

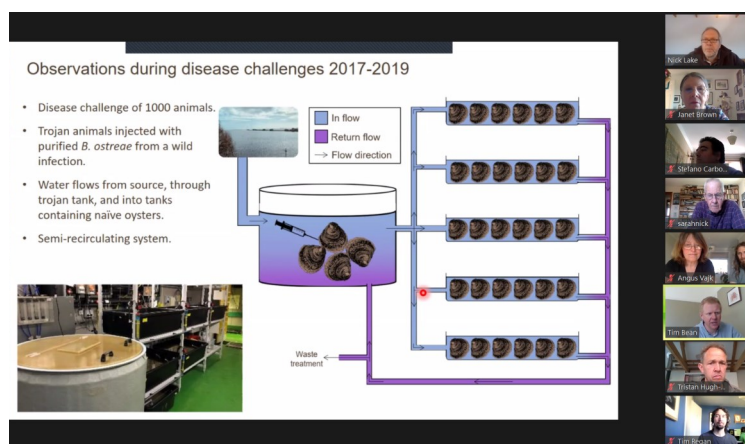
The Grower

Newsletter for the Association of Scottish Shellfish Growers

July 2021



ASSG online workshop



An online ASSG members' meeting was held April 23 which started with a talk from Dr Tim Bean of the Roslin Institute on the oyster microbiome which gave us an insight into current thinking regarding the impact of naturally occurring bacterial and viral communities on the health and growth of oysters under cultivation conditions. Follow up work is covered in more detail inside this issue (pages 10 and 11).

Dr Stefano Carboni from the Institute of Aquaculture gave us an account of current work his team are carrying out on mussels: on the distribution of their larvae and also how fouling organisms find them so we could see our growers' main concerns were being well investigated. Unfortunately it is still considered too great a risk to invest in plans for an ASSG conference this year and online is not a substitute for meeting up. However, it remains better than nothing - and screenshots have to substitute for photos!

New solutions for very old problems

Stefano Carboni, Stefano.carboni@stir.ac.uk
Institute of Aquaculture, University of Stirling

Institute of Aquaculture
UNIVERSITY OF STIRLING

INSIDE THIS 20 PAGE ISSUE

Forthcoming Events	2
CEO's Column	3-6
Letters to the Editor	7
Wild Oysters project	8
NORA conference	9
Field based diagnosis	10-11
NSA Conference	12
NAEMO	13
Brexit issues from Ireland	14-16
Science news	17-18

Advertising

The Grower is distributed to all members of the ASSG, to policy makers and scientists with interest in shellfish and is sent electronically all over the world to shellfish farmers and their ilk. It is also available online at www.assg.org.uk Why not advertise to our specialist readership?

The Grower is a quarterly newsletter edited by **Janet H. Brown, The Shellfish Team, 2 Annfield Grove, Stirling, FK8 2BN** jan.brown.shellfishteam@outlook.com
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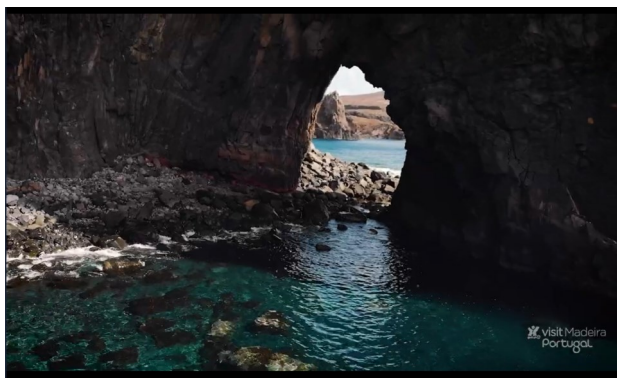
Yes to EAS meeting in Madeira

Oceans of Opportunity, October 4-7, 2021



There has been uncertainty about the EAS conference in Funchal, Madeira but it was announced June 15 that it is to go ahead. The programme grid is now online at the EAS website www.aquacaeas.eu/

There are also student travel grants available with deadline for application of July 15. A promotional video on the delights of Madeira can also be found on the website.



Keynote speakers for NORA 4 meeting announced

Announced as keynote speakers for the NORA 4 conference scheduled for November 23-25, in Middleburg, Holland, Chris Gillies of The Nature Conservancy, Australia and Betsy Peabody of the the Puget Sound Restoration Fund. Readers of The Grower with a long visual memory will recall Betsy demonstrating her total support for the restoration of the native west coast of USA oyster, *Ostrea lurida* wearing a skirt decorated with their shells. This was at the World Oyster Symposium/Conference at Cape Cod in 2016.

More details of this conference, NORA 4, can be found on page 9.



Keynote speakers;
Chris Gillies and Betsy Peabody

Dates for your diary

EAS Conference
Madeira
October 4-7, 2021

NORA 4
Middleburg, The Netherlands
November 23-25, 2021

NSA Triennial - Aquaculture 2022
Town & Country Resort and Convention Center
San Diego
February 28 – March 4, 2022

Aquaculture UK, Aviemore
May 3-5, 2022

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CEO's Column

Nick's Notes

Accentuate the positive

I am aware that some individuals thought that by voting for Brexit we would at least avoid the annual debacle of the Eurovision Song Contest - and the poor showing for the UK entry? Wrong! This year we managed nil points – although we were snapping at the heels of Germany and Spain whose musical performances were also fashionably dismissed by experts and the public alike. However, in true British style we can claim a major victory in that technically the scoring system was devised so that no country should be able to attain nil points? Hence, we managed to prove that wrong – so an achievement of sorts!

We are living in an era where trying to find the positives from some fairly challenging short- and longer-term scenarios will stand us all in good stead.

Thanks go to....

The UK Seafood Response Fund was established to help support businesses impacted by Covid and / or Brexit where sales were constrained or activities limited through restrictions. Members who sought assistance have reported success with funds allocated to help sustain their business activities. In addition, the Marine Fund Scotland has been established to support business opportunities within the blue economy. Priorities for investment support include activities which seek to deliver a low carbon blue economy contributing to climate change targets, and helping to sustain and enhance the natural capital from Scotland's seas.

Such Government support comes at a time when businesses are having to secure seed supplies and current production decisions will see shellfish coming to the market in 2-3 years' time. Hence public sector investment confidence is key to securing the ongoing inputs from private finance and operators. Our continued thanks go to the Government and Scottish officials who continue to work on such schemes which recognise the long-term and wider value of our shellfish cultivation sector.

