Donegan, Fergus (Alab)

From: [redacted]
Sent: Friday 31 March 2023 10:26
To: Alab, Info
Subject: Submission from Johnny Neville against the appeal made by An Taisce (AP5-23) against Licence T03/095A
Attachments: Johnny_Neville_Submission_to_ALAB_An_Taisce_2023_AP5_23 _Final_for_sending.docx

Dear Sir/Madam,
I attach my submission as a defence against the appeal that An Taisce have made against my licence application T03/95A.
I will also be sending a signed copy of this by registered post today.
Yours Sincerely
Johnny Neville
PS could you acknowledge receipt of this email and word file attached?

28/03/23

[redacted]

Aquaculture Licence Appeals Board (ALAB)

Kilminchy Court

Dublin Road

Portlaoise

Co. Laois

R32 DTW5

Delivered by Registered mail and emailed to info@alab.ie

Re: Submission on the An Taisce Appeal (AP5-2023) against the decision by DAFM to grant licence for application (T03/95A) in Ballyteigue Bay, Co. Wexford

Dear Sir/Madam,

An Taisce have appealed (AP5-2023) the determination of the Minister of the Marine to grant an aquaculture and foreshore licence to my application T03/095A. I now make my submission to ALAB in defence against appeal AP5-2023. I will structure my defence broadly along the line of points raised in the An Taisce appeal.

Grey Plover:

The Ballyteigue Burrow SPA Appropriate Assessment (AA) makes the supposition that Grey Plover are totally excluded from oyster farming areas is based on very limited fieldwork and work in other bays and does not take into account the numerous varying factors that surely determine bird behaviour in any given intertidal habitat such as the level of food available to Grey Plover in the substratum at different locations within the intertidal zone, the varying physical nature of the substratum at across the intertidal zone, the time of year, level and type of anthropogenic disturbance in the vicinity (husbandry on foot/on tractor/ distance from non-husbandry activities e.g. main road), weather, time of year etc. Where are the studies from outside Ireland on bird disturbance from oyster farming activities? Why do we lean so heavily on a very limited study effort and even smaller number of researchers (basically one author writing all the same limited studies)? The extent to how distorted these limited studies can be is demonstrated in the case of Light Bellied Brent Geese where the SPA authors reach a breath-taking pinnacle of delusion and which I will elaborate on fully in the Brent Geese section of my response in this submission.

Nonetheless despite all of the above shortcomings in which draconian worst-case scenario exclusion figures are used in the (AA) for Ballyteigue Burrow SPA they then go on to state:

> *The short-term change for Period 2 shows the change in the five year mean annual peak counts between 2006/07-2010/11 and 2011/12-2015/16. This is the period over which production data indicates an overall increase in oyster trestle cultivation activity. Therefore, if oyster trestle cultivation activity was causing significant negative impacts on waterbird populations in the Ballyteige Burrow SPA we would expect decreasing trends in waterbird populations in the Ballyteige Burrow SPA relative to the national trend. However**, for nine of the eleven species the population trends in the Ballyteige Burrow SPA are less negative than the national trend. It is notable that Grey Plover, which is the species most likely to be negatively affected (see above) showed an increase over this period, compared to a small decrease in the national population estimate. This species also showed a small increase over the earlier period, compared to a large decrease in the national population estimate.***

Above excerpt from From Ballyteigue SPA AA Population Trends 7.22 page 42.

> So, something magical is happening in Ballyteigue. Grey plover that are allegedly 100% excluded from the intertidal zone as a result of oyster farming activities are actually thriving very well in comparison to the national short term and long term national trends. Short term trend for that species is plus 38% in Ballyteigue as opposed to minus 6% at national scale and for long term trend it is plus 59% for Ballyteigue as opposed to minus 54% at the national level.

The Ballyteigue Burrow SPA AA concludes that for grey plover:

> *It should, however, be noted that the population trend data for Grey Plover **does not show any evidence of impacts from increasing levels of oyster trestles culture over the period 2008-2016.** On this basis, it is likely the displacement impact will be substantially lower than the calculated impacts for the two sites assessed (Table 7.5). Notwithstanding, it is recommended that site activities are confined within the licence blocks as well as maintaining strict adherence to access routes.*
>
> *7.26 page 43*

An Taisce even try to rubbish the above obvious increase in Grey Plover with increasing aquaculture by suggesting that oyster farming actually decreased during that period. I have been working on oyster farms in Ballyteigue Bay since not long after they first appeared in the Bay and have watched the evolution of it from that point till the present. During the period in the bay from 2005 onwards there was only one operator left and production increased during that period (I should know I was working on the farm). There were more trestles in the bay by 2016 than at any time previously in the history of oyster farming in the bay. Fact remains that grey plover numbers increased during that period.

In regard to the comment about staying within the confines of my licence I can assure you that I have no intentions of deploying trestles outside the proposed licence area and I will adhere to tractor route applied for.

