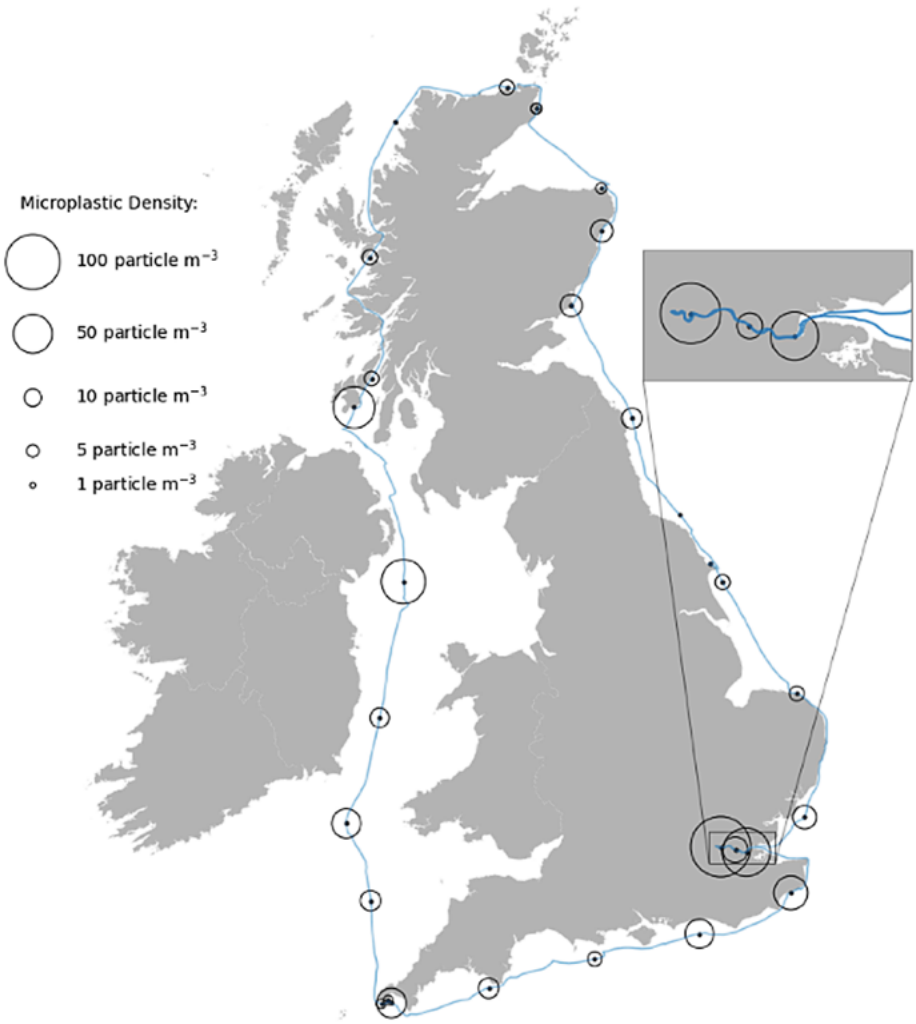
A disadvantage to our method is that less water is filtered than in a net trawl. For us, this was far outweighed by the advantages of our pump system, which was feasible on an unmotorised boat and allowed us to collect smaller pieces of plastic than would be possible with a traditional net method. We believe it is vital to know about these smaller microplastics as research has shown that there are many more of the smaller microplastics than the larger ones, and that the smaller microplastics are more likely to cause problems for animals. At the very base of the ocean's food web are tiny microscopic organisms known as plankton. When small microplastics are mistaken for plankton, the knock-on effects spread through the whole food web, impacting larger wildlife and even humans through the seafood we eat.

At the University, the samples were processed and then analysed by microRaman spectroscopy where a laser is fired at the microscopic particle on the filter, and the scattering of the laser's light produces a spectrum that provides information about which type of plastic the particle is made of.



Our microRaman, a collected microplastic fragment and Raman spectral identification

All of the microplastic data points collected by the Albatross team are shown here. The samples collected by Sea Legs and All Systems Row are still being processed and will be added to the data set once completed.



Note: a lower sample volume collected over a shorter time was used in the Thames to prevent the filter blocking with sediment. Volumes filtered ranged from 26 – 91 L.

Microplastics samples from 27 sites have been analysed and the **average number of microplastics collected was 20 pieces per cubic metre of sea water (20 MP/m³)**.

The highest amount of microplastics, **121 MP/m³, was found in the River Thames**, followed by 65 MP/m³ off the west coast of England / east coast of Northern Ireland.

No microplastics **(0 MP/m³) were found in the samples from the northwest coast of Scotland and the coast of the North York National Park** on the east coast of England.