Natural partners

Obviously, shellfish cultivation sits very much within this area of valuing and utilising the natural capital of Scotland's coastal resource. Scottish production methods clearly fit within the term "restorative aquaculture". The blue mussel and its habitat in Scotland are regarded as a Priority Marine Feature (PMF) in a nature conservation context. In some locations the density of natural blue mussel stocks held in cultivation will be directly responsible for assisting recruitment to wild stocks. Ongoing PhD research which the ASSG are co-sponsoring is being undertaken at Stirling University and is throwing some light on just how far spat from a mussel farm may travel. With the reported loss of large areas of this PMF in the wild – Scottish mussel production has a role to play in maintaining a significant spawning biomass which has the potential to assist natural recruitment.

Natural capital and rewilding are the current buzz



Dr Nick Lake, CEO of the Association of Scottish Shellfish Growers (ASSG)

words, which in a terrestrial context are being keenly promoted to engage with the public sense of positive action to ameliorate the effects of climate change. Biodiversity is another such word banded about and of which there is a general public understanding of context. These concepts are also relevant in the marine environment. However, rewilding is better described as restoration as there are limited ways to re-introduce species in the marine environment without the use of artificial boundaries.

For those who may not be fully aware of the biodiversity benefits that a mussel farm can bring there is a short film on YouTube www.youtube.com/watch?v=YX1HL8O2pnw&t=8s

Even those with a professional understanding of coastal ecology may be surprised at the interlinkage between the species shown. Such biodiversity benefits may be far from localised as this study clearly indicates in the south west of England - focusing on the Offshore Shellfish Ltd mussel farm site.

The irony will not be lost on those within the shellfish community that the very farm site being heralded as bringing so many widespread benefits in terms of biodiversity gains is under threat because of the political and economic fallout from trading relationships within Europe and Brexit implications.

This is one farm site – in Scotland similar benefits would be anticipated to be produced by our sector which spreads from the Solway Firth to the Shetland islands at multiple farm sites for both mussels and oysters.

Increasing the species mix

The role of predators has always been a key consideration within the operational constraints of shellfish cultivation. In essence the smaller the size of each individual shellfish of any species - the more predators are likely to see a nutritious snack! In scientific terms this simply refers to the expression of optimal foraging theory – effort vs reward!

Hence, being a bivalve shellfish seed is an extremely vulnerable proposition in the wild and cultivation businesses aim to provide protection and growth conditions which minimise any losses to natural forces. Holding stock off the seabed is a way of reducing such losses and cultivation sites have benefits over wild populations in this respect. The only exception being for the blue mussel – where wading birds and crabs and starfish in the intertidal are replaced by diving birds and crab and starfish juveniles which settle on longlines. Hence stock maintenance is a constant activity. Plus,

CEO's Column cont.

oyster catchers can be particularly effective at extracting small oyster seed from the mesh of bags when they are uncovered by the tide!

More often than not an oyster farm site in Scotland will have an associated community of the native oyster. Sometimes settlement of native oyster seed occurs within the oyster bags held off the seabed on trestles – often beneath these structures there will be adult native oysters in residence. Such a co-location has helped to maintain the wild population of the native oyster especially on our west coast. If for no other reason than human predators which are possibly responsible for removing the native oyster from many locations despite its protected status – will soon find that a shellfish farmer has a keen interest in such activity if it is occurring within their piece of the coastline!



Pictured above ; native oyster attached to oyster trestle..

Photo credit G Turnbull

Scallop cultivation which had a bright future back in the early 1990s was a victim of this early predation and seed availability equation. King scallop seed collected from the wild was highly dependent on the density of the adult broodstocks within an area – and also the requirement for specific habitat for spat settlement. Following settlement, it was often found that seagrass habitats were good nursery areas for growth and survival of juveniles. Cultivation of stock on the seabed was very much regulated by natural predation pressure – too many crabs and starfish roaming in open sandy areas with part grown scallops of less than 50mm in size meant that you did not have a business for long. In contrast juveniles at low densities can find sufficient niches in seagrass beds to avoid their natural predators.

Blue carbon

The recent publication by the Marine Conservation Society (MCS) and Rewilding Britain of a report considering ocean-based solutions to fight the climate

crises notes the dramatic loss of marine habitats – including seagrass beds. ([Blue Carbon – Ocean-based solutions to fight the climate crises, Marine Conservation Society/ Rewilding Britain, 2021](#))

In addition to biodiversity functions, it is noted that seagrass can fix and store an estimated 0.83 tonnes of carbon per hectare per year. Contrast this to the quoted new planted native woodland in Scotland which would only store 50 tonnes of carbon per hectare after 100 years?

I have pointed out in a previous Grower (July 2019) that public sector finance is readily available for planting trees – but as yet no one has taken forward the idea that such public investment could be made available for the blue economy?

Unfortunately, the MCS report notes that UK seagrass beds are in trouble. Between 1980 and 2005 it is estimated that the extent of eelgrass beds declined by 50%. There is also an ongoing predicted further 2% decline per year if no action is taken. With optimal water depth for eelgrass being 6m or less there is no conflict with the location of shellfish farm sites. Consequently, our sector would welcome the attention to the re-establishment of such beds based on high water quality conditions and the likely nursery environments created for bivalve shellfish.

I can remember snorkelling in sunlit eelgrass beds as a student on the Scottish west coast and coming face to face with a seal – I am not sure who was most surprised – probably me! Hopefully those beds are still in a good condition and not part of the 50% loss? Given the weather we are having at present I could be tempted to go and see. Pity my wetsuit appears to have shrunk in the intervening period?

Shellfish – blue carbon stores

More importantly the MCS report notes that “Shellfish farming offers considerable potential to reduce the pressure on species and ecosystems. Mussel farming has multiple advantages, as both a low carbon protein alternative to meat from livestock but also that it can benefit other species. Mussels are grown on ropes that hang vertically in the water. Below the ropes edible brown crabs and lobsters feed on clumps of mussels that have fallen to the seabed, attracting large shoals of mobile predators such as horse mackerel, sea bass and grey mullet. Mussel farms could even act as de facto MPAs and provide a source population of commercially important species.” I would guess that the MCS had also viewed the YouTube video noted above!

In terms of the blue economy and the desire to work towards a reduction in greenhouse gas emissions the MCS provides an estimate of the potential for shellfish to capture and importantly store (indefinitely under the right conditions) carbon – “One study of oyster farms estimated the amount of carbon sequestered at between 4.39 and 17.94 tonnes of carbon per hectare per year.”

That means that bivalve shellfish can store between 5 and 20 times the quantity of carbon locked away in a seagrass bed – and this in itself massively out performs

CEO's Column cont.

publicly financed tree planting initiatives. If we are really serious regarding gaining public value from intervention in the carbon capture and storage process, now is the time that we need to be considering the future strategy for the development of the cultivated shellfish sector in Scotland.

