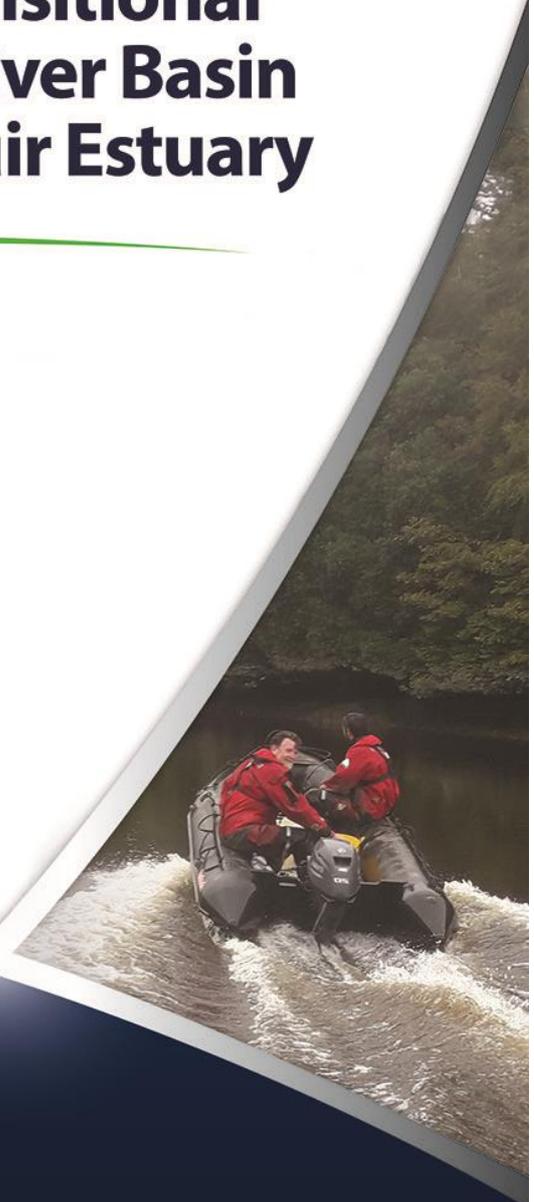
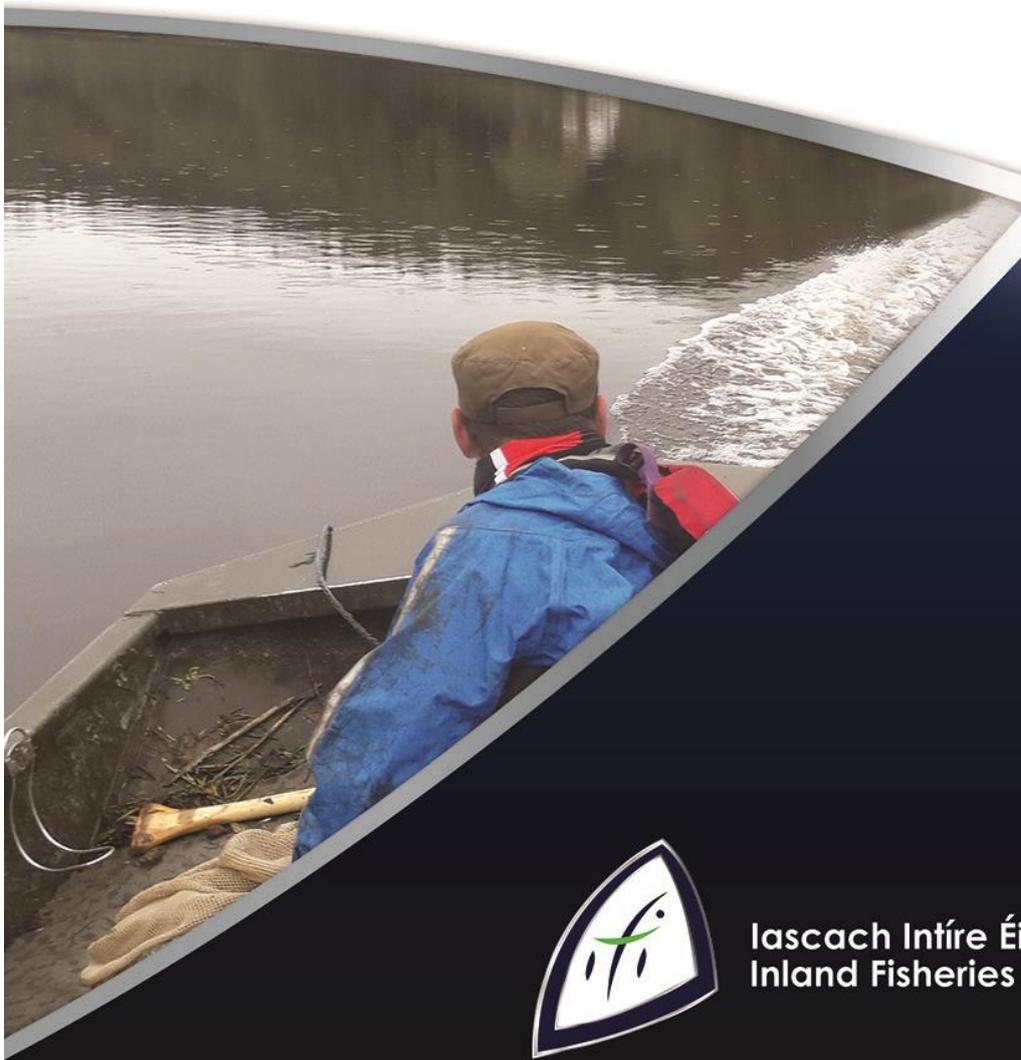


