



**BIRDWATCH IRELAND SUBMISSION -
REVIEW OF TRAWLING ACTIVITY
INSIDE THE 6 NAUTICAL MILE ZONE**

2018

A submission by

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Figure 1: An Atlantic Puffin (*Fratercula arctica*) with a mouth full of sand eels. Ireland’s seabirds are dependent on fish and other marine prey for their survival. Sustainable fisheries management must take into consideration the ecosystems-based approach acknowledging the needs of marine wildlife. Photo by Peter Loughlin.

BirdWatch Ireland submission- Review of Trawling Activity Inside the 6 Nautical Mile Zone

**Public Consultation on Trawling Activity Inside 6nm,
Sea Fisheries Policy and Management Division,
Department of Agriculture, Food and the Marine,
National Seafood Centre,
Clonakilty, Co. Cork,
FisheriesConsultation@agriculture.gov.ie**

11/06/2018

Dear Sir/Madam,

Please take into consideration the following views expressed by BirdWatch Ireland in relation to the Ministerial review of fishing access inside the 6 nautical mile zone (6nm zone)¹.

BirdWatch Ireland are the largest independent conservation organisation in Ireland. Established in 1968, we currently have over 15,000 members and supporters and a local network of over 30 branches nationwide. We have extensive experience on the topics of marine conservation and fisheries policy and are active stakeholders within EU fisheries stakeholder forums such as the North Western Waters Advisory Council.

We note that it is unfortunate that environmental NGO's are only being involved in this discussion at the public consultation phase. This contrasts with the Department's dialogue with the Fisheries Producer Organisations (POs), the Irish Fish Processors and Exporters Association (IFPEA) and the National Inshore Fisheries Forum (NIFF) during the drafting of the consultation paper. This is not best practice and does not reflect the position of NGO's as equal stakeholders with fishers, which is recognised at an EU level in stakeholder forums such as the Advisory Councils. We trust that our views will be given due consideration and request that the Department involve environmental NGO's in future discussions at the same stage as other stakeholders.

The status quo, where very few restrictions are in place on large fishing vessels within the 6nm and baseline zones is clearly not the most sustainable way to manage our coastal waters from either a social, economic or environmental perspective. This is supported by the reports by the Marine Institute on Trawl Fishing in Waters Inside 6nm around Ireland² and Fishing patterns and value of landings for vessels, greater than 15m in length, with higher than average fishing activity in waters inside 6nm³ and the Bord Iascaigh Mhara (BIM) report on the Economic analysis of trawl and seine

¹ DAFM (2018) Consultation Paper on Minister's Review of Trawling Activity Inside the 6 Nautical Mile Zone <https://www.agriculture.gov.ie/media/migration/customerservice/publicconsultation/review6nmzone/1ConsultationPaperReviewTrawlingActivityInside6NauticalMileZone270418.pdf>

² Marine Institute (2018) Trawl Fishing in Waters Inside 6nm around Ireland, Fisheries Ecosystems Advisory Services Marine Institute <https://www.agriculture.gov.ie/media/migration/customerservice/publicconsultation/review6nmzone/2TrawlFishingWatersInside6NMAroundIrl270418.pdf>

³ Marine Institute (2018) Fishing patterns and value of landings for vessels, greater than 15m in length, with higher than average fishing activity in waters inside 6nm, Fisheries Ecosystems Advisory Services <https://www.agriculture.gov.ie/media/migration/customerservice/publicconsultation/review6nmzone/3FishingPatterns270418.pdf>

fisheries within the Irish 6nm zone⁴. These reports provide a valuable evidence base and should support several important conclusions. With reference to these reports and other sources of information BirdWatch Ireland will outline in our submission how the management of fishing activities within Ireland's 6nm zone can be changed for the benefit of the fishing industry, coastal communities, fish stocks, seabirds and other marine wildlife.

Improving the management of Ireland's inshore waters will significantly contribute to the delivery of Ireland's obligations under the Common Fisheries Policy (1380/2013)⁵ Marine Strategy Framework Directive (Directive 2008/56/EC)⁶, the Birds Directives (Directive 2009/147/EC)⁷ and Habitats Directive (Council Directive 92 /43 /EEC)⁸ as well goal fourteen of the United Nations Sustainable Development Goals and sustainable marine spatial planning.

We would like to support the scenario set forth in the consultation papers that:

- All vessels using trawls over 15m length be excluded from inside the 6 nautical mile and baseline zones.

In addition, we wish to suggest several other possible options for consideration:

- A proper monitoring and management regime for sprat, herring, sandeels and other forage fish species must be implemented which reflects the importance of these species within marine food webs.
- A network of Marine Protected Areas (MPA) should be designated to protect and enhance the conservation status of designated and non-designated marine habitats and species. In particular key feeding grounds around seabird breeding colonies.
- MPAs and other sustainable management plans should be implemented to protect biologically sensitive areas such as fish spawning and nursery grounds, increasing the profitability and sustainability of the Irish fishing sector.

Environmentally sustainable fishing methods should be prioritised within the 6nm zone.

- Mobile gear should be restricted within the baseline zone and ecologically sensitive areas within the 6nm zone. This would help to resolve the conflict between mobile and static gear and would have positive environmental and fisheries management benefits.
- The Nephrops fishery within the 6nm zone should be shifted over to creeling. No trawling for Nephrops should take place within the baseline zone.
- On the East Coast where the baseline zone is non-existent the use of mobile gears within the 6nm zone should be reviewed and sustainable management plans should be implemented to protect biologically sensitive areas such as fish spawning and nursery grounds, increasing the profitability and sustainability of the Irish fishing sector.

⁴ BIM (2018) Economic analysis of trawl and seine fisheries within the Irish 6nm zone <https://www.agriculture.gov.ie/media/migration/customerservice/publicconsultation/review6nmzone/4EconomicAnalysisTrawl270418.pdf>

⁵ REGULATION (EU) No 1380/2013 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL <https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2013:354:0022:0061:EN:PDF>

⁶ Marine Strategy Framework Directive (Directive 2008/56/EC) <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32008L0056&from=EN>

⁷ Birds Directive <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32009L0147&from=EN>

⁸ Habitats Directive <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:31992L0043>

Sustainable Fisheries Management

The reformed Common Fisheries Policy (CFP)⁵ came into force in 2014, with the aim to end overfishing and restore Europe's fisheries. In the preceding decades, overfishing had left many of the EU fish stocks overexploited and, in some cases, vulnerable to collapse. Without reform it was understood the health of Europe's fisheries would continue to decline, and that this would result in the loss of even more jobs among already hard-hit fishing communities.