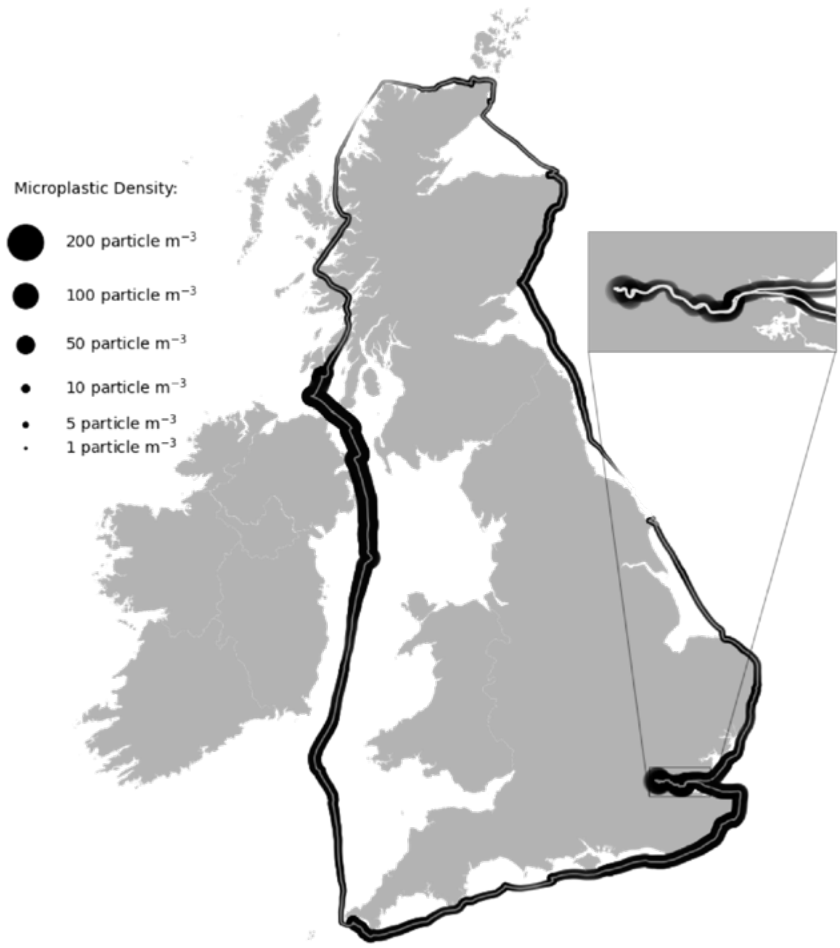
How do these numbers compare to other data from the UK?
In 2017 Cefas published the microplastic data from many of their offshore trawls. They saw just 0- 1.5 MP/m³. Our data shows much higher concentrations – **almost 100 times more microplastics in some areas**. This is mostly explained by the fact that our system collected much smaller microplastic pieces than the trawls used by Cefas. Nearly all of the microplastics we collected were smaller than 0.3 mm, which would not have been caught in the trawls.

Our data also shows up to **4 times more microplastics in the River Thames** than collected in October 2020 which found a maximum of 36.7 MP/m³ in Putney. This may be due to the different sampling locations, methods, time of year, or because concentrations are increasing.

These comparisons really show the need for a comprehensive map of these smaller sized microplastics and an annual monitoring method, which we have begun with this University of Portsmouth and GB Row Challenge collaboration.

A smoothed map has been produced from the 2022 samples, which estimates summer microplastics concentration in the seas around the UK. This is currently extrapolated from a small dataset but as this 4-year project continues and more samples are taken, the distance between sample sites will decrease and the accuracy of this map will increase. Comparisons between years will also be possible, determining if the problem is getting worse or better.

A map of this type based on a high resolution of data is key for improving policy around marine pollution and enabling action to be taken to protect vulnerable species and areas.



Underwater Soundscape

Sound travels much further in water than in air. As it travels so well, sound is used by many marine species to communicate, hunt, find a mate and avoid predators. Probably the most famous example is dolphins using echolocation to navigate or find food, but many fish also use sound to communicate.

However, it's not just animals that make noise in the sea. Humans create a lot of noise pollution through shipping, construction and operation of infrastructure like oil and gas platforms or windfarms, and our use of sonar (e.g. for military or surveying purposes). This can reduce animals' ability to hear one another, leading to getting lost or stranded, failing to find mates, or becoming more vulnerable to predators that they can't hear closing in.

Working with our partners RS Aqua, we designed a system to embed a hydrophone (an underwater microphone) into the rudders of the GB Row Challenge boats so that we could record the underwater sounds all the way round the coastline of Great Britain. This allows us to map both **"noisy" species** (like dolphins and porpoises) and **noise pollution** in our seas. In 2022, two of the three GB Row Challenge boats (Endurance and Challenger) carried hydrophones fitted inside the rudder. The third boat (Intrepid) will also be fitted with a hydrophone for future years. Having multiple boats with hydrophones is important as it enables us to cross-check findings by checking for the same types of sounds when the other boats pass the same location at different times.