Carbon footprint

Just to drive home the message that when it comes to utilising the natural capital of Scotland's coastal environment, shellfish cultivation activities are not only useful as part of carbon capture and storage. Lest we forget - the entire industry has developed on the basis of creating sustainably produced high-quality food products which are highly sought after by UK consumers and those further afield!

While plant-based foodstuffs can fulfil a proportion of our populations dietary needs there is an underlying requirement to source high quality proteins – with marine sources in contrast to terrestrial also having a beneficial lipid and mineral content to support human health.

If we are serious in protecting the environment and reducing our climate change impact our carbon footprint

for all human functions needs to be to the fore. Food production is one of the primary processes influencing our overall potential success in both reducing carbon emissions, and importantly dealing with the negative impacts of climate change which will increasingly disrupt establish food production systems.

Mussel farming has one of the lowest carbon footprints of any system of animal food production resulting in 0.6 kg of carbon dioxide per kilogram of meat. This contrasts with British beef whose production equates to the equivalent of an estimated 19 kg of carbon dioxide per kilogram of meat. British sheep production and poultry represent 18 and 6.5 kg of carbon dioxide per kilogram of meat respectively as reported by the MSC.

It should also be recognised of course that shellfish production requires no fresh water inputs which seems likely to be a key factor in the future climate change scenarios. Fresh water will be a commodity under extreme pressure in certain seasons and locations – potentially even in Scotland! In contrast the other aquaculture success story - farmed salmon - has a requirement for fresh water resources to produce the juvenile stages and also equates to a carbon footprint of

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CEO's Column cont.

4.1 kg of carbon dioxide released per kilogram of meat produced.

Greener and stronger

Building back greener and stronger has been the catch phrase during the recent parliamentary elections and that makes perfect sense. However, the “greener” will require a far higher degree of blue economy inputs if it is to be of any lasting significance other than as an electioneering throw-away line. Hopefully the blue economy will come to the fore and be the subject of strategic public sector investment to ensure that both environmental safeguards are established, and food production is prioritised based on the abundant natural capital which exists around Scotland's coastline. The shellfish cultivation sector is well placed to assist this wider drive for sustainable food production and we look forward to working with Government to secure the benefits for the nation.

Oban Conference

Normally at this point I would be encouraging you to sign up for what has always been an interesting annual conference in Oban – of course accompanied by the best Scottish seafood for lunch and dinner!

I know many would agree that it is the meeting up with friends old and new that makes the event. You will probably not be surprised that even with a lot of us having had both vaccination jabs that this still does not make any of us immortal! Regrettably we have decided that to ensure everyone's safety and wellbeing we must cancel our annual conference in Oban in 2021. All we can hope for is that all stay safe, businesses survive, and that we are able to meet up - face to face – mask or no mask - in 2022!

All the best

Nick



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A technical drawing of a workboat, showing the hull, deck, and various equipment. The drawing is in white lines on a dark blue background.

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A map of France with a white outline. The Vendée region is highlighted in white, and a location pin is placed on the coast.

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Letters to the Editor

From Garry Seidl, Hexcyl Systems

Hi Jan,

I hope all is well with you and the Scottish oyster industry. Please send invoice for renewal of our advert in The Grower.

2020 was a perplexing year for many obvious reasons. Initial panic selling and discounting of oysters at the start of Covid-19 eventually gave way to rational pricing as the season unfolded and the supply chains were re-established and customers sought alternative ways of sourcing their oysters. The shut downs were specific State by State so when some States and cities were in lockdown or had restrictions others were still open and observing social distancing protocols etc. so fortunately oysters were still on the menu.

Surprisingly during all this turmoil Hexcyl Systems is going from strength to strength with a rapidly growing national and international customer base. Exports of Australian seafood, agriculture and horticulture products are suffering due to trade sanctions slapped on selected Australian exports by China as the geopolitical environment between Australia and China sours. Recent reports state Australia has recorded the lowest unemployment figures and has been the least impacted developed economy in 2020-2021. This has been due mainly to low Covid infection rates and record prices achieved for iron ore and the massive tonnages being exported to.....China!!!

"Normal" travel abroad is most likely to recommence in 2023-2024 according to recent Australian government predictions. Those currently desperate to return to Australia are limited by the number of available flights and even more limited by available numbers of hotel quarantine beds, qualified staff and security. Hotel quarantine as imperfect as it is, is an interim measure because the hospital system is not designed to cater for the number of people requiring observation and the detention centres for illegal immigrants are not set up to

medically isolate citizens returning from Covid infected countries. Australia like most countries has not invested in dedicated quarantine facilities. Most all community transmissions currently being recorded in Australia are the result of returning travellers and those testing positive after re-entering the community following the mandatory two week hotel quarantine stay. The science suggests many more mutations of Covid-19 will manifest before global herd immunity can be achieved and this alone will most likely be the cause of a prolonged delay to normalized international travel.

Fingers crossed those with the knowledge and the power actually have the ability to navigate a path to a post pandemic world that allows free travel. My next visit may be to an independent Scotland if the SNP secure a referendum and the people of Scotland vote and chose the exit the UK. (Sexit?)

Regards,
Garry Seidl



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'The Wild Oysters Project' establishes on the Firth of Clyde

The Dream Fund, run by Postcode Dream Trust, gives organisations the opportunity to bring ambitious, innovative and collaborative projects to life. The Wild Oysters Project which is set up as a partnership between ZSL (Zoological Society of London), Blue Marine Foundation (BLUE) and British Marine, applied for funds to help restore healthy, resilient coastal waters around Great Britain by means of re-establishing native oyster populations. They have been awarded £1.18m by the Postcode Dream Trust for their three-year ambition.

To this end nurseries filled with oysters originating from Loch Ryan, have been suspended underneath marina pontoons in Largs Yacht Haven and Fairlie Quay Marina in the week of May 11-14th. The nurseries, supplied by John Hamilton, create a micro habitat where the oysters can reproduce. Native oysters need to be in close proximity to one another in order to successfully reproduce. The female broods her eggs internally. It is the sparseness of native oyster populations that has contributed to their scarcity in recent years. These oysters will hopefully begin reproducing over the next few months, releasing millions of oyster larvae, into the Firth of Clyde.

The project has partnered locally with the Clyde Porpoise CIC (Community interest company) and local working group, Fairlie Coastal Trust. A local project officer will help to monitor and care for the newly placed oysters as part of The Wild Oysters Project.

Clyde porpoise CIC Founder, David Nairn, said; "Inshore dredging, pollution, climate change and illegal shellfish harvesting have all contributed to the demise of the native oyster population here in the Firth of Clyde. Restoring this incredible species under marina pontoons will enable us to support healthy coastal waters in the Clyde and across Scotland, while also providing an outdoor classroom for local schools and communities, creating a 'window' into the ocean to inspire the next generation to protect and care for the marine environment."