One of the most important elements of this new dawn in sustainable fisheries management was, the commitment by National governments that the amount of fish that could be caught annually, would be based on scientific advice. By limiting catches to levels that would provide fishermen with the Maximum Sustainable Yield, countries like Ireland could help to restore the bounty of our seas. Larger fish stocks would help to restore a healthier marine environment as well as supplying fishermen with bigger catches that were easier and cheaper to catch. The economic benefits of sustainable fisheries were supported by the World Bank, who in 2017 estimated that better management of global fisheries would unlock 83 billion dollars in additional revenue worldwide⁹.

With optimism a legally binding deadline to end overfishing was set for 2015 where possible and by 2020 at the very latest for all fish stocks. A report commissioned by The Pew Charitable Trusts¹⁰ shows that while the extent to which fish stocks are being overfished has improved, however the number of overfished stocks remains too high. This is because fisheries Ministers continue to sanction overfishing by setting fishing quotas above scientific advice. Last December fisheries Ministers such as Ireland's Michael Creed agreed quotas for 2018 which will result in 46% of fish stocks being overfished. While this is down from 58 % in 2014 it is clear much greater progress needs to be made if Europe is going to fulfil its legal commitments¹¹.

According to the New Economic Foundation Ireland is the Member State with the highest percentage (18%) of their fishing quotas for 2018 in excess of scientific advice. Ireland has negotiated fishing quota for 2018 31,127 tonnes above scientific advice. This now means that Ireland has set fishing quota a total of 703,127 tonnes above scientific advice since 2001.^{1,12} It is clear that Ireland must take urgent steps to reduce overfishing in order to ensure that all targeted stocks are fished at Maximum Sustainable Yield by 2020.

Another significant reform within the CFP was the introduction of a ban on discarding catch, also known as the Landing Obligation (LO), a change in policy that was supported by the public and environmental NGOs. Discarding catch often contributes to overfishing and is also a wasteful practice. Landing all catches would improve the quality of fisheries data which could be used to improve fisheries management². The LO, in partnership with the complementary objective to set fishing quotas not exceeding the maximum sustainable yield by 2020, are designed to restore the

⁹ World Bank (2017) The Sunken Billions Revisited, Progress and Challenges in Global Marine Fisheries <http://bit.ly/2B28Ow2>

¹⁰ Nimmo, F., Cappell, R., 2017. Taking Stock – Progress towards ending overfishing in the EU. Report produced by Poseidon Aquatic Resource Management Ltd for The Pew Charitable Trusts.

¹¹ NEF (2018) Landing The Blame: Overfishing in the Atlantic 2017 <http://neweconomics.org/2018/03/landing-blame-overfishing-atlantic-2018/>

¹² NEF (2017) Landing The Blame: Overfishing in the Atlantic 2017 http://neweconomics.org/wp-content/uploads/2017/04/NEF_LTB_ATLANTIC_2017.pdf

EU's marine environment, improve the status of fish stocks and to make the fisheries sector more sustainable and profitable moving forward¹³.

It has been estimated that by setting quotas below scientific advice Ireland would increase landings by 200,000 tonnes and €200 million in value compared to 2014¹⁴. This would translate into greater profits, higher wages, and more jobs. Transitioning to more sustainable fisheries management is not just a moral or legal obligation but also the greatest opportunity available for us as an island nation to grow Ireland's blue economy.

This Ministerial review is an opportunity to change fisheries management in Ireland's inshore waters to create a fairer distribution of catch, to reduce the environmental impact of fishing and to protect and enhance biodiversity and restore fish stocks. All of these objectives would be in line with several elements of the reformed Common Fisheries Policy (1380/2013)¹⁵ such as the requirements within article two to ensure that fishing activities are environmentally sustainable:

- Fishing activities are environmentally sustainable in the long-term and are managed in a way that is consistent with the objectives of achieving economic, social and employment benefits, and of contributing to the availability of food supplies.
- The CFP shall apply the precautionary approach to fisheries management and shall aim to ensure that exploitation of living marine biological resources restores and maintains populations of harvested species above levels which can produce the maximum sustainable yield.
- The CFP shall implement the ecosystem-based approach to fisheries management so as to ensure that negative impacts of fishing activities on the marine ecosystem are minimised and shall endeavour to ensure that aquaculture and fisheries activities avoid the degradation of the marine environment.

Redistributing fishing opportunities within the 6nm zone to fishers who are more environmentally sustainable and contribute to the local economy would be in line with article 17 of the CFP which stresses that environmental and social criteria should be considered when allocating fishing opportunities.

- When allocating the fishing opportunities available to them, as referred to in Article 16, Member States shall use transparent and objective criteria including those of an environmental, social and economic nature. The criteria to be used may include, inter alia, **the impact of fishing on the environment**, the history of compliance, **the contribution to the local economy and historic catch levels**. Within the fishing opportunities allocated to them, Member States shall endeavour to provide incentives to fishing vessels deploying selective fishing gear or using fishing techniques with reduced environmental impact, such as reduced energy consumption or habitat damage.

¹³ Joint NGO Position, 2018 Recovering fish stocks and fully implementing the Landing Obligation Managing fishing mortality to meet CFP objectives

<http://image.pewtrusts.org/lib/fe8215737d630c747c/m/1/NGO+Position+Recovering+fish+stocks+and+fully+implementing+the+Landing+Obligation.pdf>

¹⁴ NEF (2017) A Fair Fishing Deal for Ireland – How to Manage Irish Fisheries in the Public Interest

<http://neweconomics.org/wp-content/uploads/2017/09/Fair-Fishing-Ireland.pdf>

¹⁵ REGULATION (EU) No 1380/2013 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

<https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2013:354:0022:0061:EN:PDF>

Enhancing Ireland's Inshore Environment

Ireland's inshore waters support a rich diversity of life. The 6nm zone, and in particular the baseline zone contains important biologically sensitive habitats which support commercial fish and shellfish species and flora and fauna of conservation importance at both an Irish and EU level. This is reflected in the many designated Special Areas of Conservation (SAC) and Special Protection Areas (SPA) within Ireland's coastal waters. There are a number of areas in Ireland's Exclusive Economic Zone (EEZ) such as south from Clew Bay (County Mayo) and east to the Celtic Sea that are identified as a Biologically Sensitive Area (BSA). These areas have high biodiversity and important areas for fish recruitment¹.

As has been highlighted by the Marine Institute restricting the access of larger vessels inside the 6nm zone would lead to improved protection of coastal environments, ecology and essential fish habitat¹. It is known that fishing can have significant effects on local ecology and ecosystems, this is particularly true when fishing is intensive locally and results in overfishing¹⁶. Overfishing stocks such as herring (*Clupea harengus*), sprat (*Sprattus sprattus*) and sandeels which support fish, seabirds and mammals at higher trophic levels can have serious consequences for marine biodiversity and ecosystem functioning¹⁷. Give that many of Ireland's seabirds and mammals enjoy some level of protection under law it is also important from a legal compliance perspective that fisheries are managed taking both top down and bottom up ecosystem level impacts into account.