An Taisce once again are making a big play on the 'precautionary principle' however there never will be any certainty in an SPA AA as there are factors greater than my oyster farm application which control bird behaviour, and which are operating at national and international scale such as global warming. The Marine Climate Change Impacts Partnership (MCCIP - https://www.mccip.org.uk/) is the primary independent source of marine and coastal climate change impacts evidence and adaptation advice in the UK. Established in 2005, it provides a unique interface between government, agencies, industry, NGOs and the wider scientific and stakeholder community. In its recent report entitled '**Impacts of climate change on the UK's coastal and marine waterbirds'**

(Burton, N.H.K. et al (2020) MCCIP Science Review 2020, 400–420 - https://www.mccip.org.uk/sites/default/files/2021-07/18_waterbirds_2020.pdf

They state that waders tend to show positive associations between winter temperature and measures of abundance or survival (page 9, paragraph 2) and for grey plover the climate change assessment (Table 1, page 12) is for **high benefit**. Given this positive expert assessment for grey plover for the neighbouring island it can be assumed that this is also likely to be the case for the South East corner of Ireland. Taking the broad picture of the projected positive mitigation effect of climate change on overwintering grey plover populations and that its local population has not been displaced to any significant extent (as has in fact been demonstrated for the period 2008-2016) despite the presence of oyster farms since the early 1980's in the bay. One could argue that there has not been and will not be a significant negative impact on them. One would think that they (Grey Plover) would have left the area long ago since the arrival of oyster farms in the bay if they were having such a negative impact. Quite the contrary. Indeed, given the ecosystem services provided by oysters that I refer to later in my submission one would need to seriously consider the negative impact on grey plover that would occur if the marine ecosystem turned eutrophic after removal of filter feeders from the bay. Maybe a more appropriate use of the 'precautionary principle' would be to apply it to the notion of removing oyster farming from the bay which is a small estuarine environment with high nutrient loadings.

Wigeon

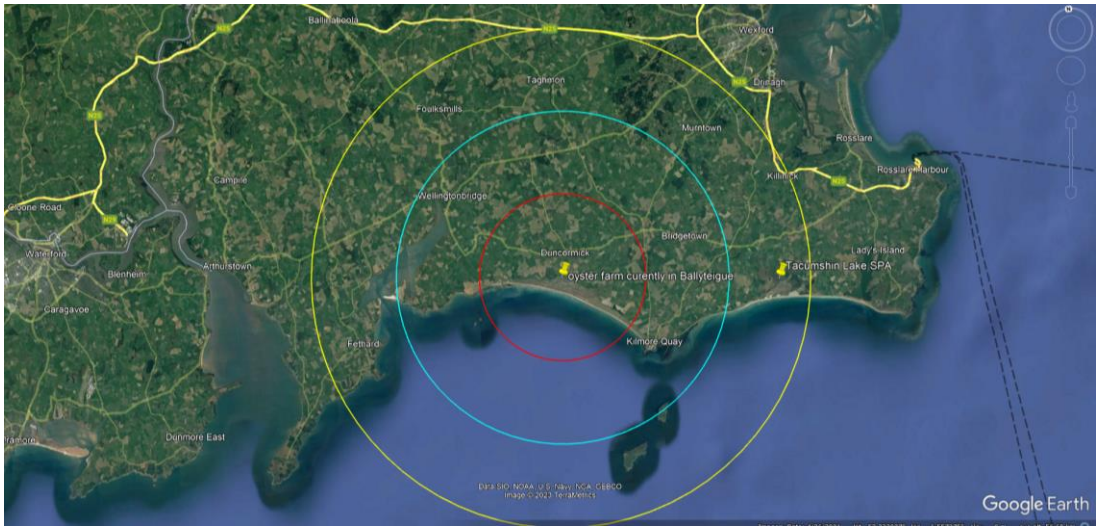
Wigeon is not even listed as a Conservation Objective for Ballyteigue Burrow SPA

The conservation objectives for the Ballyteigue Burrow SPA are for the Light-bellied Brent Goose, Shelduck, Golden Plover, Grey Plover, Lapwing, Black-tailed Godwit and Bar-tailed Godwit SCIs of the Ballyteige Burrow SPA in regard to maintaining their favourable conservation condition (NPWS, 2014c). Page 27 SPA AA.

The conservation objectives for the Wigeon SCI of the Tacumshin Lake SPA is to maintain its favourable conservation condition (NPWS, 2018b). Tacumshin Lake is greater than 10km from Ballyteigue Bay at their closest points and closer to 13.6km from the current oyster farm location to Tacumshin Lake (see google earth image below). My application is immediately east of the current oyster farm. The Ballyteigue SPA AA says that Whooper Swan can be screened out because the distance of Ballyteige Bay from Tacumshin Lake (around 10 km) is a lot greater than its likely core foraging range of 5 km (SNH, 2016). A huge national study of Wigeon in the UK entitled: **Winter distribution and habitat requirements of Wigeon in Britain** published in the Wildfowl Journal https://wildfowl.wwt.org.uk/index.php/wildfowl/article/view/515

states that for Wigeon they '***Very seldom do they fly more than 5 miles (8 km) to feed.''***

Google earth image below with a 5km (red), 10km (lightblue) and a 15km (yellow) radius around the current oyster farm in Ballyteigue shows Tacumshin Lake in the 12.5-15km zone away from my application. Highly unlikely therefore that there is a Wigeon connection between my site and Tacumshin Lake SPA.