Celine Gamble, Wild Oysters Project Manager, ZSL, said, "The Firth of Clyde is an important area for marine life and with just a handful of known oyster populations remaining across the 4000km² sea area of the Firth of Clyde, we have an exciting opportunity to contribute to the restoration of local native oyster populations here in the west of Scotland. Thanks to the players of People's Postcode Lottery, we can work to restore the native oyster population to support healthy, resilient, coastal waters in the west of Scotland."

"Now the oysters are in their new home in the marinas, they will almost immediately begin their important work each filtering 200 litres of water a day. In the coming months, the oysters will start to produce the next generation of the oyster population, by releasing larvae which will then settle onto the seabed. It's our ambition that the project will help to create cleaner water, and plentiful marine biodiversity in Britain."

This part of the project on the Clyde is just one arm of the overall project and The Wild Oysters Project have deployed a total of 4,000 native oysters into nurseries, underneath marina pontoons in Tyne and Wear in NE England and Conwy Bay in Wales as well as in the Firth of Clyde in Scotland.

BLUE's Restoration Project Manager, Jacob Kean Hammerson said, "It is vital in the current climate emergency and biodiversity crisis that nature receives the help it needs to bounce back. This is especially relevant in Scotland, just months after the Government published their decadal assessment of the marine environment showing that Scotland failed to meet a ten-year-old target to prevent damage to "priority" marine habitats. The Wild Oysters Project will give the marine environment a chance to recover."

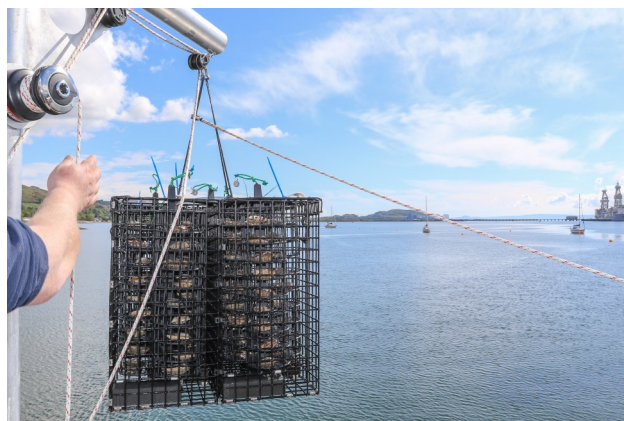
For more information visit wild-oysters.org/



Pictured above; David Nairn of the Clyde Porpoise CIC

Below; The oysters on a hoist – that is oyster nurseries going in at Fairlie Quay Marina

Photo credit; Celine Gamble, ZSL



NORA 4 Conference Update



The abstract deadline for the NORA 4 conference will soon be upon us (July 15th). The NORA 4 Organising Committee takes a positive view of the possibility of the in-person conference going ahead, in light of current vaccination rates and the steadily developing regulations relating to international travel. The Organising Committee therefore urge participants to consider submitting their abstracts in advance of the deadline, and take this opportunity to remind potential participants of the range of activities planned into the current conference programme.

The NORA 4 conference is due to take place in Middelburg, The Netherlands from 23-25 November. The focus of the conference is knowledge exchange and networking, so join us to make the most of these opportunities following our long period of covid-enforced distance. Aside from an opportunity to meet and mingle, the conference promises themed plenary sessions (for which abstracts are open), on a range of relevant topics, including oyster production, genetics, pilot project results, biosecurity, monitoring and site selection. The conference will also host speed presentations introducing the newest oyster habitat

restoration projects, a poster session and a games night. A student session requiring advanced registration is also planned before the start of the conference. And if that wasn't enough, the keynote speakers, Chris Gillies from The Nature Conservancy Australia and Betsy Peabody from the Puget Sound Restoration Fund will be adding a global view to restoration efforts and an opportunity for global knowledge exchange. In short, it promises to be an engaging and lively, not to be missed, event.

When registering for the conference, also consider whether you would like to take the opportunity to join the planned excursion to Yerseke, the hub of Dutch shellfish culture. Although the programme is still in development, the aim is to visit various laboratories involved in native oyster production & research, as well as a commercial grower. Participation is limited to 75 persons, so early registration is encouraged.

Further details of the conference programme, abstract submission, registration and excursion can be found on the NORA website: noraeurope.eu/nora-4/

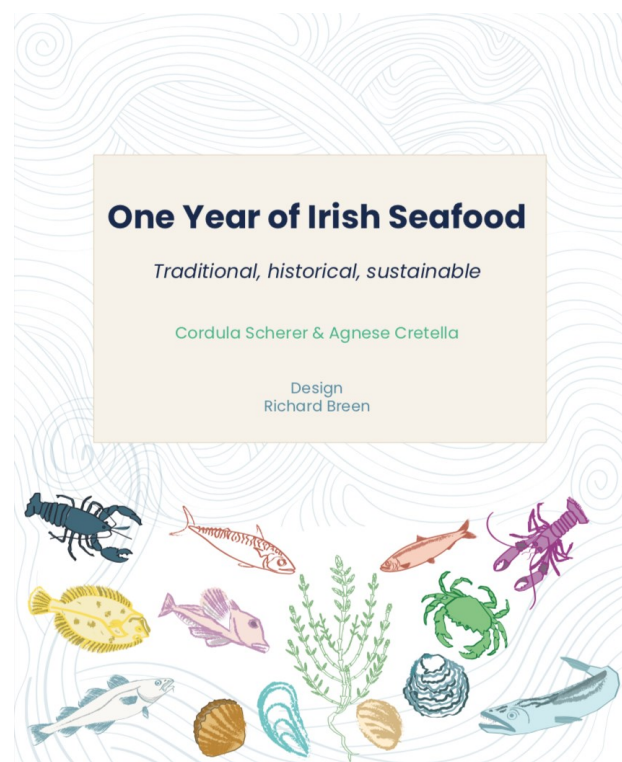
Seafood book launch

- reviving historic recipes

The book "One year of Irish Seafood" by Cordula Scherer and Agnese Cretella is a celebration of Ireland's rich coastal heritage and its diverse seafood. It takes us on a one-year journey through some of the most traditional, historical and sustainable Irish seafood. By following seafood seasonality throughout the months, it narrates the history and the ecology of each marine creature featuring the recipes while informing on its current sustainability.

At the same time, it offers delicious ideas on how to explore the taste of Irish seafood, inspired by recipes from the past. The intention is to reconnect Irish people to their local, cultural and historical coastal past and hopefully encourage a sense of stewardship towards their marine heritage for safeguarding its future. At the same time, the book also aims to attract international readership to the marvellous wonders of Irish seafood, highlighting a new perspective on Ireland's East Coast culinary history and placing Dublin at its centre.