The Marine Institute have carried out a risk assessment on the effects of fisheries on the qualifying interests of Special Areas of Conservation in Irish coastal waters¹⁶. The study found that fisheries using bottom trawls or dredges pose a risk to habitats such as maerl, sea grass and biogenic or geogenic reef habitats because these habitats are sensitive to physical disturbance. Bottom trawls or dredges are negatively impacting on marine communities in sedimentary habitats. The scale of the impacts on these communities will depend on the intensity and seasonality of the activity relative to the capacity of the habitat to recover between fishing seasons¹⁶. Fishing these areas intensively will result in negative impacts on these habitats with knock on impacts on fish communities that may use these sensitive coastal habitats as spawning grounds or nursery grounds¹⁶. Protecting these areas from trawling and dredging would improve the conservation status of these habitats. This would have knock on benefits at an ecosystem level benefiting the recruitment of commercially exploited fish species.

The Marine Institute have themselves advised that bottom trawling has significant impacts on seafloor habitats, especially for habitats not subject to natural disturbance and that the negative impacts on species on the seabed maybe pronounced depending on the frequency of disturbance and presumably the sensitivity of different species to disturbance¹⁶. The negative impacts of trawling on seabed habitats can be mitigated by reducing frequency and extent of disturbance caused by towed gears. Closing off the access of mobile bottom gears in the baseline zone and controlling their access from the baseline to the 6nm zone in biologically sensitive areas would help to prevent and mitigate habitat disturbance and degradation. The MI have advised that managing fishing pressure is more effective when fleets are local and limited. This would support prioritising access for vessels <15m within the 6nm zone.

The negative impact that mobile bottom gear has on commercial fish species must also be considered when managing access to inshore waters. According to the departments own

¹⁶ Marine Institute (2015) Article 6.2 (Habitats Directive) Risk Assessment, The effects of fisheries on Qualifying Interests in Special Areas of Conservation in Irish coastal waters, Marine Institute, Rinville, Oranmore, Co. Galway

consultation document “a reduction in the abundance of large ‘fish eating’ fish such as cod, hake and whiting, and an increase in species which feed at a lower trophic level (lower down the food chain) such as Nephrops, has resulted in a decline in the mean trophic level of the fish community over time in coastal waters. Trawling effort and fish outtake in coastal waters therefore needs to be managed to restore the prevalence of large fish¹.” The department go on to say that “the abundance and growth of juvenile cod, haddock and whiting is positively related to the diversity of demersal species and fauna on the seafloor¹.” The conservation of benthic habitats would be greatly improved by reducing fishing pressure caused by towed bottom gears within Ireland inshore waters, this would benefit demersal fish stocks in coastal waters by restoring habitat structure and enhancing the abundance and quality of important benthic habitats. Given the benefits of restricting and controlling trawling pressure on seabed habitats **BirdWatch Ireland recommend that bottom trawling should cease in the baseline zone and that it should also be banned within important nursery grounds or conservation areas outside of the baseline zone where there is evidence that negative impacts are occurring.** On the East Coast where the baseline zone is non-existent the use of mobile gears within the 6nm zone should be reviewed and sustainable management plans should be implemented to protect biologically sensitive areas such as fish spawning and nursery grounds, increasing the profitability and sustainability of the Irish fishing sector. Given the importance of Ireland’s inshore waters for marine wildlife and commercial fisheries any fisheries management should be underpinned by science and reflect the precautionary principle and the ecosystem-based approach. Areas within the Blacksod Bay, Roaringwater Bay, Saltee Island and Hook Head SACs are already closed to towed bottom gears¹. Similar steps should be taken to eliminate, reduce and mitigate the impacts in other designated sites such as SPA’s designated for seabird colonies.



Figure 2: Roseate Tern holding a sand eel. On Rockabill Island sand eels make up 13% of the Roseate Tern diet with Clupeids such as sprat making up 82%. The management of these ‘forage fish’ is therefore critical for the conservation of Ireland’s internationally important Roseate Tern population. Photo by Brian Burke

Considering the Conservation of Seabirds During Fisheries Management

It has been highlighted within the departments consultation document that temporary overfishing of small pelagic fish stocks such as sprat and herring has negative knock on impacts on populations of seabirds and mammals¹. In BirdWatch Ireland's Life on the Edge report (2016)¹⁷ we highlighted why the seas around Ireland's coast and out beyond the shelf edge are so important for seabirds and their survival. Using case studies, we highlighted some of the key challenges and threats to seabird survival and the challenges in ensuring that fisheries management and policy will allow marine ecosystems to recover and provide for the multiple needs of fish, fisheries and marine wildlife into the future.

Seabirds are more threatened globally¹⁸ than any other comparable group of birds with over one quarter of species threatened and five percent of species critically endangered. Overfishing and climate change are pushing many seabird species closer to extinction, according to the latest update on the conservation status of the world's birds by BirdLife International¹⁹ for the IUCN Red List of Threatened Species. Recent monitoring of Irish seabird populations²⁰ reflect these global trends²¹. More local evidence of changes in seabird populations includes declines in numbers of breeding pairs and breeding productivity in species such as Black-legged Kittiwake, Northern Fulmar and Atlantic Puffin at colonies in Ireland and Britain^{22,23,24,25,26,27}. The recently updated IUCN Red List of Threatened Species revised the status of Kittiwake (*Rissa tridactyla*) to globally threatened¹⁹. This seagull species is native to Ireland's coast and reflects the declining conservation status of Irish and European seabird populations. While the cold waters of the North East Atlantic have been considered amongst the most productive in the world, particularly for cold-loving fish species such

¹⁷ Cummins, S., Lewis, L.J. & Egan, S. (2016) Life on the Edge - Seabird and Fisheries in Irish Waters. A BirdWatch Ireland Report.

<https://www.birdwatchireland.ie/LinkClick.aspx?fileticket=SIJ1VfMzL6g%3d&tabid=1575>

¹⁸ Croxall, J.P., Butchart, S.H.M., Lascelles, B., Stattersfield, A.J., Sullivan, B., Symes, A., Taylor, P. 2012. Seabird conservation status, threats and priority actions: a global assessment. Bird Conservation International, 2012, Vol. 22, 1-34.

¹⁹ BirdLife International Red List https://www.birdlife.org/sites/default/files/RedList/Red-List-Bird-Roundup_BirdLife.pdf

²⁰ . Newton, S., Lewis, L., Trewby, M. 2015. Results of a Breeding Survey of Important Cliff-Nesting Seabird Colonies in Ireland 2015. A report commissioned by the National Parks & Wildlife Service and prepared by BirdWatch Ireland.