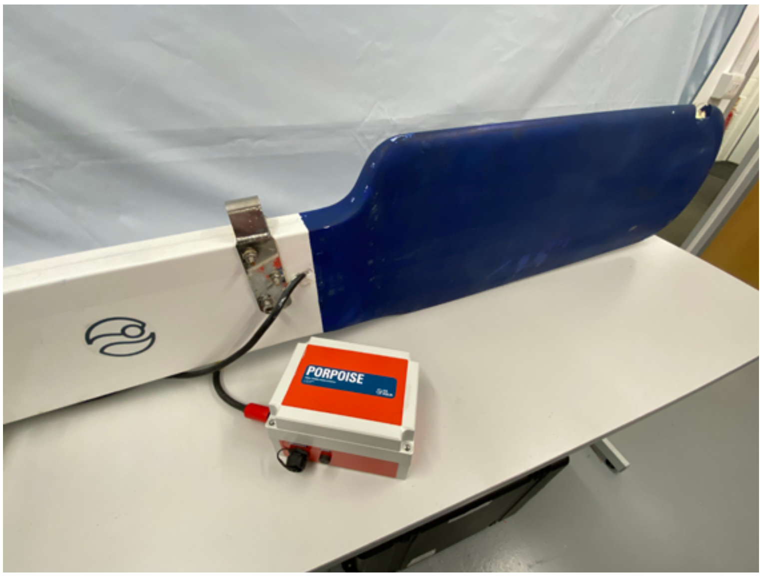
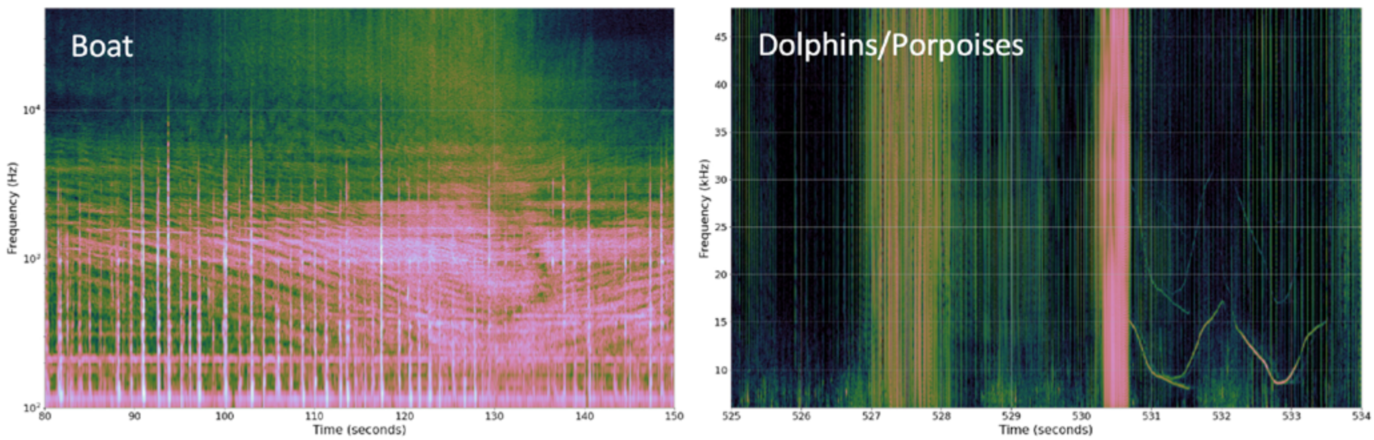
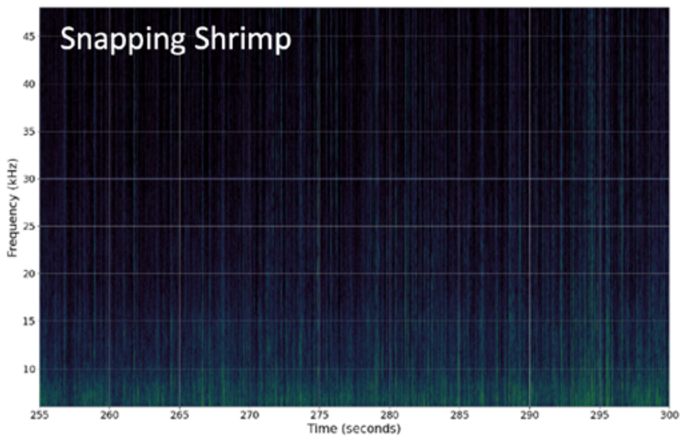


Image of the RS Aqua Porpoise hydrophone integrated with the rudder of a GB Row Challenge boat.

The RS Aqua Porpoise acoustic recording systems collect a huge amount of data, including everything from the low frequency noises humans can hear, to high frequency ultrasonics such as dolphin echolocation clicks. These data are being interpreted by astrophysicists at the University of Portsmouth's Institute of Cosmology and Gravitation. Why are astrophysicists helping us look beneath the sea? Finding patterns or changes in large, noisy data sets is central to how astrophysicists study the universe, and we are using that expertise to see what we can find in the underwater soundscape around the UK.

To start with, we targeted specific time points when the crews reported sightings of particular things (e.g. boats or dolphins). Once these events were also recognised in the sound recording, a spectrograph of the sound was made to show the sound visually. This allowed us to build familiarity with the data, and identify some archetype examples of different marine sounds. We found that using the high frequency capabilities of the hydrophone (10-192 kHz) allows us to cancel out the noise of the rowing itself and identify a number of distinctive marine sounds.





Examples of an archetype spectrograph for a boat, a dolphin/porpoise pod and snapping shrimp are given here

An algorithm was then developed to recognise these patterns across the entire dataset of sound recordings. This consisted of a broad-band survey, that identified individual segments of sound at high-frequency (>10 kHz) which were louder than background levels. These audio clips flagged by the algorithm are referred to as *"instances"*. 376 instances were found and then inspected in more detail, with 97 identified as boats, 27 as Cetacea (whales, dolphins and porpoises) and 48 as snapping shrimp. The rest of the instances remain unidentified at present. The maps below show the locations where each of these types of sounds were detected.

Hearing the snapping shrimp so far north up in the East of Scotland is of particular interest as they are normally found in more southern areas and movement may be an indicator of ***climate change*** *and warming seas.*

Further soundscapes will be collected over the next 3 years of GB Row Challenge, but we will also be carrying out a deeper analysis of the 2022 soundscape to see if we can find and identify more species. This could help with mapping their distributions and further improve our understanding of how they use sound.

Dolphin

Dolphins are very dependent on the use of sound to survive. Like us they use sound to communicate, but they also use it for navigation, hunting, and to avoid predators. They make a variety of sounds, including clicks, whistles, grunts and squeaks, which serve different functions. Dolphins use high frequency clicks for echolocation. This is like having built-in sonar. The dolphins send out a sound and listen for the echo (how the sound is reflected) which tells the dolphin how far away something is and how big it is. This can help them find and track food, or detect predatory sharks and avoid them.