Fish Stock Survey of Transitional Waters in the Southern River Basin District – Barrow, Nore, Suir Estuary

2019

IFI/2020/1-4525



Iascach Intíre Éireann
Inland Fisheries Ireland

Inland Fisheries Ireland

National Research Survey Programme

Fish Stock Survey of Transitional Waters in the Southern River Basin District – Barrow, Nore, Suir Estuary 2019

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1. Summary

This report presents fish capture data collected during Inland Fisheries Ireland (IFI) surveys of transitional waterbodies in 2019. Two separate surveys are reported in the current report. One was conducted throughout the Barrow – Nore - Suir transitional water body complex to designate an ecological status based on fish populations, as per the requirements of the Water Framework Directive (Directive 2000/60/EC). The other was carried out to assess juvenile bass populations in the lower sections of the transitional water body complex under IFI's National Bass Programme <https://www.fisheriesireland.ie/what-we-do/research/national-bass-programme>.

A number of fish sampling methods were used across the two surveys, which ensured that a range of habitat types were sampled, thus making it likely that all fish species present in the estuary were captured. Across both surveys, a total of 41 species and 6553 individual fish were captured. Where applicable, current data was compared to previous surveys to assess how fish populations have changed in the intervening years. Although overall fish population status have remained largely stable, changes in the population structure of some species, such as dace, an invasive, are noteworthy and are discussed. The presence of juvenile bass, plaice, cod and whiting highlights the importance of this major estuary as a nursery for these popular angling species.

2. Introduction

The economic and ecological value of estuarine nursery function in supporting marine fish populations is well characterised (Able 2005; Beck *et al.* 2001). Larval/juvenile stages of many marine species are transported to estuaries where they may spend the first few years of life, taking advantage of the food availability, warm temperatures and shelter which estuaries provide (Vasconcelos *et al.* 2011; Gillanders *et al.* 2003).

European Sea Bass are probably the most popular sea angling species and their juvenile stages mature in estuarine habitats around Ireland, but a large range of flatfish and ray species also utilise these productive environments. Likewise, mullet species spend a large proportion of their lives within estuaries. Since estuaries are heterogeneous even at small spatial scales, due to factors such as variations in fluvial input and sediment deposition, an area within an estuary which may have limited nursery function for a particular species may play an important role for another. For this reason, a single estuary can accommodate a range of juvenile species with differing requirements (Vasconcelos *et al.* 2011; Ray, 2005), as well as supporting different life stages of the same species.

experiences a range of anthropogenic pressures, from pollution inputs to dredging and sea wall development.