²¹ Paleczny, M., Hammill, E., Karpouzi, V., Pauly, D. 2015. Population Trend of the World's Monitored Seabirds, 1950-2010. PLoS ONE, Vol. 10

²² Frederiksen, M., Wanless, S., Harris, M.P., Rothery, P., Wilson, L.J. 2004. The role of industrial fisheries and oceanographic change in the decline of North Sea black-legged kittiwakes. Journal of Applied Ecology, Vol. 41, 1129-1139.

²³ Arnott, S. A., Ruxton, G. D. 2002. Sandeel recruitment in the North Sea: demographic climatic and trophic effects. Marine Ecology Progress Series, Vol. 238, 199-210.

²⁴ Poloczanska, E. S., Cook, R. M., Ruxton, G. D., & Wright, P. J. 1999 Fishing vs. natural recruitment variation in sandeels as a cause of seabird breeding failure at Shetland: a modelling approach. ICES Journal of Marine Science, Vol. 61, 788-797.

²⁵ Montevecchi, W. A. & Myers, R. A. 1996. Dietary changes of seabirds reflect shifts in pelagic food webs. Sarsia, Vol. 80, 313-322.

²⁶ Pettex, E., Barret, R.T., Lorentsen, S-H, Bonadonna, F., Pichegru, L., Pons, J-B & Grémillet, D. 2015. Contrasting population trends at seabird colonies: is food limitation a factor in Norway? J. Ornithol, Vol. 156, 397-406.

²⁷ Fauchald, P., Anker-Nilssen, T., Barrett, R.T., Bustnes, J.O., Bårdsen, B.J., Christensen-Dalsgaard, S., Descamps, S., Engen, S., Erikstad, K.E., Hanssen, S.A., Lorentsen, S-H., Moe, B., Reiertsen, T.K., Strøm, H., Systad, G.H.. 2015. The status and trends of seabirds breeding in Norway and Svalbard. NINA Report.

as Herring²⁸, the changes in the availability of preferred forage fish species, particularly in inshore waters, has likely affected both seabird distribution and has had knock-on effects on seabird breeding productivity^{29,30}. Changes in the availability of fish species eaten by seabirds has probably been the biggest driver of these changes^{31,32,33,34}.

Fish are integral to the life cycle of most seabirds making up a large component of their diet. Most seabirds feed upon small, shoaling, lipid-rich pelagic fish that occur in the upper to mid water column³⁵. The historical overfishing of larger predatory fish in the North Atlantic has resulted in fishing down food webs i.e. removing top predators and then progressively overfishing species at lower trophic levels, now there are many fisheries in Irish and EU waters that target smaller planktivorous fish and invertebrates such as Nephrops. Fishing down marine food webs has major implications for the functioning of marine ecosystems³⁶ altering the balance of the ecosystem and impairing the long-term viability of other ecologically important species^{37,38}. Ecosystem based fishery management of fisheries is especially important because of the position of smaller fish and invertebrates in marine food webs. Forage fish can experience rapid population expansion because of their relatively small body size, fast growth, early maturity, and relatively high fecundity. However, their short life span can also lead to sudden population collapse when adult mortality rates are high. As such, forage fish have unstable population dynamics and may exhibit large annual, inter-annual, or decadal-scale fluctuations and these booms or bust years can have huge implications for the species that depend upon them. When fisheries target these smaller fish species, it not only puts pressure on seabirds that depend upon them but alters the food abundance of the larger predatory fish species with the overall effect of hindering their recovery and unbalancing the entire marine ecosystem. Therefore, depleted abundance of forage fish can

²⁸ Mackey, M., Ó Cadhla, O., Kelly, T.C., Aguilar de Soto, N., Connolly, N. 2004. Cetaceans and Seabirds of Ireland's Atlantic Margin. Volume I – Seabird distribution, density & abundance. Report on research carried out under the Irish Infrastructure Programme.

²⁹ McSorley, C.A., Dean, B.J., Webb, A., Reid, J.B. 2003. Seabirds use of Waters Adjacent to Colonies: Implications for Seaward Extensions to Existing Breeding Seabird Colony Special Protection Areas. JNCC Report No. 329.

³⁰ Vigfúsdóttir, F. 2012. Drivers of productivity in a subarctic seabird: Terns in Iceland. School of Biological Sciences University of East Anglia, UK

³¹ Cairns, D.K. 2012. Seabirds as indicators of marine food supplies. *Biol. Oceanogr.*, Vol. 5, 221-234.

³² Chivers L.S., Lundy M.G., Colhoun K., Newton S.F., Reid N. 2012. Diet of black-legged kittiwakes (*Rissa tridactyla*) feeding chicks at two Irish colonies highlights the importance of clupeids. *Bird Study*, Vol. 59. 363–367.

³³ Monaghan, P., Uttley, J.D., Burns, M.D. 1992. Effect of changes in food availability on reproductive effort in Arctic Terns *Sterna paradisaea*. *Ardea*, Vol. 80, 71–81.

³⁴ Kadin, M., Olsson, O., Hentati-Sundberg, J., Ehrning, E. W. and Blenckner, T. 2016. Common Guillemot *Uria aalge* parents adjust provisioning rates to compensate for low food quality. *Ibis*, 158, 167–178.

³⁵ Shealer, D.A. 2002. Foraging Behaviour and Food of Seabirds. E.A. Schreiber & J. Burger (eds.). *Biology of Marine Birds*. CRC Press. London. 137-177.

³⁶ Pauly, D., Christensen, V., Dalsgaard, J., Froese, R., Torres, Jr. 1998. Fishing down Marine Food Webs. *Science*, Vol. 279, 5352.

³⁷ Murawski, S. A. 2000. Definitions of overfishing from an ecosystem perspective. *ICES Journal of Marine Science*, Vol 57, Issue 3, 649-658.

³⁸ Coll, M., Libralato, S., Tudela, S., Palomera, I., Pranovi, F. 2008. Ecosystem overfishing in the Ocean, *PLoS One*, 3.12: e3381.[Online] <http://dx.doi.org/10.1371/journal.pone.0003881>

negatively affect the ecosystem³⁹ and the marine wildlife that depend on them. Forage fish play a crucial role in supporting top predators in marine food webs, such as seabirds⁴⁰.