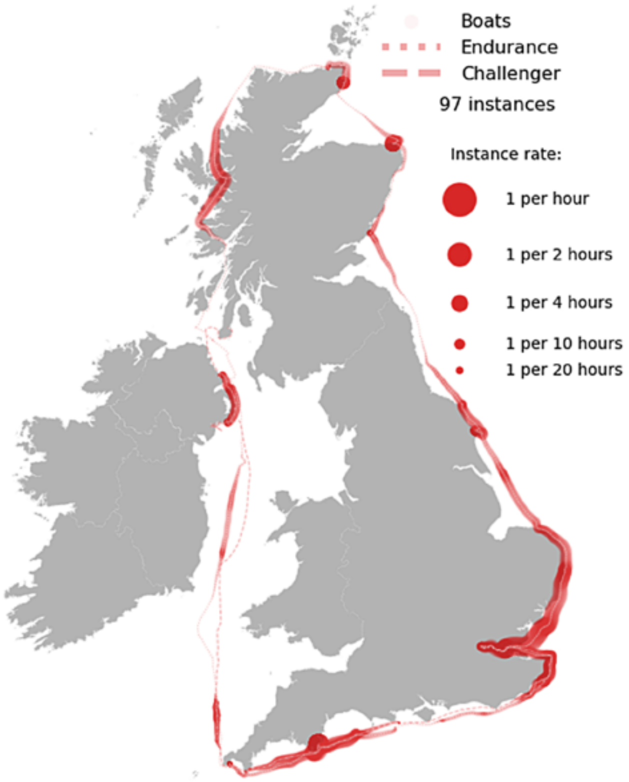
Dolphin use the other, lower frequency, types of vocalisation to communicate with one another. A recent study suggested that humans are making so much noise in the seas now that dolphins have to "shout" to each other to be heard, making it harder for them to communicate with each other. This has significant implications for the health of the individuals but also for the health of the whole pod when they are trying to communicate dangers or to coordinate hunting groups.

Snapping shrimp

Snapping shrimp also use sound to hunt and communicate, but in a very different way to dolphins. One of the claws of the snapping shrimp is much larger than the other and they can close it so fast – just half a millisecond- that it produces a shockwave. The rapid closing of the claw causes an air bubble to form, grow and collapse and it is the bubble collapsing that produces a shockwave and gives a loud and distinctive popping sound. The shrimp use the shockwave to stun prey and deter predators. They also use the sound produced this way to communicate with the other shrimp nearby. When you get lots of shrimp living in an area it can sound a bit like popcorn heating up – click on the link in the snapping shrimp map to have a listen to the ones we heard.

Underwater sound maps from 2022

The underwater sound of a boat going past



The underwater sound of dolphins/porpoises

The underwater sound of snapping shrimp

Notes:
One instance means that sound was heard, but it can't say how many boats, Cetacea or snapping shrimp were present, or how close they were to the hydrophone at that time.

Low shipping noise around the Isle of Wight is due to rowers passing at night time, rather than during the day during heavy boat traffic.

Environmental DNA (eDNA)

Along with the sounds and microplastics, our intrepid rowers also collected samples of environmental DNA, or eDNA to provide data on biodiversity. All animals are constantly shedding tiny traces into the environment – these include dead skin cells, mucous, saliva… and of course wee and poo. These tiny traces contain the DNA of the animal, and they can be filtered out of the ocean by passing seawater through a fine mesh. Similar to the microplastics, the filter mesh is sent to a laboratory to analyse the DNA and identify which species it came from. It makes it possible to record many species even when you never see them.

Twice a day, our rowers filtered 1 litre of water and added a special preservative to keep the DNA stable until they returned home and could send the samples to the lab of our partners NatureMetrics for analysis. This data is being further analysed by the University of Portsmouth's Institute of Marine Biology.

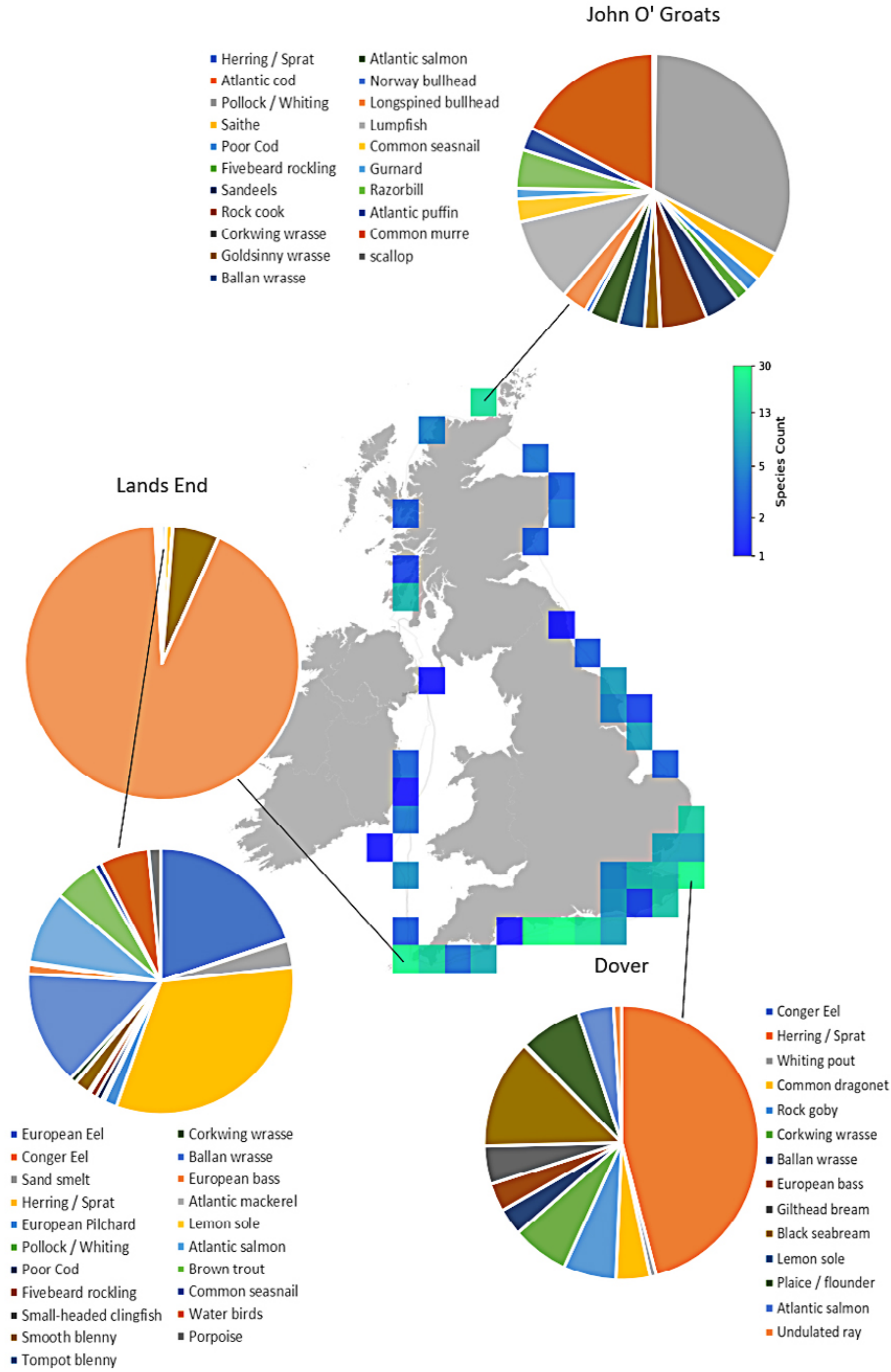
A total of 77 eDNA samples were collected around the UK and analysed for marine vertebrates (anything that lives in the sea with a backbone). From just 77 litres of water – that's only about a quarter of a bathtub – we found 82 species ranging from critically endangered European eels and endangered undulated rays to commercial fish such as herring, salmon and cod, as well as many other beautiful fish such as wrasse, gobies and garfish. Mammals were also detected (seals, porpoises and dolphins) and even some seabirds such as the vulnerable Atlantic Puffin. The full list of species detected is shown in the following tables.