Google Earth Image Above Showing the 5,10 and 15km radius from the existing oyster farm and the location of Tacumshin Lake within the 10-15km band.

However, the SPA AA attempts to find another way of justifying the 'screening in' of Tacumshin Lake SPA Wigeon into the Ballyteigue SPA AA by stating that *'The Wigeon SCI of the Tacumshin Lake SPA has also been screened in due to the **low site fidelity** of wintering populations of this species.'*

This statement is in contrast to the high fidelity that Wigeon show to Tacumshin Lake as they occur in numbers up to 4725 in Winter according to the site synopsis data for Tacumshin Lake SPA SITE CODE: 004092 (NPWS).

Furthermore, the SPA AA for Ballyteigue Burrow states

> 'The conservation condition of the Wigeon SCI of the Tacumshin Lake SPA has not been assessed.'

So, they throw Tacumshin Lake Wigeon into the mix of the Ballyteigue Burrow SPA despite the distance between the two being considerably greater than the foraging range of Wigeon, the high fidelity of Wigeon to Tacumshin Lake and the lack of information/study into the conservation condition of Wigeon at Tacumshin Lake. Looks like Wigeon are getting studied more at Ballyteigue Burrow rather than at one of the most important bird sites in the country in the viz Tacumshin Lake.

The Wigeon study in the UK also states that:

> *-Although 80% of Wigeon roost on the coast, only 54% of their feeding is done there. A third of the feeding time is on mudflats but **inland pastures are now the most important Wigeon habitats.** Wigeon feed both by day and night and generally feed close to the roosting site. Wigeon have a predominantly coastal distribution but this is probably **due to a shortage of suitable areas inland rather than preference for estuarine habitats or foods**.*

Estuarine habitats aren't even their preferred habitats. For the small number of wigeon that apparently use Ballyteigue Burrow SPA the density per ha figures as stated in the SPA AA in table 5.6- page 33 show that the highest densities of wigeon occurred in the two bird counts zones (0OL06 and 0OL04) one of which has an oyster farm in it and the other is immediately adjacent to it. Could it be the case that Wigeon are positively impacted by oyster farming (similarly to Light-bellied Brent Geese) in that they enjoy feeding on the green algae on top of the oyster bags?

It appears that the author of the Ballyteigue SPA AA is grasping at straws to include Wigeon in the Ballyteigue Burrow SPA AA. To say that there is even a tenuous link between Wigeon SCI of Tacumshin Lake and the Ballyteigue SPA would be bad enough but to screen them in and then state that oyster

farming which has been there since the 1980's is negatively impacting their numbers (numbers which they haven't even bothered to assess) and that my application for an oyster farming site will add to the wigeon woes is really calling into question the credibility and the impartiality of these SPA appropriate assessments. Anything that can possibly be gathered up and used against shellfish farming is used to make a case against us. Even with all of that, the SPA AA for Ballyteigue Burrow still concludes that my licence application could be approved and indeed the Minister saw fit to make a positive determination despite all of the efforts to make that impossible. But that doesn't stop An Taisce. Armed with these snippets of misinformation generated in the Ballyteigue Burrow SPA AA, they will fight on even to the highest courts to rid Ballyteigue of oyster farms once and for all.

Light-bellied Brent Geese

As mentioned previously oyster farming in Ballyteigue has been a reality since the 1980's. I as a worker on oyster farms have had more time on the shore of Ballyteigue than any other human being in Ireland. I have witnessed countless occasions when Brent Geese feed on top of the oyster bags during the winter when there is algae on the oyster bags. They also feed at any location around the shore that has green algae growing on the shore (particularly stony areas near a freshwater inflow with green algae on the stones). They also feed on grass fields, but I suspect the ornithologists that come down here for the one or two days a year to write up Appropriate Assessments aren't looking back towards the land much or around a hidden corner on the shore where the Brent Geese are devouring Enteromorpha or ulva on stones near freshwater inflows. They would rather say that because on that day(s) they didn't see them on the oyster bags that there must surely be a negative interaction with oyster farms. Even when I am working on the current oyster farm that exists in Ballyteigue Bay the Brent Geese continue to feed on the bags and keep about 20m away from us but continue feeding.