The book was launched June 17 and will be available shortly. More details can be found at www.tcd.ie/tceh/projects/foodsmartdublin/



Developing a fast (24h) and affordable field-based diagnostic kit

Placing disease-diagnostic tools into the hands of those that need them has always been a challenge, and is something that we believe needs to change in order to stop the transmission of shellfish disease. Current methods of disease control rely on surveillance of disease presence and absence, vigilance in the face of unexplained mortalities and preventing animal movement from disease-positive to disease-free areas. However, these measures are not always successful and have unfortunately seen recurrent failures in recent years, with the spread of oyster herpes virus (OsHV-1), Bonamiasis and *Vibrio* species. To improve this situation, Dr. Tim Bean and Dr. Tim Regan of the Roslin Institute, University of Edinburgh have designed a field-based system for pre-emptive pathogen diagnostics using a portable qPCR machine. Their aim is to empower growers to monitor for disease themselves before animals are moved onto clean aquaculture sites. If a pathogen is detected, the grower can make rapid decisions on movement therefore preventing spread of the pathogen. In addition to informing pathogen presence, this information may be useful to improve husbandry by reducing stress during peaks of pathogen presence thereby mitigating losses. Applying a simple DNA extraction method to an overnight quarantine tank, this technique can test all of the animals present, unlike current methods which only test a subset of the animals and often require removal or destruction of the animals tested. As with all diagnostics, the method is not perfect, but it goes beyond current practices and provides an extra level of control.



Earlier this year, the kit was successfully field-tested on native oysters in Essex for *Bonamia* detection and lab -tested on Pacific oysters for OsHV-1 detection. However, the same platform could potentially be used to detect any given pathogen/invasive species of interest at the right time of year, including *Vibrio* spp. which as many of you will be aware, can be associated with mortalities in farmed finfish and shellfish. Of note, *Vibrio aestuarianus* has been associated with significant mortality events in Ireland and France but is not yet

believed to be widespread in Scotland.

To ensure that the method worked correctly on a farm, and to improve the methodology for use by shellfish farmers, John Barrington volunteered his site on Loch Creran following Tim Bean's talk at the ASSG



oyster growers' online workshop in April, for a visit by Tim Regan in late May. Time outside the lab was made even more enjoyable by the overdue sunny weather (*as shown on picture left*). We got to work selecting 60 oysters to place in buckets containing aerated artificial seawater overnight (*pictured above*). The following day, samples were collected from each bucket for performing on-site diagnostics as well as later lab validation at the Roslin Institute.



Developing diagnostic kit cont.

After a brief demonstration, DNA extraction was performed by John and samples were loaded onto the qPCR machine. Using a phone app connecting to the qPCR machine, samples were tested for the presence of *Vibrio aestuarianus* or the less concerning *Vibrio splendidus* in addition to *Crassostrea gigas* as an internal assay control. After a couple of hours, all 6 samples were successfully tested in duplicate returning a relieving negative result for *Vibrio aestuarianus*. *Vibrio splendidus* was detected, although this species is not thought to be associated with mortalities in this area.

Tim Bean and Tim Regan have applied for funding to further validate this kit and apply it to other species of interest e.g. *D. vex* (*Didemnum vexillum*). Working directly with growers, they plan to improve the methodology and workflow developing instructional videos and SOPs for practicality and ease of use. If successful in their funding bid, they will be testing the kit in as many locations as possible. If you would like to test the kit on your own site, please get in touch with Dr. Tim Bean at tim.bean@roslin.ed.ac.uk.



Pictured above; John Barrington masters the finer points of PCR in his work shed converted to laboratory temporarily. Below; the PCR with telephone where results are printed out. Photo credit: John Barrington / Tim Regan



The background to this work which Tim Bean explained in his talk at the ASSG members' workshop can be explained by him best thus.

Disease occurs due to an interaction between host genetics, pathogen virulence, and environmental conditions. In the natural world, things typically balance each other out and we see ecosystems with low-level disease and normal animal growth and reproduction. But given interventions such as animal movements, rapid industry expansions, and climate change, it becomes more likely that we will see occasional blips in either the relative virulence of pathogens, or the susceptibility of host. In shellfish aquaculture, we have seen this appear in various guises, such as the emergence and rapid spread of virulent OsHV-1, the slow but unstoppable movement of parasites such as Bonamia, and the appearance of many different *Vibrio* bacterial strains; which seem to be a combination of susceptible animal movement and/or virulent pathogen spread. In the worst-case this results in “boom and bust” cycles of aquaculture. In the past people got around this by growing different stock species to overcome disease issues, but this is clearly not a sustainable option. Animal movement and climate change are not going away, so we need to develop systems that not only prevent spread of major pathogens and reduce the emergence of new strains, but also allow us to understand how different farm environments interact with the animals that we produce to give us the best outcomes all round. What is clear is that there is no single way to deal with this, and whilst we should be aware that the management of disease spread is key, it is important to foster a multi-faceted approach, for example including biosecurity, management of host genetics and adapting husbandry methods to suit the microbial environment. As such, we will need to use all the tools available!

This work was funded by the Seafood Innovation Fund (Project FS042) and Sustainable Aquaculture Innovation Centre

Editor's note

Farmed species - what's in a name?

It does appear now that a reader can take a pretty good guess as to the point of view an author is going to take in a peer reviewed scientific article. If the title refers to *Magallana gigas* you can be pretty sure it is about either taxonomy or taking a view of *gigas* as an INNS. On the other hand if the author refers to *Crassostrea gigas* they will be writing about the farmed species, its growth, methods of farming, disease problems etc. (This can also be determined by the journal the paper is published in itself. For Journal of Shellfish Research and for Aquaculture to name but two, it is editorial policy.)

This suggests to me a parting of the ways and it might actually be a positive sign. Tim Bean alerted me to a science paper by eminent geneticists Weiwei You and Dennis Hedgecock talking on cycles of boom and bust in aquaculture and it is a story that is easily recognisable on a broad scale, but in the paper they have examined many such events in a localised way. The pattern essentially starts with the farming of a local species, perhaps following from increasing fishery pressure on that species. Increasing intensity leads to reliance on hatchery production of stock and in time to disease. There is then pressure to introduce non-native species, more dependent on hatchery production which eventually leads to more disease. This is a recognisable story in oysters but is more obvious in shrimp farming but they provide examples from numerous marine species. Much of the increase in disease they suggest is due to a loss of genetic resilience due to reliance on hatchery reared stock as the demand for seed increases. This they say is particularly "a problem of marine species which have high fecundity, high early mortality and relatively long

life that make them susceptible to loss of genetic diversity and inbreeding." The conclusion is somewhat surprising in that You and Hedgecock (2019) advocate for reduction in the number of farmed aquatic species such as has occurred in land-based agriculture. *Crassostrea gigas* represents by far the major proportion of farmed oysters globally so there is a strong argument to regard them as a farm species and accept the dichotomy in name as a useful tool. As farmers invest more and more in genetic selection and improvement so these differences will potentially become more pronounced, the auroch became the cow and the *Crassostrea gigas* will earn its distinct farm species name.