	Common name	Latin name
Fish species that are often found in rivers	Carp	*Cyprinus carpio*
	Minnow	*Phoxinus phoxinus*
	Roach	*Rutilus rutilus*
	Ruffe	*Gymnocephalus cernua*
	Perch	*Perca fluviatilis*
	Atlantic salmon	*Salmo salar*
	Brown trout	*Salmo trutta*
	European Eel	*Anguilla anguilla*
Fisheries species	Herring	*Clupea harengus*
	European Pilchard	*Sardina pilchardus*
	Sprat	*Sprattus sprattus*
	European anchovy	*Engraulis encrasicolus*
	Atlantic cod	*Gadus morhua*
	Poor Cod	*Trisopterus minutus*
	Whiting	*Merlangius merlangus*
	Atlantic Pollock	*Pollachius pollachius*
	Saithe	*Pollachius virens*
	Norway pout	*Trisopterus esmarkii*
	Whiting pout	*Trisopterus luscus*
	Golden grey mullet	*Chelon auratus*
	Thicklip grey mullet	*Chelon labrosus*
	Atlantic horse mackerel	*Trachurus trachurus*
	Atlantic mackerel	*Scomber scombrus*
	Gilthead bream	*Sparus aurata*
	Black seabream	*Spondyliosoma cantharus*
	European bass	*Dicentrarchus labrax*
Flatfish	Lemon sole	*Microstomus kitt*
	Flounder	*Platichthys flesus*
	Common topknot	*Zeugopterus punctatus*
	Solnette	*Buglossidium luteum*
	Common sole	*Solea solea*
Ray	Undulated ray	*Raja undulata*
Birds	Razorbill	*Alca torda*
	Atlantic puffin	*Fratercula arctica*
	Northern gannet	*Morus bassanus*
	Common murre	*Uria aalge*
	Seagull	*Larus sp.*
	Cormorant	*Phalacrocorax carbo*
	Greylag goose	*Anser anser*
	Common pigeon	*Columba livia*
Invertebrate	Scallop	*Pecten maximus*

	Common name	Latin name
Sand eels & sand smelt (often used as bait)	Raitt's sand eel	*Ammodytes marinus*
	Lesser sand eel	*Ammodytes tobianus*
	Smooth sand eel	*Gymnammodytes semisquamatus*
	Great sand eel	*Hyperoplus lanceolatus*
	Sand smelt	*Atherina presbyter*
Other marine fish species	Conger Eel	*Conger conger*
	Garfish	*Belone belone*
	3-spined stickleback	*Gasterosteus aculeatus*
	15-spined stickleback	*Spinachia spinachia*
	Butterfly blenny	*Blennius ocellaris*
	Smooth blenny	*Lipophrys pholis*
	Tompot blenny	*Parablennius gattorugine*
	Transparent goby	*Aphia minuta*
	Black goby	*Gobius niger*
	Rock goby	*Gobius paganellus*
	Two-spotted goby	*Gobiusculus flavescens*
	Common goby	*Pomatoschistus microps*
	Sand goby	*Pomatoschistus minutus*
	Common dragonet	*Callionymus lyra*
	Rock cook	*Centrolabrus exoletus*
	Goldsinny wrasse	*Ctenolabrus rupestris*
	Ballan wrasse	*Labrus bergylta*
	Corkwing wrasse	*Symphodus melops*
	Boarfish	*Capros aper*
	Rock gunnell	*Pholis gunnellus*
	Fivebeard rockling	*Ciliata mustela*
	Lesser weaver	*Echiichthys vipera*
	Norway bullhead	*Micrenophrys lilljeborgii*
	Longspined bullhead	*Taurulus bubalis*
	Small-headed clingfish	*Apletodon dentatus*
	Clingfish	*Lepadogaster sp.*
	Lumpfish	*Cyclopterus lumpus*
	Common seasnail	*Liparis liparis*
Marine mammals	Halichoerus grypus	*Grey seal*
	Common dolphin	*Delphinus delphis*
	Harbour porpoise	*Phocoena phocoena*
Land mammals	Muntjac	*Muntiacus reevesi*
	Red fox	*Vulpes vulpes*
	European badger	*Meles meles*
	Woodmouse	*Apodemus sylvaticus*
	Brown rat	*Rattus norvegicus*