The removal of large quantities of these ‘forage-fish’ pelagic fish species, could reduce supply of preferred fish of breeding seabirds. The Life on the edge report highlights the importance of forage fish like herring, sprat and sandeels within the diet of Irish seabirds. Both herring and sprat make up a large proportion of the diet of Manx Shearwater (*Puffinus puffinus*), Atlantic Puffin (*Fratercula arctica*) and Razorbill (*Alca torda*). Sprat are important prey items for European Shag (*Phalacrocorax aristotelis*), Common Guillemot (*Uria aalge*), Little Tern (*Sterna albifrons*), Sandwich Tern (*Sterna sandvicencis*), Common Tern (*Sterna hirundo*), Roseate Tern (*Sterna dougallii*), Arctic Tern (*Sterna paradisaea*), Mediterranean Gull (*Larus melanocephalus*) and Common Gull (*Larus canus*). While herring are eaten by Kittiwake Cliff (*Rissa tridactyla*), Lesser Black-backed Gull (*Larus fuscus*) and Great Black-backed Gull (*Larus marinus*).

One Irish case study involving Intensive monitoring of the Roseate Tern breeding colony at Rockabill Island indicates that almost 82% of their diet is made up of Clupeids (mostly sprats), with sandeels (almost 13%) and Gadoids (5%), making up the remainder⁴¹. In the worst-case scenario, if fish populations are reduced below the level needed for seabirds to support themselves and their young, or if the fish species and prey sizes needed to feed chicks are unavailable, then nests fail (i.e. no young are fledged due to starvation or depredation) or indeed, seabirds fail to reproduce at all if the shortfall occurs early in the season⁴².

Some of the most dramatic examples of seabird declines due to collapsing fish stocks have come from Norway which holds 10% of the world’s biogeographical population of seabirds⁴³. Here, the largest Puffin colony on the Lofoton islands, historically supported an estimated 700,000 pairs in 1964⁴⁴. Subsequently, the collapse of herring stocks in Norway because of overfishing resulted in an almost complete breeding failure of Puffins, and between the years 1969 and 1990 they bred successfully in only five seasons⁴⁵. The closure of the herring fishery in 1988 saw an immediate improvement in Puffin breeding success at the colony⁴⁶.

Overfishing is not the only pressure currently being exerted on declining seabird populations in Europe. Global warming is causing ocean surface temperatures to increase, causing surface waters to expand and sea-levels to rise. Warming surface waters also reduce the degree of vertical mixing, which diminish the upward transfer of deep, cool, nutrient-rich waters that encourage the growth of

³⁹ Pikitch, E., Boersma, P.D., Boyd, I.L., Conover, D.O., Cury, P., Essington, T., Heppell, S.S., Houde, E.D., Mangel, M., Pauly, D., Plagányi, É., Sainsbury, K., and Steneck, R.S. 2012. Little Fish, Big Impact: Managing a Crucial Link in Ocean Food Webs. Lenfest Ocean Program. Washington, DC.

⁴⁰ Heath, M.R. 2005. Changes in the structure and function of the North Sea fish food web, 1973–2000, and the impacts of fishing and climate. ICES Journal of Marine Science, Vol. 62, 847–868.

⁴¹ Burke, B., Kinchin-Smith, D., Somers, S. Newton, S. 2016. Rockabill Tern Report 2016. BirdWatch Ireland Seabird Conservation Report.

⁴² Hunt, G. L., Barrett, R. T., Joiris, C., Montevecchi, W. A. 1996. Seabird/fish interactions with particular reference to seabirds in the North Sea. ICES Co-operative Research Report, Vol. 216.

⁴³ Barrett, R. T., Lorentsen, S-H., Anker-Nilssen, T. 2006. The status of breeding seabirds in mainland Norway. Atlantic Seabirds, Vol. 8, 97-126.

⁴⁴ Anker-Nilssen, T., Barrett, R. T. 1991. Status of seabirds in northern Norway. British Birds, Vol. 84, 329-341

⁴⁵ Anker-Nilssen, T., Barrett, R. T. 1991. Status of seabirds in northern Norway. British Birds, Vol. 84, 329-341

⁴⁶ Jennings, S., Kaiser, M. J., Reynolds, J. D. 2001. Marine Fisheries Ecology

phytoplankton⁴⁷, also affecting the abundance, size composition, diversity, and trophic efficiency of zooplankton⁴⁸. This decline in plankton biomass, the very foundation of primary production in the oceans, has many implications that resonate up the marine food web through fish and to marine mammals and seabirds⁴⁹. Even small changes in this part of the ecosystem could have a large-scale effect on fish and influence seabird reproductive success and population change⁵⁰.

The pressures brought about by climate change, marine pollution and the increasing demands on our oceans for energy, transport and pollution (oil spills) emphasise the importance of building resilient ecosystems that can adapt to environmental changes. Of the multitude of anthropogenic pressures being exerted on marine ecosystems fishing is the one which the Irish Government have the greatest ability to influence in the short-term.

BirdWatch Ireland call on the Government to improve the monitoring and protection of forage fish species such as sprat, sandeels and herring which are such an important food source for other larger predatory fish and seabirds. An ecosystem-based and precautionary approach to fisheries management will provide more benefits in the long-term both in terms of conserving fish stocks, supporting marine biodiversity and makes the most economic sense.



Figure 3: An adult Gannet (*Morus bassana*) with their chick. Photo by Brendan Shiels

⁴⁷ Behrenfeld, M.J., O'Malley, R., Siegel, D., McClain, C., Sarmiento, J., Feldman, G., Milligan, A., Falkowski, P., Letelier, R., Boss, E. 2006. Climate-driven trends in contemporary ocean productivity. *Nature*, Vol. 444, 752–755

⁴⁸ Richardson, A. J. 2008. In hot water: zooplankton and climate change. *Journal of Marine Science*, Vol. 65, 279-295

⁴⁹ MacDonald, A., Heath, M.R., Edwards, M., Furness, R.W., Pinnegar, J.K., Wanless, S., Speirs, D.C., Greenstreet, S.P.R. 2015. Climate driven trophic cascades affecting seabirds around the British Isles. University of Strathclyde, Glasgow

⁵⁰ . Montevecchi, W. A., Myers, R. A. 1995. Prey harvests of seabirds reflect pelagic fish and squid abundance on multiple spatial and temporal scales. *Marine Ecology Progress Series*, Vol. 117, 1-9.

Managing Ireland's Herring and Sprat Fisheries Sustainably

Given the established importance of herring (*Clupea harengus*) and sprat (*Sprattus sprattus*) within marine food webs and the focus placed upon these two fish species within the consultations supporting documentation BirdWatch Ireland would like to comment further on the management of these fisheries.