You, W., & Hedgecock D., 2019. Boom-and-bust production cycles in animal seafood aquaculture. Reviews in Aquaculture, 11,1045-1060 <https://doi.org/10.1111/raq.12278>

Letters to the Editor

Feedback on this or on any other topic in The Grower is very welcome. No letters are published without prior agreement from the author of the letter, who will also be provided with a mock-up of the printed view ahead of publication.

National Shellfisheries Association conference - online



National Shellfisheries Association
Established 1908

The first fully online shellfish conference was the NSA conference that should have been held in Charlotte, North Carolina. So how did it work? Clearly there was a great deal of work involved and it would not have worked without Shirley Chu whose screen was the one we viewed everything on and it was her name called when there was any glitch, of which there seemed to be remarkably few. One great advantage is to be able to, theoretically, to attend every presentation, no worries about programme clashes since the programme remained accessible for a generous period of time after the conference, but on the other hand it is clearly difficult for presenters to record their talks for an audience that is not visible at the time. You also can't ask questions - but the main clue is in the title, you cannot confer.

But costs must be reduced and also airmiles so what is the future? I think it is essential for young scientists

to be able to meet with and talk with their peers and seniors, to make contacts but whether there is scope for an alternative back-up service for some conferences we shall see? My own discovery is that my usual practice is to write up my notes from a conference while travelling home while the notes still make sense. Conferences attended on line do not have that enforced solitude afterwards in which to write and by the time I get round to looking at the notes they fail to make sense any longer.

Defining barriers and identifying solutions for mussel aquaculture expansion

NAEMO - North Atlantic and European Mussel Organisation

Julie Webb, Åsa Strand, Llucia Mascorda Cabre, Alessandro Laudicella and Daniel Taylor

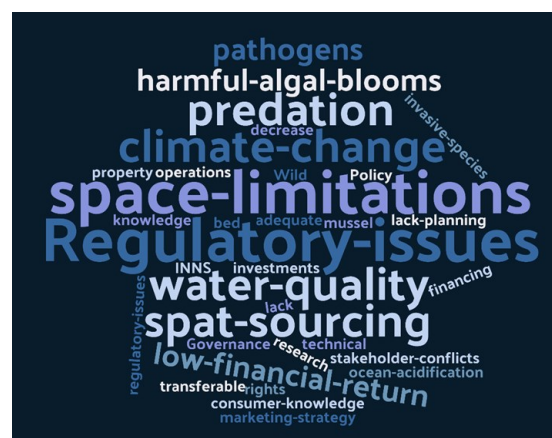
At this year's 113th NSA Virtual Annual Meeting in March, the NAEMO (North Atlantic European Mussel Organization) network hosted an online workshop "Defining barriers and identifying solutions for mussel aquaculture expansion". The workshop aimed to bring together perspectives from across the sector (industry, research, policy/governance) to jointly identify and discuss barriers for sustainable expansion of mussel aquaculture whilst identifying potential solutions and routes for sector development.

The workshop was well attended, with 37 participants from 9 different countries across Europe and North America. Following a brief welcome and introduction to the NAEMO network from Dr Åsa Strand, keynote speaker Dr Jordi Guillen, fisheries economist at the European Commission's Joint Research Centre, set the scene for the workshop with his presentation on "The decline of mussel aquaculture in the European Union: causes, economic impacts and opportunities". His talk provided evidence and understanding behind the lack of growth in the sector and a solid foundation for the workshop discussions. Presentations continued with a film including flash talks by key network members and industry representatives discussing their perspective of the main barriers for mussel aquaculture expansion and means to overcome them. Participants were then split into five breakout groups and tasked with discussing the barriers to, and solutions for, expansion of blue mussel production around the Atlantic. The interactive summary session presented the top three issues and solutions from each group, compiled into broader categories, and the overall top three were voted upon by participants with an interactive group discussion to conclude.

Although the range of 'barriers and solutions' was broad and varied, some highly interconnected themes emerged across the sector regardless of geography.

Barriers were notably precise and were connected to licensing problems (e.g. time frames and interpretation of regulations) and market limitations, with seed supply and social license being equally prioritized for the last spot on the top 3 barriers. Solutions were, in contrast, less tangible and more diverse. The top 3 solutions included improvement of public perceptions and social license through knowledge building and transfer, increased collaboration between industry, academia, NGOs and public bodies/networks (i.e. according to the Triple helix model), and marine spatial planning. The results from the workshop are now being processed further with the ambition to produce a policy brief summarizing the main findings.

The workshop organizing committee would like to thank the NSA for including the workshop in the conference and every one contributing to and participating in the workshop.



Above; Word cloud of barriers identified by some key network members and industry representatives and expressed in the video presented during the workshop.



The situation in Ireland - part 2

An interview with Marie-Aude Danguy of Triskell Seafood Ltd

The July 2020 issue carried a certain amount of copy on coping with the Pandemic as reported from various places. Little did we realise then that a year later there would still be so much that is different from what we took before to be normal life. Another major change thrown in for this year is of course the implementation of Brexit rules from January. Last year Triskell supplied us with a picture of life under lockdown. It concluded with a thought if just 20% of Irish consumers ate a dozen oysters every month they would have no oysters left to export... I asked for an update this year and here they reflect on problems that have ensued since the imposition of the Brexit rules. Pressure of work however prompted them to suggest that this time it should be done in the form of question and answer. Editor

Had they made preparations for the changes due with Brexit?

We certainly had! Our Office Manager Brona did training with the Local Enterprise Office (LEO) and with Bord Bia (the Irish Food Board) and both organisations had offered one-to-one mentorship services to all participants. Our preparation for Brexit began in September 2019, about 16 months before it actually happened.

Of course it is difficult to prepare for the unknown, there were so many 'what ifs' and 'maybe's' which made it difficult both for the trainers and those, like ourselves, who were trying to ensure that there would be minimal disruption to the business.

How much help was available? Was this help easily accessible and what were the best sources of help with problems?

In Ireland there was certainly loads of help available and it was easy; and in many cases free; to access. The Irish Government ran ads across all media to encourage businesses to prepare for Brexit and to try and ensure that they were as informed as possible.

A number of companies were also in touch before and after offering their services as Custom Clearance Agents or help to do the training to set up in-house as a CC Agent.