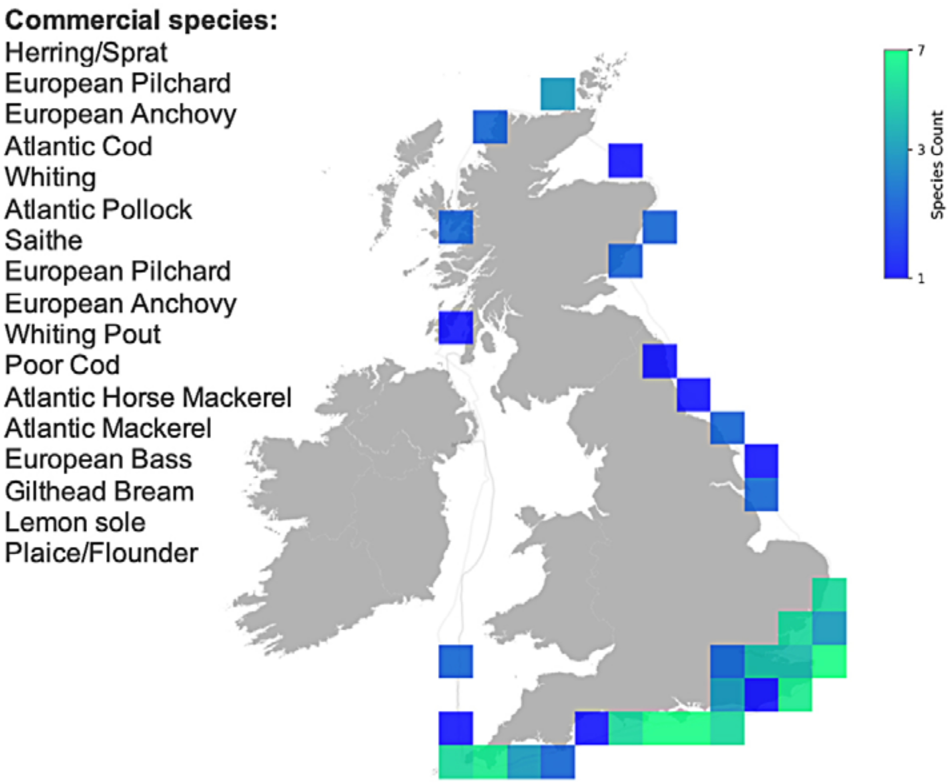
Here you can see a map of the UK and coloured squares in areas where eDNA samples were collected. The squares are coloured by the number of marine vertebrates found at each sampling point, and for 3 sites (Dover, Lands End and John O' Groats) a pie chart shows the proportion of DNA for each species found. In the sample from Lands End the amount of goldsinny wrasse and sand eel DNA was very high so a second pie chart gives details of the other species also seen there.