The main objectives of the current survey are:

- To measure the ecological status of fish populations in the estuary complex as per the requirements of the European Water Framework Directive (WFD; 2000/60/EC).
- To inform on the role of this waterbody in relation to important marine recreational fish species
- To provide scientific advice to support any potential fish conservation measures within the estuary

According to WFD requirements, ecological status of waterbodies must be assessed by both a number of physical and chemical characteristics and a range of biological indicators. Fish populations are one of the key biological indicators of ecological status in transitional waters. Essentially they are assessed by comparing data collected from monitoring against reference (natural) conditions. Fish status was assessed using the estuarine multi-metric fish index (EMFI) (Harrison and Kelly, 2013) to derive ecological status. As the Barrow, Nore and Suir estuary complex is subject to repeat surveys every three years as part of the surveillance monitoring programme, any change in fish population structure within the estuary was examined.

3. Methods

3.1 WFD Survey

For the purposes of WFD monitoring and reporting, the Barrow Nore Suir estuary system has been split into eight separate water bodies (Table 1). Fish stock surveys were conducted to ensure sufficient coverage of each separate water body so that stocks of each could be assessed. Sampling took place between 23rd September and 1st October 2019. Habitat type across the sites ranges from soft mud to hard sandy substrate and brackish to fully saline and all in between. The separate waterbodies are described in more detail in www.wfdfish.ie.

Current work in the Republic of Ireland and United Kingdom indicates the need for a multi-method (beach seine, fyke net and beam trawl) approach to sampling fish in estuaries and these procedures are now the standard IFI methodology for fish stock surveys in transitional waters (Harrison and Kelly, 2013) for the WFD monitoring program.

Beach seining is conducted using a 30m x 3m net (10mm mesh size) to capture fish in littoral areas (Fig 2). The bottom of the net has a weighted lead line to increase sediment disturbance and catch efficiency. Fyke nets (15m in length with a 0.8m diameter front hoop, joined by an 8m leader with a 10mm square mesh) are used to sample benthic fish in the

Transitional water body	MS Code	Easting	Northing	Type	Area (km²)
Barrow Estuary, Upper	SE_100_0300	273066	137640	TW	1.15
Barrow Nore Estuary, Upper	SE_100_0250	272129	128644	TW	0.64
Barrow Suir Nore Estuary	SE_100_0100	271527	107512	TW	28.21
New Ross Port	SE_100_0200	267862	117105	TW	6.71
Nore Estuary	SE_100_0400	265312	135294	TW	1.26
Suir Estuary, Middle	SE_100_0550	249824	114070	TW	7.03

Table 1: Transitional water bodies within the Barrow - Nore - Suir estuary system surveyed for the WFD fish surveillance monitoring programme, October 2019 (FT=freshwater tidal, TW=transitional)

littoral areas. Beam trawls are used for sampling benthic fish in the littoral and open waters, where bed type is suitable. The beam trawl measures 1.5m x 0.5m, with a 10mm mesh bag, decreasing to 5mm mesh in the cod end. The trawl is attached to a 20m tow rope and towed by a boat. Trawls are conducted along transects of 100m in length.

All nets are processed on-site by identifying the species present and counting the total numbers caught in each. Length measurements are recorded for each species using a representative sub-sample of 30 fish if necessary. Unidentified fish specimens were retained for subsequent identification in the laboratory.

A handheld GPS was used to mark the precise location of each site. Physiochemical data were also collected at each site.

3.2 Trawling Survey

Separately, IFI conducted a trawl survey in the lower sections of the estuary (New Ross Port, Lower Suir Estuary and Barrow Suir Nore estuary) complex from 2nd to the 3rd September 2019 under its National Bass Conservation Programme.