Did they anticipate many problems ahead of Brexit happening?

There was a lot of uncertainty about what was going to happen which made it difficult to anticipate potential issues. It wasn't clear until the very last minute whether a deal was going to be agreed between Britain and the EU, the consequences for Northern Ireland, and what that might entail. In fairness Ireland was paying close attention to what was going on, probably as a result of our geographical location on the fringe of Europe, and our long ties to Britain. In France some of our customers and suppliers seemed to hardly tune in or consider the possible outcomes.

Even though the Government here took a really strong stance on encouraging businesses to be Brexit-ready we knew it was going to be a mess. It all felt very



last minute, decisions were being pushed back and pushed back. Even as we were getting close to Christmas we didn't know whether there could still be a deal and what form that would take. As a result, I don't believe either side could have been 100% ready in January and that was a major cause of the backlog at customs and ferry ports in the New Year.

How different has the reality of Brexit been from what was anticipated?

I don't think all the problems were anticipated. It seemed to take about 3 months from 1st January for things to settle down, particularly for the courier companies to sort out the backlogs of goods through customs. I'm not clear where the responsibility for that lay in the end. And then the regulations are still changing; we only received guidance on 18th April on what was entailed for the new health regulations for live seafood that came in on the 21st April! That lack of clarity is not helpful.

The next set of health regulations coming into effect on the 1st October '21 are also unclear at this stage and we don't know what this will mean for us as traders moving live product. It is a very difficult situation but we're adamant that we want to continue working with our GB suppliers and customers with whom we have built up strong relationships over many years.

How much has the paper work/administration increased with the change?

Massively. There is a huge amount of extra work and cost involved, both in terms of new fees being applied for customs and in the manhours required to complete the new paperwork. The level of detail required is problematic too, for instance we have to specify the trailer number plates on the customs paperwork which may not be known until the very last minute.

The situation in Ireland - part 2 cont.

There is an issue too around the systems being used and the various authorities involved in regulating export and import not developing systems and procedures that are aligned with one another. We are wasting an incredible amount of time trying to interpret what each side wants and going back and forth speaking to the Revenue, the Irish Marine Institute, the Department of the Marine, HMRC and TRACES. We feel there has been a lack of support from some Authorities we deal with and a reluctance on an official level to make decisions about what can reasonably be required from businesses on the ground, like ourselves, who just want to get on with doing business.

Are the problems you are experiencing due to the fact they are time - limited because of dealing with live product?

Yes, that was very evident when we did a recent import of live *C. gigas* seed from Guernsey. Although the import was known about and flagged to all relevant Authorities well in advance we could never have expected the amount of time and headache involved in getting it into this country. We were importing for a group of growers but the process was extremely complicated and aggravated by the fact that there was very little support available when the logging of correct information failed. I feel sure no individual grower would have had the time, patience or resources to have arranged the same import independently.

As an example of what we are dealing with; some of the paperwork required to import is only submissible 24 hours ahead of that import but the automated response to the submission says that a member of staff will get back to you within 5 working days!

It seems to us that there hasn't been enough thought put into thinking through the implications of each instruction.

We are experiencing the same levels of red tape and delays when importing and exporting equipment from Britain but clearly a pallet of oyster bag floats being stuck in a warehouse for a fortnight is simply an inconvenience. When we are talking about shipments of live shellfish everything is obviously so constrained by time and the cost of a lost shipment is enormous.

Have substantial losses been incurred? – or does the risk of losses remain?

Yes to both questions. The extra administration involved in exporting has had an impact on our bottom line, no question. There is also a loss of business; we have British customers who haven't got the necessary registrations in place for us to be able to ship to them or who feel that the duty liable on the goods are too high and so cancel orders.

On the seed import that I mentioned from Guernsey, we had one customer who had underestimated the time required to register on TRACES and so ultimately wasn't able to take any seed. As the sources for disease-free seed are limited that has a long-term impact on his business as well on ourselves as the importers. Other

users agree that some of the systems used are not user-friendly, and I would question how much consultation and testing went into the setting up of the procedures involved.

We also lost a significant trade of live shellfish from GB to France due to the ban of products from category B waters, as well as some exports from Ireland to the UK of half-grown and fully grown oysters.

In the particular case I've heard about - is the problem due to dealing with a less accessible place ie an island -or are there likely to be similar problems with movements between Ireland to Northern Ireland or to the rest of the UK?

Currently we have no issues with shipping to the North of Ireland, as a result of the Northern Ireland Protocol doing business with growers there is the same as with the EU. The sale of shellfish into Britain is another matter; we await confirmation of what the next set of health regulations will entail. It is likely there will be extra admin work and extra health checks at the Border Control Posts (BCP) which will create more stumbling blocks.

Is the problem directional i.e. more difficult to go from GB to Europe or equally difficult either way (I suspect it is just live things going to Europe?)

I believe traditionally there was more business into the EU from Britain than the other way around. Leaving without a trade agreement resulted in catastrophic consequences for UK shellfish growers and fishermen, overnight preventing them from trading as usual. How did the industry arrive at this situation? Who assumed what and when?

We are also aware that a lot of Irish companies have simply given up on exporting to Britain and have spent the last year building new markets for their goods to other destinations.

Nicki Holmyard has written very eloquently about the major problems Offshore Shellfish is having with exporting mussels but presumably any difficulties you are having is not due to product coming from class B waters?

There is no doubt that the ban in Europe on buying from Britain has been a boom for Irish and Dutch mussel farmers. The growers we have spoken to have said the lack of UK supplies has resulted in a massive boost in their sales. We feel enormously sorry for the growers in Britain who have spent so many years building those connections up and who have quality product ready for market that they simply can't sell.

To what extent are the difficulties due to the additional paperwork and the fact that lorries are not prepared to deal with orders that could carry special risks to their time allocation?

The transport companies are reluctant to use the land bridge now because of the possible delays and paperwork involved. That means that there are extra

The situation in Ireland - part 2 cont.

costs involved to export as some of the new ferry routes are more expensive and the timings can mean extra manhours for the drivers. Sudden changes to the weather and sailings can have a massive impact as well. This year has seen Hatcheries in France cancel shipments to Ireland at the last minute following bad forecasts rather than risk the loss of that shipment altogether due to delays in ferry sailings.

There is no longer any quick fix available for these situations or where a driver might face other unexpected delays en route that might make him late for his sailing. There is simply too much last minute paperwork and customs involved.

The issues around BCPs are also of concern for the hauliers, and ourselves. If BCPs are not located by the ferry ports, are the trucks coming from Holyhead or Cairnryan supposed to divert their route to access a BCP? Are sufficient resources going to be put in place to avoid any delays for batches of seafood with limited shelf life? In Ireland we already have Posts in Dublin, Rosslare and Shannon – all the major points for goods in and out.