For a professional bird impact study paid by the state (The Ballyteigue Burrow SPA Appropriate Assessment) to come up with a 'theory' that Light Bellied Brent Geese somehow react negatively to oyster trestles in Bannow Bay as opposed to positively in Dungarvan Harbour oyster trestles and that furthermore that because Ballyteigue Burrow SPA by virtue of being closer to Bannow Bay than Dungarvan Harbour is to be anticipated these Brent Geese also display a negative interaction with oyster trestles in Ballyteigue defies belief. As someone who spends my working life on the shore I know 100% that this theory is utterly incorrect. I'm sure every oyster farmer in the country would feel the same. This argument has been conjured up for one reason only and that is to cast doubt on the well-known observation that Brent Geese use algal covered oyster bags on trestles as an additional and important source of feeding. It doesn't even occur to them that availability of the additional feeding habitats (green covered stoney shore line and lush grasslands) both of which are in abundance around Bannow and Ballyteigue may result in Light Bellied Brent Geese being less dependent on algal covered oyster bags.

My licence for an oyster farm will not deprive any Brent Geese from access to any green algae in fact we are adding an additional source of feeding for them by virtue of the fact that our oyster bags will be substrate for the growth of green macro algae such as *Enteromorpha sp* which they eat. Without our structures there wouldn't be any green algae at that location. It would be a mudflat relatively devoid of diversity.

General comments on the Appropriate Assessment for Ballyteigue Burrow SPA and An Taisce's critique of it.

An Taisce in their appeal are highly critical of the approach and result of the Appropriate Assessment process for both the SAC and the SPA, effectively calling for an even more strict assessment to be imposed on my licence application. I am critical also of the Ballyteigue SPA Appropriate Assessment in that at every opportunity the author of the report has taken the most precautionary approach possible to assessing impacts to not only birds within Ballyteigue Burrow but also from other SPA's even ones well beyond any well-known foraging ranges (e.g. Wigeon in Tacumshin Lake).

They have looked for maximum impacts:

> *'as a precautionary measure, we have used the maximum waterbird occupancies for the calculation of displacement impacts.'*

Penalised aquaculture sites in Ballyteigue for being smaller than the usual oyster farming sites!:

> *'The aquaculture sites at Ballyteige Bay differ from the above scenarios due to their size and shape and the position of the aquaculture sites within the bay. The aquaculture sites are small and linear with widths of around 40-70 m, meaning that all activity within the sites will have potential disturbance effects extending outside the sites. The sites are also located in the middle of the bay with a large area of intertidal habitat adjacent to the sites where waterbirds are likely to be distributed at low tide.'*

They have scrambled due to a lack of real data from Ballyteigue Bay to use whatever limited studies they could get from other bays and altered the results of them to make the impact more extreme for Ballyteigue Bay:

> *-'We used data from monitoring at Dungarvan Harbour (Gittings and O'Donoghue, 2018a, 2018b, 2019; see Chapter 7) to quantify the potential response of waterbirds to husbandry-related disturbance. This monitoring reported an 80% flush rate within 100 m (n = 5 observations) and a 23% flush rate at distances of 100-300 m (n = 30 observations). Because of the small sample size, we have used a **100%** displacement rate for the 0-100 m distance band, and we rounded up to a **25%** displacement rate for the 100-300 m distance band'*

So, with a swipe of the pen they up 80% to 100% and 23% to 25%.

Their displacement analysis relies on the following assumptions all of which are highly debatable and all leaning towards a worst-case scenario -

> • *All the species are **completely excluded** from areas occupied by oyster trestle cultivation.*
>
> • *The disturbance responses derived from the Dungarvan Harbour data are **representative of the likely disturbance** responses in Ballyteige Bay.*
>
> • *The subsite occupancy values used in the analyses are representative of typical subsite occupancy values across seasons.*
>
> • *Within the subsites containing the aquaculture sites, and in the absence of any oyster trestle cultivation activity, the waterbirds would occur within the aquaculture sites in proportion to the area occupied by the aquaculture sites.*

All of these assumptions quoted above from the Ballyteigue Burrow SPA AA are extremely biased towards a harsh assessment of aquaculture in the SPA. They even admit:

> -'*The assumption that all the species are completely excluded from areas occupied by oyster trestle cultivation is **precautionary**. While this assumption is correct for at least one of the species covered by*

> *the assessment (Grey Plover),* ***other species show reduced densities within areas of oyster trestle cultivation but are not completely excluded (Bar-tailed Godwit and Dunlin), while other species appear to show variable responses to oyster trestle cultivation which differ between sites (Light-bellied Brent Goose and Curlew)'.***

Note they deliberately avoid using the phrase '**positive response'** and use as a 'precaution' no doubt the phrase 'variable response'. They can't even muster the strength to admit oyster farms have positive impacts on certain bird species.