The survey method used was first developed by CEFAS (UK) in consultation with local skippers (Pickett et al. 2002) primarily to sample juvenile bass populations. The survey vessel used had a registered length of 9.72m, a gross register tonnage (GRT) of 8.8 tons, engine power of 49 kw, and was equipped as a stern trawler (Fig. 3a).

The trawl was fished off the stern gantry using two sets of twin, 10 fathom bridles (Fig. 3b). The length of the tow warp varied depending on depth in the area being trawled. Trawls in less than 5 m of water used a 30 m tow warp and a 50 m tow warp was used for depths greater than 5 m. Depths ranged from 0.91 m to 17.0 m. Towing speed was maintained as close to 3 knots over the ground as was practicable. Two 1.0m steel trawl doors (60 kg) were attached to the bridles during towing to keep the net open. The trawl was based on CEFAS specifications with the exception of mesh size: 80 mm diagonal stretched mesh was used throughout instead of the 70 mm used by CEFAS in order to comply with minimum mesh sizes required with Irish trawls. The cod-end was fitted with a 20 mm mesh 'Herring Brailer' net.

For each tow a log was completed, recording shoot and haul times and position (longitude and latitude), starting and ending depth, salinity, weather conditions, and number of each species caught. On hauling, at the end of each tow, the cod-end was opened directly into a 60 gallon tub on deck and then sorted though. For each species of fish, a representative sub-sample of thirty fish was measured and any surplus fish were counted but not measured.

This method can target larger fish residing in deeper, wider sections of the estuary, which cannot be sampled by the other methods referred to above. The inclusion of these data in this report provides a more complete picture of the fish populations inhabiting the estuary complex.