Except for some herring spawning grounds off the North West Coast of Donegal the vast majority of the herring spawning grounds and all of the sprat spawning grounds take place within Ireland 6nm zone. This review is therefore a pivotal opportunity to review the management of these species in Ireland. The consultation document has suggested that the herring and sprat fisheries inside 6nm zone should be redistributed from vessels >18m to vessels <18m. **BirdWatch Ireland believe merely redistributing fishing pressure within the existing fleet while failing to address the ongoing unsustainable management of Ireland's sprat and herring stock is a missed opportunity both from an environmental and fisheries perspective.** As we have previously demonstrated forage fish species such as sprat and herring which occupy lower trophic levels within marine food webs are very important to the functioning of marine ecosystems^{36 37 38}. Their exploitation impacts upon marine biodiversity³⁶ and commercial fisheries^{53 53}.

Both herring and sprat are vulnerable to overfishing. In the case of sprat there is no Total Allowable Catch (TAC) for the species in Irish waters, as well as no stock assessment or reference points to ensure that the exploitation of the stock is sustainable¹. The stock status of herring north-west of Ireland is poor. Fishing mortality (F) in 2010 and 2011 was above the levels which would result in the maximum sustainable yield (MSY) from the stock and there is reduced reproductive capacity with the Sustainable Stock Biomass (SSB) being below the limit reference point (Blim)¹.

Clupeids such as herring and sprat are the main pelagic prey of many important commercial fish species. Research in the Baltic has shown that when greater quantities of sprat are available it contributes positively to the growth of juvenile cod⁵¹. Impacts on fish species at lower trophic levels are known to have a negative impact on commercial fish species in Europe due to a series of top down and bottom up interactions. A decrease in herring biomass is expected to have a direct negative effect on haddock⁵². Given that many fish stocks in Ireland's EEZ are overfished and the CFPs deadline to end overfishing is fast approaching the negative impact of the sprat and herring fisheries on the sustainability of commercial stocks must be reflected in their management.

The full implementation of the Landing Obligation in January 2019 will result in a large proportion of non-marketable landing being processed as fishmeal. This increase in the availability of fishmeal will likely impact on the commercial viability of forage fisheries such as sprat where a large proportion of the catch would have been processed as fishmeal to satisfy the demand from the fin fish aquaculture. This review is an opportunity to end the unsustainable practice of targeting forage fish for fishmeal. These fisheries are not environmentally sustainable and if the knock-on ecosystem impacts on commercial fish stocks had to be absorbed by the market then they wouldn't be considered economically or socially sustainable either.

The management of forage fisheries in Ireland lacks the necessary scientific basis to establish that it is sustainable. These fisheries have failed to adopt the precautionary approach or an ecosystem-based approach and do not account for species interactions nor for the consequences of fishing for

⁵¹ Casini et al 2016, p.8, <http://rsos.royalsocietypublishing.org/content/royopensci/3/10/160416.full.pdf>

⁵² Lynam, C. P., Llope, M., Möllmann, C., Helaouët, P., Bayliss-Brown, G. A., & Stenseth, N. C. (2017). Interaction between top-down and bottom-up control in marine food webs. *Proceedings of the National Academy of Sciences*, 114(8), 1952-1957.

important commercial fish species, non-commercial fish species or other marine wildlife such as seabirds and cetaceans. **Management plans should be adopted which reflect the pivotal role forage fish play in marine food webs including top-down and bottom-up interactions with commercial fish stocks and marine wildlife.** Given the ongoing declines in the populations of a number of colonies of seabird species around the Irish coast and the legal obligations under the Birds and Habitats Directives it is incumbent on the Irish Government to ensure that the management of forage fisheries and other marine resources does not negatively impact upon the conservation status of protected species.

BirdWatch Ireland recommends that a proper monitoring and management regime for sprat and herring must be implemented which reflects the importance of these forage fish species within marine food webs. We believe that sprat and herring stocks should be protected and allowed to recover to levels which can support abundant commercial fish stocks and healthy populations of seabirds and marine mammals. The management of these fisheries should be underpinned by management plans which reflect both fisheries and conservation science. **Marine Protected Areas or other restrictions on fishing activities should be established which ensure that sufficient populations of prey fish species are available to support wildlife populations.**

The Economic and Social Benefits of Managing our Inshore Waters Sustainably

According to the Marine Institute and BIM restricting access of vessels >15m from Ireland's inshore waters would result in improved security and economic opportunity for smaller vessels and fishing communities all around Ireland's coast. **Preventing large vessels of >15m and in particular vessels >18m from fishing within the 6nm zone would greatly benefit the majority of fishermen and fishing communities in Ireland** by transferring fishing opportunities resulting in a net increase in the number of fishing vessels, jobs and added value of the catch within the smaller segments of the fishing fleet.

Of the 1,991 vessels registered in Ireland over 80% are less than 12m in length, approximately 3% are between 12-15m in length, approximately 1% are between 15-18m and the remainder are over 18m. There are only 19 vessels between 15-18m and only 8 vessels between 15-17m. Policies which benefit smaller vessels also benefit the clear majority of fishers and fishing communities. Smaller vessels make up the clear majority of Ireland's fishing sector and play an important role in supporting employment in coastal communities which often are marginalised by a range of other negative socio-economic pressures.

The supporting reports from the Marine Institute² and BIM³ highlight that smaller vessels have a very high reliance on fishing inside the 6 nautical mile zone and baselines. **The 10-12m class are 100% dependent on the 6nm zone for all their landings.** The 12-18m class is 32% dependent on this zone while the over 18m class is only 2.6% (3% when rounded up) dependent on this zone. **The smaller scale boats in the fleet are also in decline and need urgent intervention.** It is the segment of the fishing fleet which has had the largest numeric losses since 2006 (<10m down 76 and 10-12m down 17 vessels respectively).

Larger vessels can access fish stocks anywhere in Irish coastal or offshore waters. Despite being only 2.6% dependent on the 6nm zone the >18m (163 vessels) land 66% and 48% of the total remaining volume and value respectively. **Vessels >18m are neither technically nor financially dependent on inshore waters to any extent, yet they dominate the volume and value of catches within the 6nm zone.**

Restricting the access of vessels 15-18m would only impact upon 1% of the Irish fleet or 19 vessels out of a reported fleet of 1,991. The environmental and social benefits that would accrue from restricting the access of the >15m would far outweigh the negative impact on such a small number of vessels.

In addition, we also support the position of the Marine Institute¹ in relation to the following positions.

1. Exclusion of large vessels from inside 6nm could strengthen the link between local fish resources and local economies.
2. Regulating access to Ireland's inshore waters so that benefits accrue to local communities would be in line with the Maritime Spatial Planning (MSP) Directive.
3. The opportunity to source more fresh fish locally would help to reduce the carbon footprint of fish supplies
4. Revitalising and investing in smaller ports would have spin off benefits for local economies and would likely create new opportunities for the creation of jobs in the eco-tourism, recreational fishing and conventional tourism sectors.