They even admit that the 5% displacement threshold is again precautionary and that in the real-world numbers error levels can be well above 5%:

> *-'The minimum error level in large-scale waterbird monitoring is considered to be around 5% (Hale, 1974; Prater, 1979; Rappoldt, 1985). Therefore, any population decrease of less than 5% is unlikely to be detectable and, for the purposes of this assessment, 5% has been taken to be the threshold value below which displacement effects are not considered to be significant. This is a conservative threshold, as error levels combined with natural variation are likely to, in many cases; prevent detectability of higher levels of change****. This threshold is also likely to be very conservative in relation to levels that would cause reduced survivorship (see above).***

The above list of approaches and assumptions have been used to deliver an **incredibly harsh assessment** of aquaculture in the Ballyteigue Burrow SPA. However, the Appropriate Assessment Conclusion Statement by Licensing Authority for aquaculture activities in the Ballyteigue Burrow Special Area of Conservation (SAC) (Natura 2000 Site Code 000696) and the Ballyteigue Burrow Special Protection Area (SPA) (Natura 2000 Site Code 004020) comes to their senses to some degree and start applying the brake to the runaway theories and assumptions and concludes that for grey plover:

> *'On this basis, it is likely the displacement impact will be substantially lower than the calculated impacts for the two sites assessed (4.6-4.9%)'.*

And for Light bellied Brent Geese and Wigeon:

> *'The predicted displacement impacts to Light-bellied Brent Goose (6.7-7%) and Wigeon (6.7-7%) are significant. However, there is a high level of uncertainty about this prediction due to the* ***variable*** *nature of their responses to oyster trestle cultivation,* ***and*** *the likely* ***significant overestimation of sub-site occupancy levels in the displacement calculations'****.*

And overall in regard to licencing of the sites

> *'12.1 Having considered the conclusions and recommendations of the Appropriate Assessment process, the Licensing Authority is satisfied that, from a Natura 2000 perspective, a decision can be taken in* ***favour of licensing proposed aquaculture operations in Ballyteigue Burrow SAC/SPA****, subject to the mitigation measures referenced above. Accordingly, the Licensing Authority is satisfied that the proposed licensing of aquaculture in the Bay is not likely to significantly and adversely affect the integrity of Ballyteigue Burrow SAC/SPA.'*

The 15% Habitat Overlap Rule.

European Commission's Article 17 reporting framework stated that disturbance of greater than 25% of the area of an Annex I habitat represents unfavourable conservation status, however in Ireland and inter departmental agreement (The Road Map to Compliance with the Habitats Directive for Aquaculture imposed a threshold value of 15% area for aquaculture even though oyster farming does not constitute a continuous disturbance nor does it represent damage to the habitat (indeed many

academics and regulatory bodies around the worlds see oyster farming as beneficial to habitats). This value of 15% is probably the strictest interpretation of the EC guidelines of 25% currently in Europe at present. Another example of applying strict thresholds on aquaculture licencing. Despite this the SAC Appropriate Assessment Conclusion Statement says:

> *5.1 Based upon the spatial overlap and sensitivity analysis, it is concluded that aquaculture activities at trestle sites **do not pose a risk of significant disturbance** to the conservation of the habitat features of Estuaries [1130] and Mudflats and sandflats not covered by seawater at low tide [1140] or their associated community types.*

The above conclusion is due in large part to the very small area being applied for oyster farming (considerably smaller than most oyster farms in the region). Clearly not the result that An Taisce were looking for so they call now for an abolishing of the 15% rule.

Water Quality/Ecosystem Services provided by Oyster Farming

Ballyteige Bay is a fairly enclosed system with a bottle-neck connection to the open sea (so much so that its tidal periods are at odds with more open bays in the region). Add in the nutrient loadings from agriculture and waste water treatment systems and you have a recipe for a marine ecosystem to be driven towards eutrophication and its associated negative impacts (high algal levels, oxygen depletion during darkness, fish kills and benthic dead zones). When that happens what do the wintering bird populations have left to feed on? Not a lot is the answer. Then you have birds (even SCI ones) abandoning the SPA or worse still dying. So, the impact of eutrophication driven anoxic events doesn't just stop with marine life; it has a massive negative impact on birdlife too. Water quality is the foundation for the whole ecosystem. Oyster farming actively prevents eutrophication as unlike agriculture it uses no artificial feed, it removes nutrients from the water column (directly and indirectly), drives the ecosystem away from eutrophication thus avoiding oxygen depletion caused by otherwise excessive alga growth. Enhanced bacterial denitrification can occur under oyster farms thus removing even more nitrogen from the transitional water body. The complete opposite of land-based agriculture (particularly dairy) which is expanding dramatically in the southeast of Ireland. The European Commission in its 2015 report from the Environment Directorate-General "**Science for Environment Policy – Future Brief 'Sustainable Aquaculture**' states that shellfish farming has been proposed as an ecosystem service tool for lowering nutrients in water from all sources to help meet the Water Framework Directive's (WFD) objectives. The benefit of oyster farming on water quality and ecosystem health isn't just my opinion: I am backed up by a wealth of peer reviewed scientific literature (see some included at the end of the document). In addition to promoting ecosystem health by improving water quality as described above I would also point out that oyster farming increases biodiversity by providing structures that create additional habitats for marine life in an area that would otherwise be a relatively barren mudflat. Fish often shelter in numbers underneath the bagged trestles. Other filter feeders settle on the structures and remove additional nitrogen and phosphorus in addition to the oysters. Oyster trestles are a haven for small marine life that are in turn prey for fish and birds.