Fig. 3a. The survey vessel and **3b.** Crew members deploying the trawl

4. Results

4.1 WFD Survey

4.1.1 Sampling

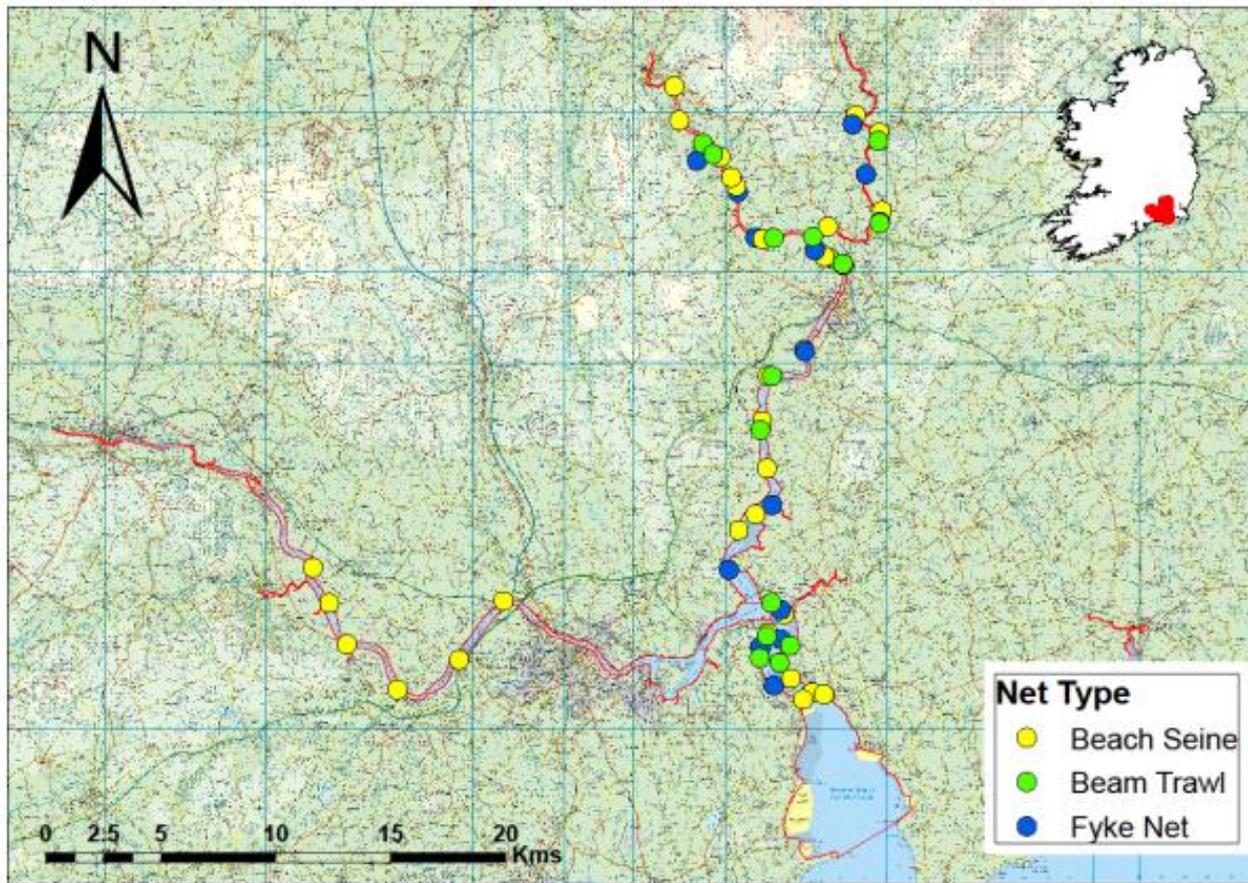


Fig. 4: Map of the Barrow Nore Suir Estuary complex showing all samples taken during the survey in Sept-Oct 2019.

Across the seven water bodies, a total of 65 samples were taken using three different sampling methods (Fig.4).

3482 individual fish were captured, counted and identified to species level prior to release. 31 different fish species were encountered over the course of the sampling programme (Table 2).

Species (common name)	Species (scientific name)	Total count	Ave length (cm)	Max length (cm)	Min length (cm)	St. dev (cm)
Brown trout	<i>Salmo trutta</i>	13	16.7	34.5	6.2	8.4
Butterfish	<i>Pholis gunnellus</i>	1	11.0	11.0	11.0	NA
Cod	<i>Gadus morhua</i>	2	32.5	47.9	17.1	21.8
Common goby	<i>Pomatoschistus microps</i>	1173	4.3	14.0	1.6	1.6
Dace	<i>Leuciscus leuciscus</i>	188	12.0	26.2	1.0	4.3
European eel	<i>Anguilla anguilla</i>	166	35.5	66.0	9.0	12.9
European seabass	<i>Dicentrarchus labrax</i>	32	12.0	21.1	7.6	4.3
Fifteen-spined stickleback	<i>Spinachia spinachia</i>	1	12.0	12.0	12.0	NA
Fivebeard rockling	<i>Ciliata mustela</i>	12	15.4	23.0	10.9	3.7