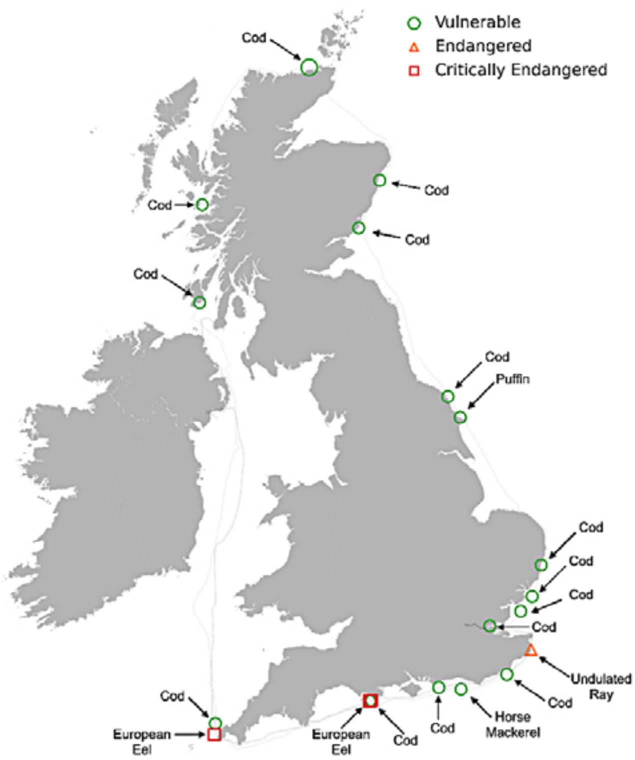
Environmental DNA maps from 2022

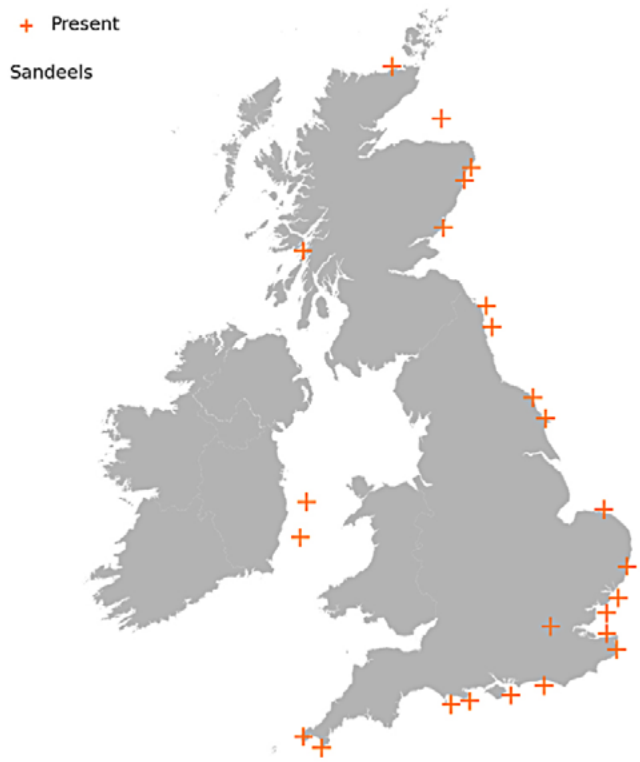


Environmental DNA samples were collected using a manual method in 2022 – water was pushed through the filters by hand using a syringe. Apart from being hard work for tired rowers, this also limited the volume of water that could be processed. Additionally, it meant that quite a lot of human DNA was introduced into the samples when they were collected due to the difficulty maintaining a sterile environment in the cabin where the equipment was stored! This reduced our ability to find the really rare species and those that naturally give off smaller amounts of DNA (e.g. sharks and rays). From 2023 onwards, an automatic pumping system will be used and less handling will be required, reducing the amount of human DNA. This means that even more species are likely to be detected.

Maps of eDNA samples showing the locations where we detected commercial species, vulnerable species and sand eels, a keystone group of species that can define their entire ecosystem.