The Marine Institute of Ireland in their conclusion to the appropriate assessment of mussel aquaculture in Wexford Harbour state that mussels are mitigating against eutrophication. The text below is from the concluding statement:

> *-The filtration capacity of the mussels may have a beneficial impact on the eutrophication status of the bay and the habitat provision by mussels can be beneficial to the ecological function of the system.*

-The addition of more mussels to the system (with new applications) should have additional benefit in terms of reducing effects of eutrophication and may mitigate the water quality status in the Lower Slaney water-body.

Oysters act in a similar manner and one could argue are even better for biodiversity due to the structures used and in the gentle harvest method employed (bags simply lifted off the trestles and taken away for grading and sale). We will use only triploid oysters and to date there has never been settlement of gigas oysters in the bay and this can be verified in a PHD study by Judith Kochmann (*Into the Wild: Documenting and Predicting the Spread of Pacific Oysters (Crassostrea gigas) in Ireland)* in 2012 which found not only no settled wild gigas in Ballyteigue but none in the south coast of Ireland. So that study would have been written about 27 years after oyster farming commenced Ballyteigue and despite the fact that in the early years diploid oysters were used.

It would be remiss of me not to bring to the attention of ALAB the crucial ecosystem services that oyster farming provides as understood by academic experts who have looked at this objectively and which are mentioned below.

Although nitrogen is the main driver for eutrophication a dual-nutrient reduction strategy for Nitrogen and Phosphorus in Irish estuaries has been advocated (O' Boyle et al 2015). There are numerous studies calculating the nitrogen and phosphorus content of bivalve shellfish some of which are tabulated in a Review by Van der Schatte Olivier et al 2020 who calculate that on average, the dry weight of bivalve tissue contains 44.9% carbon, 9.3% nitrogen and 0.9% phosphorus, while shell contains 11.7% carbon, 0.3% nitrogen and 0.04% phosphorus and through harvesting considerable quantities of these nutrients can be removed from the marine ecosystem.

However, Ferreira *et al* argue that harvest weight alone underestimates the annualized ecosystem service of nitrogen removal at the population level (three year grow out on farms) and has calculated that 11280 tons of oysters in Ireland remove 431.7 tons of nitrogen per year (Ferreira et al, 2016) or 38.27 kgN/ton of oysters. Hernández-Sancho calculates a shadow price for nitrogen removal of €30.93 Kg of N (conservative cost as it does not include capital costs of waste water treatment plant) (Hernandez-Sancho, 2010) and this is used by Norton in Irish ecosystem evaluations (Norton, 2018). So as an example, 10,000 tons of oysters would remove 382700Kg of N costing € 11,836,911 using the shadow cost of removal. This estimate is probably quite conservative given that costs for upgrades to wastewater treatment and urban stormwater collection in the USA can be as high as 7610 and 3629 US$ /lb in the USA (Rose, 2014) or €14764 and €7041/kg N respectively.

In addition, bivalve shellfish enhance denitrification in sediments beneath them thus removing additional Nitrogen as harmless N2 gas. Humphries determines that the denitrification rate for aquaculture oysters is 346 µmol N2-N m2h-1 (Humphries, 2016) which is 0.0096926 grams of Nitrogen/m2/h-1 using a standard conversion. Rates of around 20 and some up to 1600 µmol N2-N m2h-1 have been calculated by other researchers (Piehler, 2011), (Kellogg, 2013).

Under the 4th Nitrates Action Plan there is a Phosphorus (P) build up allowance for soil index types 1 and 2 for grasslands with a stocking rate above 130kg /Ha. Thus, any proposed intensification of agriculture could lead to increased levels of P in estuarine waters. The shadow cost of P removal is 93.63kg (Sebastiano, 2015) and is quoted by Norton in Valuing Ireland's Blue Ecosystem Services

(Norton et al 2018). So, although there is less P removed by shellfish the shadow cost of removal is three times higher than for N. Thus, shellfish aquaculture is unique in providing the removal of N and P and could be involved in nutrient trading with agriculture but as it stands is offsetting agricultural inputs in real-time in the estuary.

Using the above conservative shadow prices, I would hope to remove (when at full production in year 4) about **4200Kg of N per annum nett** valued at **130,000 Euro** (excluding the amount of Nitrogen removed through enhanced benthic-pelagic coupling) and also approximately **420 kg of P per annum nett valued at 39,000 Euro.** In short, my oysters would be working hard for free for the state protecting the ecosystem health of Ballyteigue Burrow SAC and SPA. Of course, the cost of remediating a nutrient sensitive marine ecosystem that falls into a eutrophic state with associated oxygen depletions and widespread benthic dead zones, fish kills and removal of food resources to birds would be absolutely huge. Thus, there is an additional inherent economic value to the service that my farm would provide by preventing such a catastrophe.