Flounder	<i>Platichthys flesus</i>	698	8.4	32.5	3.0	4.1
Lesser spotted dogfish	<i>Scyliorhinus canicula</i>	2	63.5	66.0	61.0	3.5
Long-spined sea scorpion	<i>Taurulus bubalis</i>	2	13.2	16.2	10.2	4.2
Minnow	<i>Phoxinus phoxinus</i>	12	5.2	8.5	3.9	1.5
Nilssons pipefish	<i>Syngnathus rostellatus</i>	2	14.8	15.0	14.5	0.4
Plaice	<i>Pleuronectes platessa</i>	3	8.0	10.8	6.5	2.5
Pogge	<i>Agonus cataphractus</i>	5	10.7	12.5	8.0	1.8
Pollack	<i>Pollachius pollachius</i>	3	10.9	15.4	7.0	4.2
River lamprey	<i>Lampetra fluviatilis</i>	1	13.2	13.2	13.2	NA
Roach	<i>Rutilus rutilus</i>	22	12.4	30.0	3.3	5.2
Rock goby	<i>Gobius paganellus</i>	2	7.0	7.6	6.3	0.9
Salmon	<i>Salmo salar</i>	7	18.2	58.0	6.4	18.2
Sand goby	<i>Pomatoschistus minutus</i>	22	5.2	8.9	3.2	1.8
Sand smelt	<i>Atherina presbyter</i>	25	4.5	11.6	3.3	1.6
Scad	<i>Trachurus trachurus</i>	9	7.8	8.2	7.1	0.4
Sea trout	<i>Salmo trutta</i>	1	23.5	23.5	23.5	NA
Smelt	<i>Osmerus eperlanus</i>	23	9.6	78.0	3.0	15.0
Sprat	<i>Sprattus sprattus</i>	1035	6.7	11.1	3.5	1.3
Thick-lipped grey mullet	<i>Chelon labrosus</i>	8	3.4	7.5	2.3	1.7
Three spined stickleback	<i>Gasterosteus aculeatus</i>	1	3.0	3.0	3.0	NA
Twaite shad	<i>Alosa fallax</i>	9	12.2	18.5	8.4	4.3
Whiting	<i>Merlangius merlangus</i>	2	11.8	11.8	11.7	0.1