In summary I suppose there are 4 key issues that are causing problems and which will continue to cause problems until they are satisfactorily addressed.

- * Uncertainty. We don't know what the future holds as we are not getting clear guidelines from the Authorities.
- * The applications used by the various bodies involved in the export & import of shellfish must be compatible and work towards the same goal.
- * While some individuals in the various organisations have done their best to help with queries it is nevertheless critical that there are people available in the Marine Institute, Irish Revenue, TRACES, the BCPs, HMRC, the Department of the Marine etc to take phone calls, to answer questions and process the paperwork. Automated emails just don't cut it with live product.
- * It is critical that people in charge make decisions tailored to our fast-paced and valuable industry. We all want to see the growers, fishermen, traders, buyers, processors and the transporters getting back to doing business.



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SCIENCE NEWS

NORA announces their support for the UN Decade on Restoration

The Native Oyster Restoration Alliance is an official supporter of the UN Decade on Restoration, which was officially launched this World Environment Day on 5th June. To mark the occasion, NORA launched a series of new products to raise awareness of the importance of native oysters, and the critical role of native oyster habitat restoration in the decade to come. These included a short fact sheet on the native oyster and its restoration, as well as an oyster-adapted UN Decade on Restoration logo and Social Media Card, designed by Essenberg Designs. The NORA Outreach Working Group developed a series of colouring pages for children, and word searches relating to various aspects of the native oyster and its restoration. All these materials can be freely and easily downloaded from the NORA website noraeurope.eu.

NORA is excited to partner with the Native Oyster Network and the Australian Shellfish Network in promoting understanding of native oyster habitats and their restoration. The coming decade will see continued growth in restoration globally, and the networks strive to ensure that the work undertaken by the many associated projects is given the attention they deserve on the national and global stage.



Seafish news – shellfish purification



A new guidance document entitled 'How to Build a Shellfish Purification Centre' is now on the Seafish web site. It can be found on the re-worked 'Bivalve shellfish purification' page (www.seafish.org/responsible-sourcing/aquaculture-farming-seafood/bivalve-shellfish-purification/), which also includes links, not only to their six existing purification system operating manuals, but other recently reviewed / updated bivalve-related Regulation guidance documents and web pages.

They are hoping these new / re-worked resources are valuable to Scottish shellfish stakeholders, and Lee Cocker, Aquaculture manager would welcome any feedback or comment readers may have.

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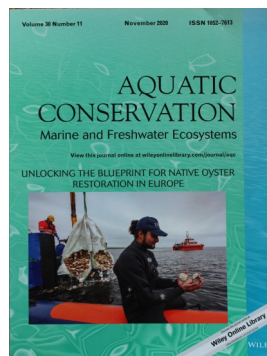


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SCIENCE NEWS cont. Recent publications of interest

A number of very interesting papers vied for mention in this slot but then rather slowly it dawned on me that they were all emanating from one issue of one publication! Many of our readers will have received a copy of this thanks to the generosity of the Deep Project who recently sent out the special issue of "Aquatic Conservation Marine and Freshwater Ecosystems" Volume 30 no.11 "Unlocking the blueprint for native oyster restoration in Europe".

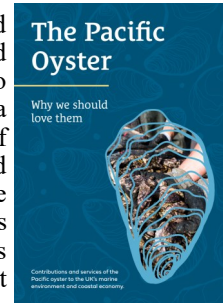
For any readers interested in native oysters and their restoration this provides an invaluable resource that can also be accessed online at onlinelibrary.wiley.com/toc/10990755/30/11



A recent study on farmed oysters has been commissioned by the SAGB with the purpose to "assist in the formulation of a policy towards the cultivation of the Pacific Oyster in England and Wales" and funded by the Fishmongers' Company's Fisheries Charitable trust. It is available on line at

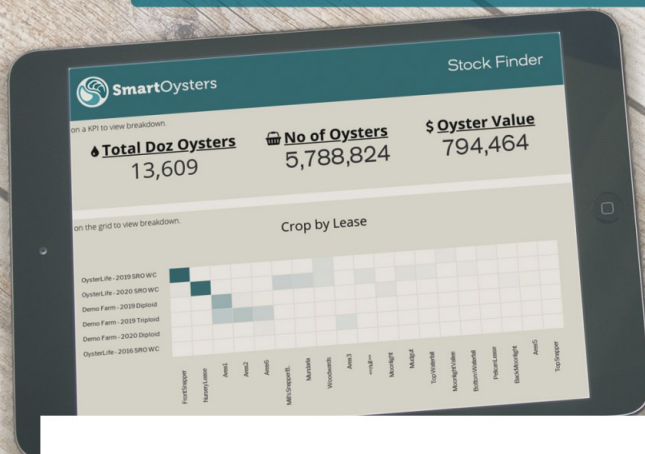
fishmongers.org.uk/wp-content/uploads/2021/06/the-pacific-oyster-why-we-should-love-them.pdf Another recent publication (April 21) is "Understanding drivers of wild oyster population persistence available at doi.org/10.1038/s41598-021-87418-1

To get a wider view, a 20 year retrospective review on world aquaculture production which includes interesting reference to farmed bivalves, see a publication from Nature at www.nature.com/articles/s41586-021-03308-6 A briefer press release is available at <https://news.stanford.edu/press/view/38738> Thanks to Sandy Shumway, one of the authors for sending that link.



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Photo news

Oyster restoration on the Clyde



Pictured above; from left, Jacob Kean Hammerson of BLUE, Celine Gamble (ZSL) and David Nairn at Largs Marina. They were there to place oysters from Loch Ryan in special nurseries (*pictured right*) in the marinas at Largs and Fairlie on the Firth of Clyde as part of the Wild Oysters Project. Full story can be found at page 8.

Photo credit Celine Gamble (ZSL)

Shellfish culture

These are screen shots from a nice tale that uses a talking mussel to spread a very important message on climate change. These are taken from an award winning entry into the Young Reporters for the Environment competition organised by Keep Scotland Beautiful.

This was the entry from young Harvey Pole, featuring this cute and talking mussel. www.youtube.com/watch?v=Xl_N0q11jF4
The entry was called "Save the Mussels! - A Climate Crisis Interview". A slightly longer version of the video has also been created as an entry for the international competition run by FEE (Foundation for Environmental Education). This can be viewed here www.youtube.com/watch?v=nZhk0s2fP0I

Harvey is a member of Cromar Future Group's Everything Electronic Youth Club www.futuregroup.org.uk/
The film premiered on April 5 2021.



SAVE THE MUSSELS! A Climate Crisis Interview