Shellfish aquaculture is at the very low end of the carbon footprint scale. A recent (September 2021) study published in Nature '*Environmental Performance of Blue Foods*' shows this clearly. https://www.nature.com/articles/s41586-021-03889-2

Add in the fact that some seaweed growth occurs on oyster farming structures and my business could theoretically be carbon neutral. Surely this is the way forward for sustainable environmentally friendly protein production. The EU in their latest round of funding are advocating sustainable food production whilst protecting the global environment.

Other regulating services such as reducing turbidity allowing for increased light transmission with positive impact on submerged aquatic vegetation, removal of microbial pathogens, dissipation of wave energy and reducing laminar water flow leading to reduced coastal erosion. These services are less well understood especially in terms of economic value but are nonetheless a feature of oyster farming.

Good large-scale examples of this scientific/academically proven knowledge being put into action include the Billion Oyster Project in New York Harbour (https://www.billionoysterproject.org/ecosystem-engineers) where water quality and ecosystem improvements in New York Harbour are achieved by **adding oysters** to the waterbody. Equally the Chesapeake Bay Foundation who are restoring water quality in the bay using oysters https://www.cbf.org/about-cbf/our-mission/restore/oyster-restoration/index.html

And the Oyster Recovery Partnership (ORP) also in Chesapeake Bay using oysters to clean up the water. Indeed, the public can even buy oysters to be placed in the waterbody to assist with the process.

https://oysterrecovery.org/water-quality-improvement/#:~:text=Science%20has%20shown%20that%20oysters,into%20their%20tissue%20and%20shells.

The above examples use native oysters but the same principle can be applied to aquaculture oysters as recommended by the National Oceanic and Atmospheric Administration (NOAA) who say as an example in a recent joint study that all of the nitrogen currently polluting the Potomac River estuary could be removed if 40 percent of its river bed were used for shellfish cultivation. The very same principles apply.

https://oceanservice.noaa.gov/news/apr14/oyster-aquaculture.html

According to NOAA

> -*this alternative approach to water quality management has the potential to address legacy pollution, provide a marketable seafood product if there are no other contaminant issues that would prevent human consumption, and enhance local economies with additional income to growers through the possible development of a program—similar to those being considered in other parts of the country—where growers would be paid for the water cleaning services done by their oysters.*

There are many more examples of using oysters and other filter feeders to keep ecosystems healthy and diverse all around the world.

Unfortunately for oyster farmers in Ireland, not only would it even be considered that they get paid for such water cleaning services but we have people and organisations who proclaim to be protecting the environment actually still believing or at the very least are trying to propagate the untruth that oysters cause water quality problems and doing everything they can to prevent oyster farming in estuaries. A pretty bleak assessment of the state of environmental protection by those proclaiming to care the most in this country.

Precautionary Principle

An Taisce are now making a big play to the 'precautionary principle'. Oyster farming in Ballyyteigue commenced before any SPA or SAC designation and has had no negative impact to date which in my opinion means that precautionary principle is no longer relevant. In fact, I believe that my presence in the bay should I finally be licenced will actually protect the ecosystem.

In Summary:

Above I have tried to address the main arguments brought about by An Taisce in their appeal and also expressed my issues with the harsh SPA Assessment in Particular for the Balyteigue Burrow SPA which has no doubt given An Taisce additional motivation to fight this application to the bitter end.

So, there is an overwhelming body of academic studies advocating for shellfish farming particularly in ecosystems that are nutrient sensitive such as Ballyteigue. It is clear that my application has a considerable amount of support in some of the submissions made in the previous stage of the licencing process and now has the approval of the licencing authority too after and extremely rigorous and precautionary assessment under the Habitats Directive. To bow down to the type of anti- aquaculture legal threats that An Taisce is making would be to the detriment of the health of the ecosystem and would be particularly devasting to me as I know I would make my business successful and I am an environmentalist by nature and I know that the habitats and species will benefit by having me there oyster farming. My son who has degrees in science and engineering would also be keen to assist me with oyster farming should I get the licence. This is a perfect example of a sustainable business that could be passed from generation to generation, keeping talent in the rural coastal areas. An Taisce are so anti-aquaculture, even against long established shellfish culture operations (as also seen in their appeals against mussel farming in Wexford Harbour) that they are willing to let the ecosystem be a victim in their quest to rid Ireland of aquaculture let alone snuffing out opportunities for local people in rural coastal locations. If my application to have a licence for a tiny oyster farm fails at this late stage after all of the effort that has been put into it by me and the state, then it will truly set a benchmark that shellfish aquaculture will not be tolerated in this country because of the actions/threats of An Taisce. I hope that ALAB do not buckle under this type of pressure and that common sense prevails.