Table 2: Species captured over the course of the Barrow – Nore - Suir Transitional water body survey in Sep-Oct 2019.

4.1.2 Abundant species

In 2019, four species (flounder, Goby (sand and common) and sprat) made up 84% of the total catch. The same species made up the majority of the catch during the previous four surveys (2016, 62%; 2013, 67%; 2010, 85%) (Fig. 5).

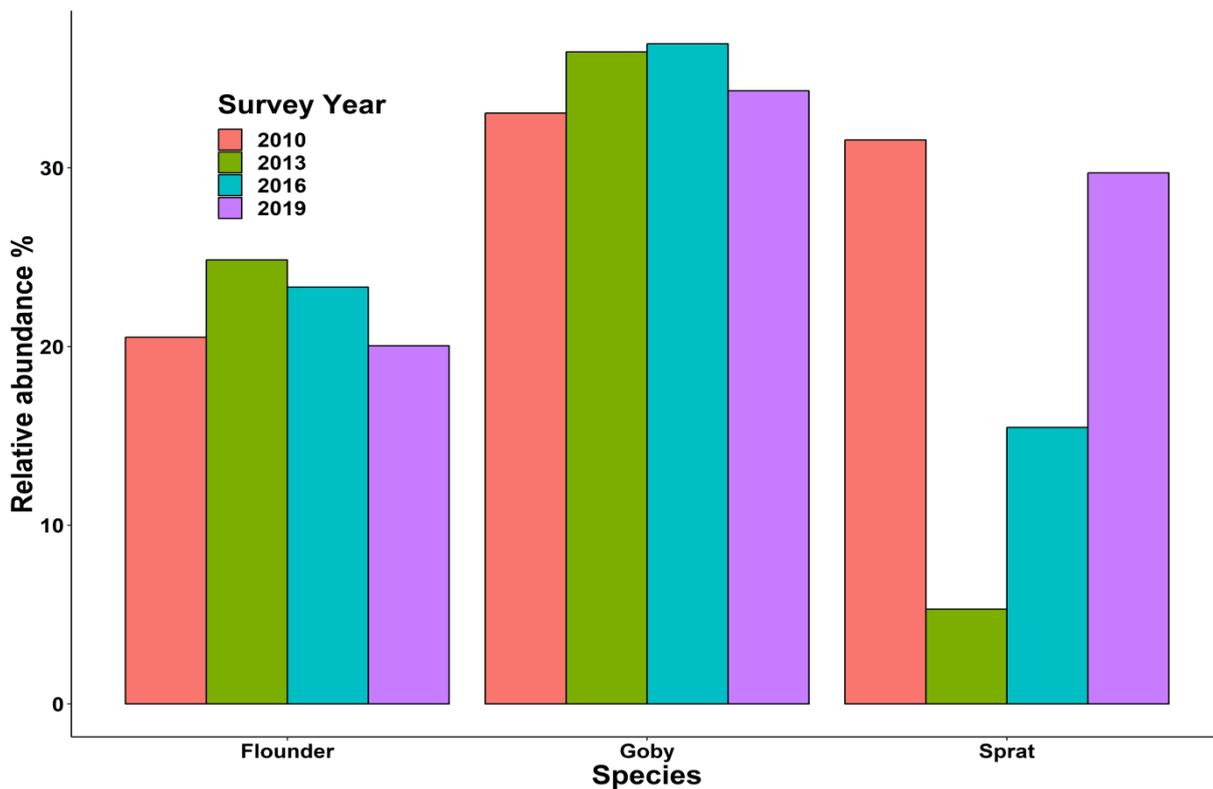


Fig 5: Relative abundance of the three most dominant species captured during the last four WFD surveys of the Barrow Suir Nore Estuary.

As observed previously flounder were present in large numbers throughout the estuary. There is a clear trend that larger flounder are found in the lower sections of the estuary, whereas smaller juveniles occur in the upper regions. This observation remained constant between sampling years (Fig. 6). It confirms that juvenile fish settle near the top of the estuary and gradually move downstream as they grow.

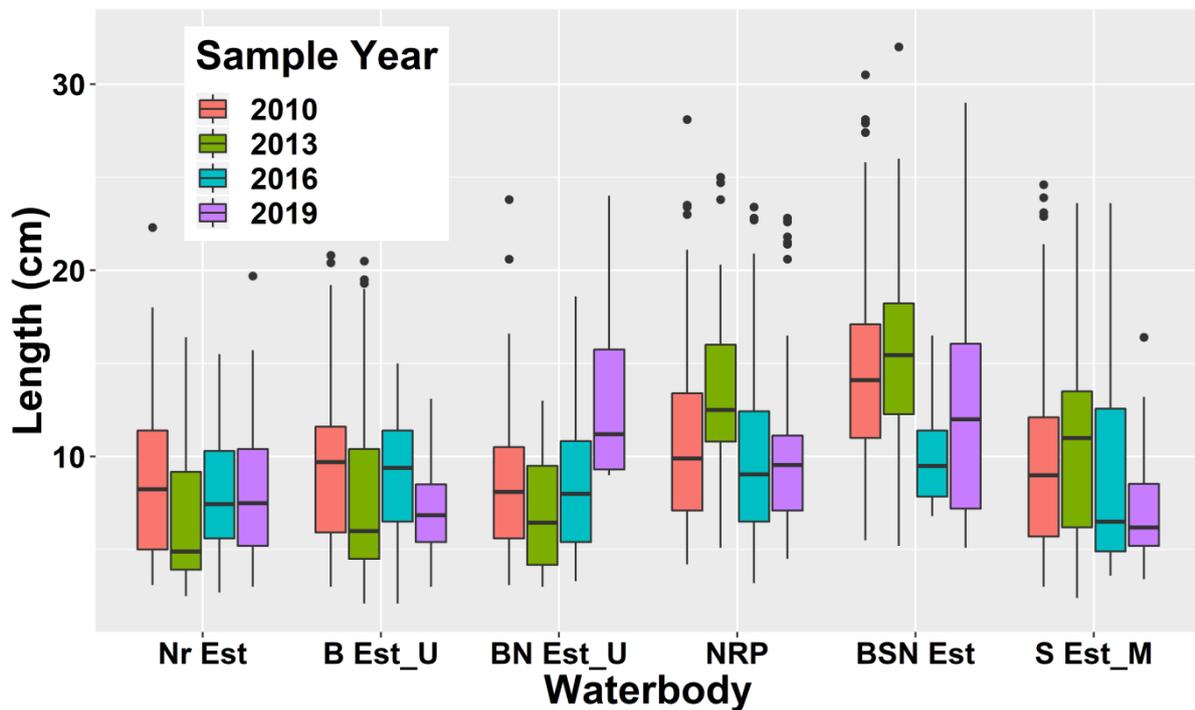


Fig 6: Average lengths of flounder captured during the last three WFD surveys of the Barrow Suir Nore Estuary across all waterbodies. Nr Est: Nore, B Est_U: Barrow Upper, BN Est_U: Barrow Nore, NRP: New Ross Port, BSN Est: Barrow Suir Nore, S Est_M: Suir Middle.