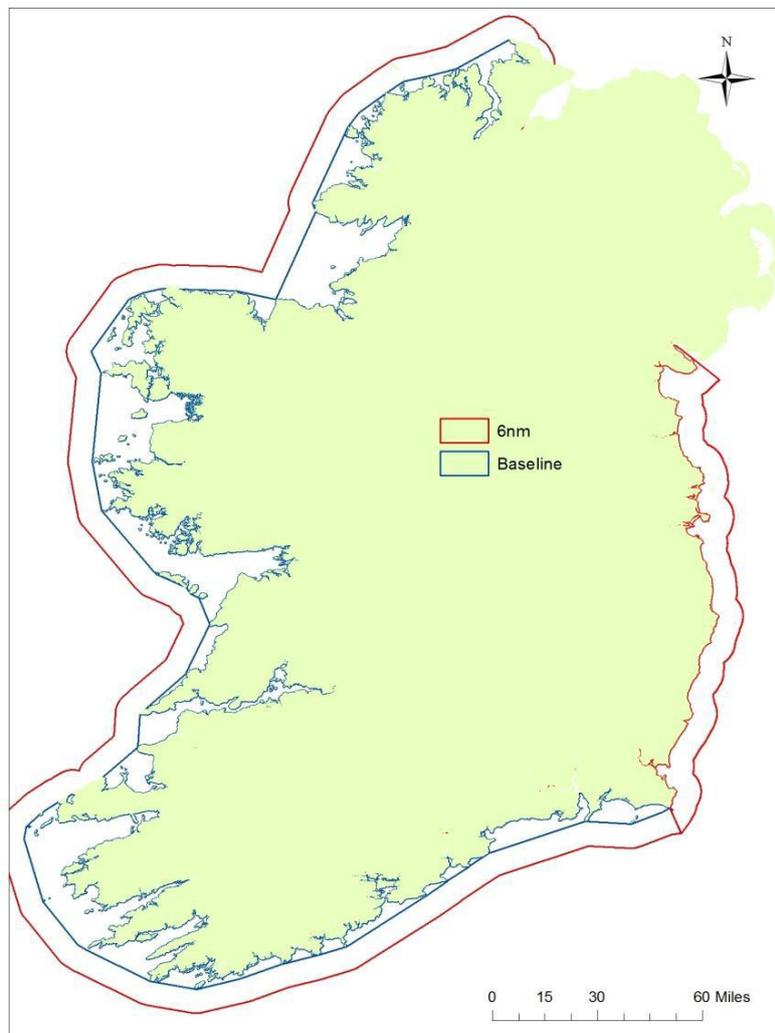


Figure 4: Coastal Delineation of Straight Baselines and Inside 6nm Zone¹

Prioritising Sustainable Fisheries Within the 6nm Zone

BirdWatch Ireland believe that greater protection should be afforded to Ireland's inshore waters and in particular the baseline zone. By shifting landings within the 6nm zone from the >15m to the <15m vessels the profitability and economic viability of the smaller vessels will be greatly increased. In the past one of the perceived conflicts in reducing fishing effort in inshore waters for the purposes of protecting biodiversity, fish nursery grounds or restoring fish stocks has been that to restrict fishing activity in such areas would impact on the viability of the smaller segments of the fleet, which are dependent on the existing fishing grounds within inshore waters. By transferring fishing opportunities from the larger sections of the fleet to smaller operators the opportunity will be created to provide greater protection to areas within Ireland baseline zone which would previously have been targeted by all sections of the fleet. We suggest that the fishing effort of vessels <15m engaged in fishing with mobile gear should be focused between the 6nm and baseline zones. These vessels would still be more profitable than they were previously due to the redistribution of fishing opportunities from the >15 vessels. This move would have a range of benefits from both an environmental and fisheries management perspective by reducing the negative impacts that trawling has on sensitive inshore habitats. There would also be a range of socio-economic benefits such as reducing the conflict between mobile and static gears.

Conflict between mobile and static gears

According to the Marine Institute the main fishing gears used by vessels < 12m in length are static (traps, nets), while large vessels primarily use trawls¹. There is ongoing conflict between the use of mobile and static gear where the two fishing methods overlap, as trawling can result in the loss of static gears due to entanglement in towed gears. There is a need to give greater protection to static gears in inshore waters. The loss of static gear can be costly for small fishers. Protecting static gear would therefore increase the viability and attractiveness of the potting sector. As the Marine Institute point out the exclusion of large trawling vessels from inside 6nm, will help the situation but will not completely resolve the difficulties of using static gears for smaller vessels¹. However, by ending trawling in the baseline zone this would greatly reduce conflicts between mobile and static gears and benefit the majority of smaller fishers who use static gear.

Prioritising access to the baseline zone for fishers using static gear would be in line with Article 17 of the Common Fisheries Policy which states that criteria of an environmental, social and economic nature should be taken into consideration when distributing fishing opportunities at a Member State level. Article 17 states that *"the criteria to be used may include, inter alia, the impact of fishing on the environment...and...the contribution to the local economy."*

BirdWatch Ireland recommend that the baseline zone is prioritised for static fishing gear. This would benefit these more environmentally friendly fishers with knock on benefits for the environment and the sustainability of fish stocks. We believe that the potential increase in fishing pressure on stocks such as lobster and crab will require monitoring and management.

On the East Coast where the baseline zone is non-existent the access of bottom trawling and mobile fishing gears within the 6nm zone should be reviewed and sustainable management plans should be implemented to protect biologically sensitive areas such as fish spawning and nursery grounds.

Growing Ireland's Creel Fishing Industry

By improving the conditions for static gear in Ireland's inshore waters it would create the opportunity to switch the focus of the Irish Nephrops (*Nephrops norvegicus*) fishery from trawling to creeling. Creel fishing for Nephrops is one of the most environmentally friendly ways to fish⁵³ and should be prioritised within Ireland's baseline and six-mile zones. Creel fishing has a low impact on the marine environment and in particular has a far lower impact on benthic habitats than trawling.

Creel fishing is a very selective fishery resulting in low levels of bycatch (both target and non-target species). Creel fishing bycatch is much lower than the Nephrops trawl fishery for example⁵⁴. Given the high levels of bycatch within the trawl Nephrops fishery and the impending implementation of the discards ban / landing obligation in January 2019 the benefits of shifting a segment of the Nephrops fishery to creel fishing are obvious. Reducing the bycatch from the Nephrops trawling sector would help to reduce the risk of choking in fisheries such as the mixed demersal fishery in the Irish Sea when the landing obligation is fully implemented. Creels also have a very low juvenile bycatch rate⁵⁴. The risk of fisheries choking which are relevant to Ireland has been highlighted by the North Western Waters Advisory Councils Choke Mitigation Tool⁵⁵.