Yours Sincerely

Johnny Neville

References:

Craeymeersch J.A., Jansen H.M. (2019) *Bivalve Assemblages as Hotspots for Biodiversity*. In: Smaal A., Ferreira J., Grant J., Petersen J., Strand Ø. (eds) Goods and Services of Marine Bivalves. Springer, Cham. https://doi.org/10.1007/978-3-319-96776-9_14

Dame, R.F. 2012. Ecology of Marine Bivalves, an Ecosystem Approach. Second edition. Boca Raton, FL: CRC Press. 271 pp

European Environment Agency (2012) Common International Classification of Ecosystem Services (CICES V4): Consultation Briefing Note European Environment Agency 1–9. https://cices.eu/cices-structure/

Ferreira, J. &. B. S., 2016. Goods and services of extensive aquaculture: shellfish culture and nutrient trading.. *Aquaculture International,* 24(3), pp. 803-826

Gephart, J.A., Henriksson, P.J.G., Parker, R.W.R. et al. Environmental performance of blue foods. *Nature* **597,** 360–365 (2021). https://doi.org/10.1038/s41586-021-03889-2

Grabowski, J. e. a., 2012. Economic Valuation of Ecosystem Services Provided by Oyster Reefs. *BioScience,* 62(10), pp. 900-909

Hernandez-Sancho, F. M.-S. M. a. S.-G. R., 2010. Economic valuation of environmental benefits from wastewater treatment processes: an empirical approach for Spain.. *Science of the Total Environment,* 408(4), p. 953–957

Higgins CB, Stephenson K, Brown BL (2011) Nutrient bioassimilation capacity of aquacultured oysters: quantification of an ecosystem service. Journal of Environmental Quality 40: 271.

Humphries, A. e. a., 2016. Directly Measured Denitrification Reveals Oyster Aquaculture and Restored Oyster Reefs Remove Nitrogen at Comparable High Rates. *Frontiers in Marine Science,* 3(74).

Kellogg, M. C. J. ,. O. M. &. P. K., 2013. Denitrification and nutrient assimilation on a restored oyster reef. *Marine Ecology Progress Series,* Volume 480, pp. 1-19.

Mc Caffrey, J. H. J. T. a. M. B., 2016. Living oysters and their shells as sites of nitrification and denitrification. *Marine Pollution Bulletin,* Volume 112, pp. 86-90

Millenium Ecosystem Assessment, 2005. *Ecosystems and Human Well-Being: synthesis.* [Online] Available at: https://www.millenniumassessment.org/documents/document.356.aspx.pdf

Newell, R., 2004. Ecosystem influences of natural and cultivated populations of suspension-feeding bivalve molluscs: a review.. *Journal of Shellfish Research.,* 23(1), pp. 51-62.

Norton, D. H. S. a. B. J., 2018. *Valuing Ireland's Blue Ecosystem Services, SEMRU Report Series.* [Online] Available at: http://www.nuigalway.ie/semru/documents/marine_ecosystem_service_non_technical_report_final.pdf

O' Boyle, S. e. a., 2015. Factors affecting the accumulation of phytoplankton biomass in Irish estuaries and nearshore coastal waters: A conceptual model. *Estuarine, Coastal and Shelf Science,* Volume 155, pp. 75-88.

Piehler, M. &. S. A., 2011. Habitat-specific distinctions in estuarine denitrification affect both ecosystem function and services. *Ecosphere,* 2(1), pp. 1-17

Rose, J. B. S. T. M. G., 2014. A role for shellfish aquaculture in coastal nitrogen management.. *Environmental Science and Technology,* 48(5), pp. 2519-25..

Sebastiano, D. e. a., 2015. Using a Shellfish Harvest Strategy to Extract High Nitrogen Inputs in Urban and Suburban Coastal Bays: Practical and Economic Implications. *Journal of Shellfish Research,* 34(2), pp. 573-583.

Van der Schatte Olivier, A., L. Jones, L. Le Vay, M. Christie, J. Wilson & S. Malham (2020). A global review of the ecosystem services provided by bivalve aquaculture. *Reviews in Aquaculture* 12, 3–25. https://onlinelibrary.wiley.com/doi/epdf/10.1111/raq.12301

Shumway S.E. 2011 (Editor) Shellfish Aquaculture and the Environment. John Wiley & Sons, Inc

Shumway, S.E, Davis, C., Downey, R., Karney, R., Kraeuter, J., Parsons, J., Rheault, R. and Wikfors, G. (2003) *Shellfish aquaculture — in praise of sustainable economies and environments.* World Aquaculture 34: 8–10.

Smaal, A., J. Ferreira, J. Grant, J. K. Petersen & Ø. Strand (2019). Goods and Services of Marine Bivalves. Springer International Publishing. 591 pp. DOI: https://doi.org/10.1007/978-3-319-96776-9