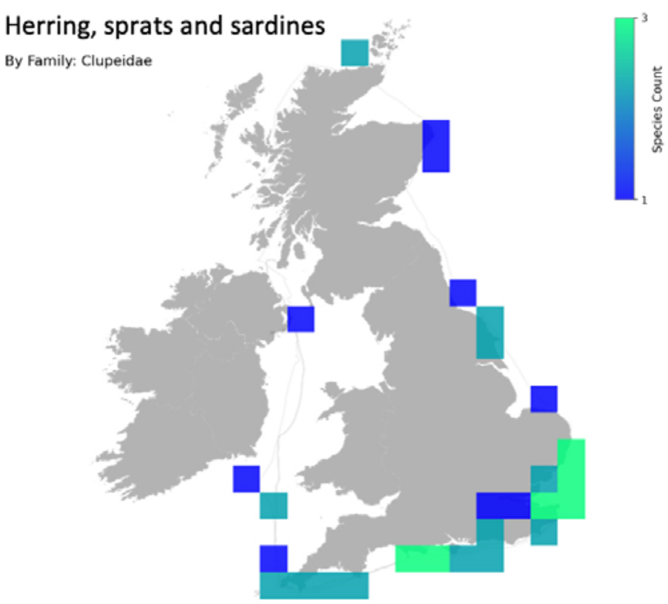


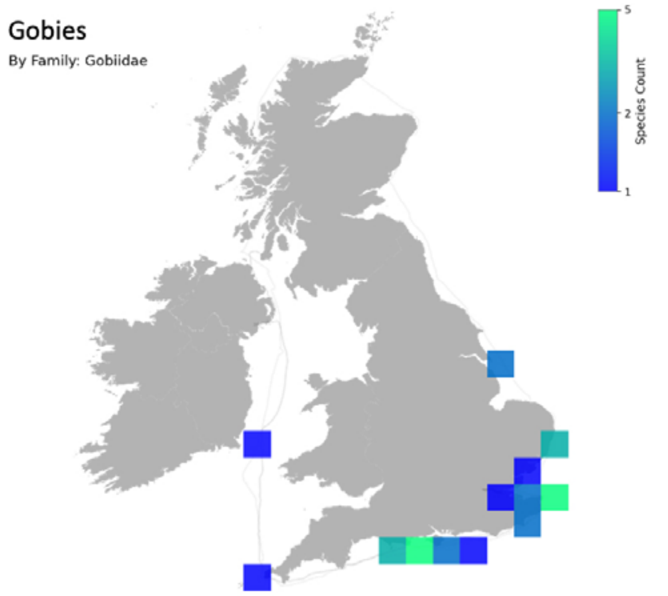


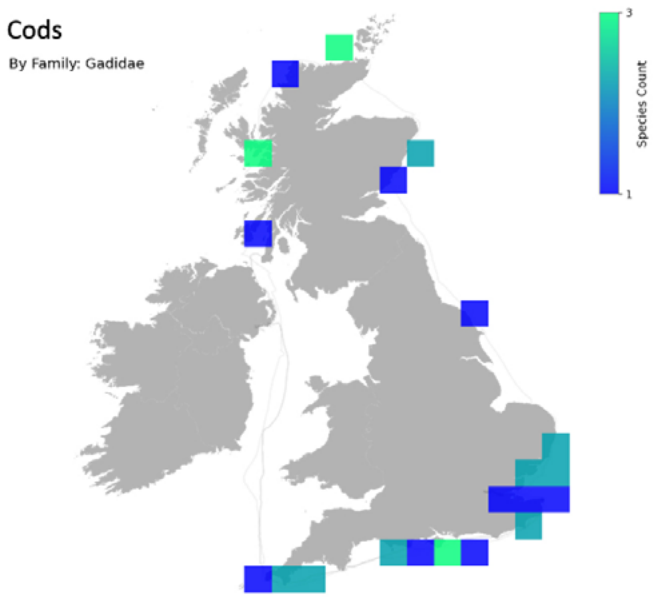


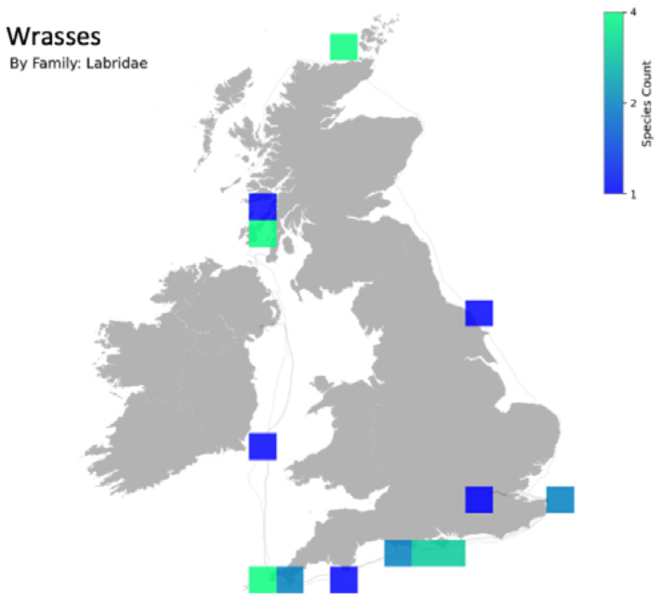
Not detecting a species' DNA in our sample does not mean that the species is not there, just that it's DNA was not captured in the 1 Litre of water sampled from that area. With repeated samples taken over the following years we will build up a more comprehensive picture of the species present in each area, yielding one of the most detailed baselines of British coastal biodiversity. It is important to monitor how these species maps change over time. Southern species moving north could indicate effects of climate change and warming seas, while **pollution events, overfishing and the arrival of invasive species can also negatively impact biodiversity. Meanwhile, there are many brilliant conservation projects underway that can increase biodiversity in a relatively short period of time**. Mapping the biodiversity of UK seas annually this way is a great way to monitor these effects on the species beneath of seas.

The maps below show the eDNA distributions of 4 families of fish from our 2022 data. We found gobies in the southern part of Great Britain, wrasses predominantly in the west and members of the sardine and cod families, all around the UK. Future work will examine how different species are associated with particular habitat types found around the coastline (e.g. shallow sandy areas, seagrass beds, or deeper rocky environments).









Putting it all together

At the moment it may seem like 3 different projects happening (microplastics, sound and eDNA), each with its own exciting contribution to the knowledge of UK seas, but **the real strength of a project like this is how we combine these data sets** going forward. The results you've seen so far are just the tip of the iceberg and we will be spending the next 3 years collecting more data but also combining the data sets. For example, we will look at how the microplastics and noise pollution maps compare to the biodiversity (eDNA). Do the numbers or types of species found change where it is noisier or where there is more microplastic pollution? Are areas of restoration showing improvements in biodiversity and decreases in pollution? If so can we use these restoration projects as examples of best practice for other areas of the UK that are not doing as well.

This research is only possible thanks to the generosity of our community. Every donation of any size helps carry this work forward, tackle marine pollution and protect our seas. To support this vital work please visit the University of Portsmouth **Environment Fund** and donate today.

Additional scientific funding raised will be used to increase the number of samples collected and analysed. This would include analysing the collected eDNA for other types of biodiversity, such as invertebrates- animals without a backbone, including crabs, lobsters, starfish, sea urchins, shellfish and many other groups. Some of these species can be good indicators of pollution. We are also keen to expand all data sets to include seasonal information, this would be accomplished by shorter rowing trips in the spring and autumn, between races, to see how seasonality impacts the microplastics, the underwater soundscape and biodiversity. Further work would also include the amalgamation of other datasets with ours, such as satellite data, sea floor maps and data from other scientists. This has to be done carefully to ensure that we are comparing like with like but with a dedicated resource to ensure data parity this could also be a very powerful tool.

If you are interested in sponsoring the next challenges:

For sponsoring the event or the teams contact Jim Bastin at GB Row Challenge.

For larger contributions to the scientific research contact the Fundraising team at the University of Portsmouth.

If you would like to take part in GB Row Challenge in 2024 or beyond, contact Jim Bastin at GB Row Challenge. Combining Adventure and Science! Join the movement.

Sponsors

A huge thank you to all the sponsors who have made this project possible:

Our Lead Engineering Technology Partner

Thank you to all the Team at Harwin who contributed to the ambitious challenges they faced and rose to the challenge to create a system that work in the harshest environments.

Science and Innovation Partner

Thank you to the team of Scientists at the University of Portsmouth for your support and guidance in order to creates robust data sets.

Filtration Partner

Thank you to Porvair Plc and especially to Jon Churchill for his tireless work and energy in leading the filtration project.

Environmental DNA Partner

Thank you to NatureMetrics and especially to Kat Bruce for the donation of NatureMetrics time and expertise as well as being willing to row around the UK to collect the invaluable eDNA data needed for this project.

Acoustics Partner

Thank you to RS Aqua for the time devoted to designing the bespoke acoustic recording system for the GB Row Challenge boats.

Corporate Partners

Thank you to Agathos and Harwin for your support and belief, making this project a possibility.

Charity Partners

Thank you to the Active Row for your support. A special thanks to the team at Active Row, who did a tremendous job designing the virtual platform, allowing supporters and followers of GB Row Challenge to participate in the event.

Philanthropic support

We are deeply grateful to the funders who have supported this work and made this research possible. Thank you to The Robert and MeiLi Hefner Foundation and the A.G. Leventis Foundation for your continued support, enabling this work to continue.

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