The low levels of bycatch within the creel fishery relative to the trawl fishery would be of benefit for the recovery of several important low and zero TAC stocks, which in accordance with article two of the Common Fisheries Policy need to be recovered to levels which can support Fmsy by 2020 at the very latest. For example, reduced bycatch would help with the recovery of overfished bycatch stocks within the Irish and Celtic Sea's, which would positive knock on socio-economic benefits for the segments of the fishing industry which are engaged in these fisheries.

Creeling for Nephrops also provides individuals of larger size and in better condition, thereby obtaining higher unit prices⁵⁶. Research from Portugal has demonstrated that the economic viability is also higher for creel vessels compared to trawling which is only viable if major costs (such as labour and fuel) are covered by the revenue from other target species (e.g., the rose shrimp). When the negative impact of trawling on the environment and other fisheries is also considered the argument to reallocate fishing effort directed at Nephrops from trawlers to creels becomes overwhelming. This is an opportunity that should not be missed. **BirdWatch Ireland recommend that the Nephrops fishery within the 6nm zone be shifted over to creeling. No trawling for Nephrops should take place within the baseline zone.**

Marine Protected Areas

In Ireland, there is an urgent need to delineate and manage a network of Marine Protected Areas (MPAs) that effectively protects our marine biodiversity and helps to maintain sustainable fisheries.

⁵³ Adey, J. M. (2007). Aspects of the sustainability of creel fishing for Norway lobster, *Nephrops norvegicus* (L.), on the west coast of Scotland (Doctoral dissertation, University of Glasgow)

<http://theses.gla.ac.uk/524/1/2007adeyphd.pdf>

⁵⁴ Morello, E. B., Antolini, B., Gramitto, M. E., Atkinson, R. J. A., & Froggia, C. (2009). The fishery for *Nephrops norvegicus* (Linnaeus, 1758) in the central Adriatic Sea (Italy): preliminary observations comparing bottom trawl and baited creels. *Fisheries Research*, 95(2-3), 325-331.

⁵⁵ NWWAC (2018) Addressing High Choke Risk stocks under the Landing Obligation

http://www.nwwac.org/_fileupload/Opinions%20and%20Advice/Year%2013/FINAL_NWWAC_ADG%20LO_adv_ice%20High%20Choke%20Risk_Dublin_April_2018.pdf

⁵⁶ Leocádio, A. M., Whitmarsh, D., & Castro, M. (2012). Comparing trawl and creel fishing for Norway lobster (*Nephrops norvegicus*): biological and economic considerations. *PLoS one*, 7(7), e39567.

This network should include the protection of spawning and nursery grounds for key fish species including groundfish such as mackerel and pollock.

The designation of Marine Protection Areas (MPA) is a vital tool in the implementation of the Marine Strategy Framework Directive (Directive 2008/56/EC)⁵⁷, the Habitats Directive (Council Directive 92/43/EEC)⁵⁸ and Birds Directives (Directive 2009/147/EC)⁵⁹ and the Common Fisheries Policy. Ireland has a poor record of creating MPAs and is lagging behind at both an EU and global level. Many of the designated areas in Ireland's marine environment have no restrictions on fishing activities. While areas within Blacksod Bay, Roaringwater Bay, Saltee Island and Hook Head SACs are now closed to towed bottom gears¹ in general there is very little consideration given to the connection between the conservation objectives of the sites and fishing activity.

By improving the fishing opportunities for boats <15m within Ireland's 6 nm zone the perceived conflict between fishing access and environmental protection will be reduced. The opportunity exists to designate a network of marine protected sites which can improve the environmental status of the marine environment, protect fish nursery grounds and increase the size and number of commercially caught fish in an area increasing the profitability of the fishing sector in return. Given the environmental sensitivity of the baseline zone and the high number of existing designated sites it contains it should be the focus of MPA designation. Local fisheries are known to benefit from the spill over of fish populations from within protected areas. For example, research from Apo Island in the Philippines demonstrated that in the case of Acanthuridae (surgeonfish) and Carangidae (jacks), two families of reef fish that account for 40–75% of the fishery, yield tripled in a well-protected no-take reserve over 18 years (1983–2001)⁶⁰. Biomass of these families did not change significantly over the same period at a site open to fishing. The benefits of the reserve to local fisheries at the island were higher catch, increased catch rate, and a reduction in fishing effort. The fishery and tourism benefits generated by the reserve have enhanced the living standard of the fishing community. The spin-off benefits of ecotourism and recreational fishing may be significant⁶¹.

Inshore waters including estuaries and coastal habitats are essential for the viability of many fish species as they act as nursery grounds for many fish species, including commercial stocks. Juvenile growth and survival are known to be determined by both the capacity and quality of these nursery habitats. Human impact such as the destruction and degradation of coastal habitats due to mobile bottom fishing gear is one of the most serious threats to fish recruitment and the recovery of certain fish stocks⁶². For example, the impacts of fishing gear and the loss in habitat surface combined with habitat degradation has led to a decline in juvenile recruitment of sole with knock on negative impacts on the stock within the English Channel⁶². Ireland's inshore waters support important

⁵⁷ Marine Strategy Framework Directive (Directive 2008/56/EC) <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32008L0056&from=EN>

⁵⁸ Habitats Directive <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:31992L0043>

⁵⁹ Birds Directive <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32009L0147&from=EN>

⁶⁰ Russ, G. R., Alcala, A. C., Maypa, A. P., Calumpong, H. P., & White, A. T. (2004). Marine reserve benefits local fisheries. *Ecological applications*, 14(2), 597-606.

⁶¹ Prayaga, P., Rolfe, J., & Stoeckl, N. (2010). The value of recreational fishing in the Great Barrier Reef, Australia: a pooled revealed preference and contingent behaviour model. *Marine Policy*, 34(2), 244-251.

⁶² Rochette, S., Rivot, E., Morin, J., Mackinson, S., Riou, P., & Le Pape, O. (2010). Effect of nursery habitat degradation on flatfish population: Application to *Solea solea* in the Eastern Channel (Western Europe). *Journal of sea Research*, 64(1-2), 34-44.

nursery grounds for commercially important species such as Plaice, Herring, Whiting and Cod⁶³. Trawling within these nursery grounds also results in high levels of juvenile bycatch. These undersized fish are discarded resulting in negative impacts on stock recruitment as well as food waste. **Protecting nursery grounds in Ireland inshore waters would help to improve the recruitment of important commercial fish stocks as well reducing the unwanted bycatch of undersized fish which will be beneficial considering the implementation of the landing obligation under the Common Fisheries Policy.**



Figure 5: Three Razorbills (*Alca torda*) with sprat

⁶³ Marine Institute (2017) The Stock Book 2017 : Annual Review of Fish Stocks in 2017 with Management Advice for 2018 <https://oar.marine.ie/handle/10793/1337>