Sprats were more abundant in 2019 than in the more recent surveys due to large numbers captured in the lower sections of the estuary. Otherwise, the proportion of these ubiquitous species within the estuary complex remained relatively constant between surveys.

4.1.3 Key Species

Seven species which are considered important for their conservation status (brown trout, smelt, twaite shad, European eel), angling value (Bass, thick lipped mullet), or as a potential invasive species (dace), also made up a sizable proportion of the total catch across all sampling years (2019, 13%; 2016, 22%; 2013, 28% ; 2010, 11%) (Fig. 7).

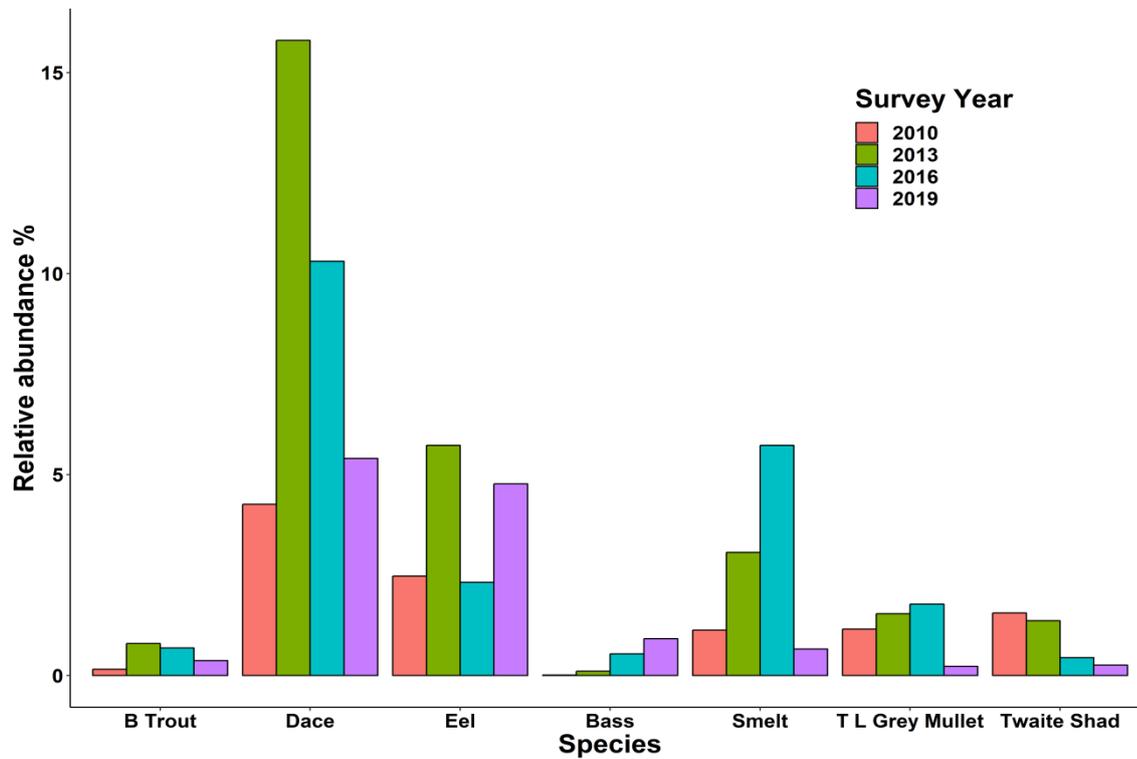


Fig 7: Relative abundance of important species captured during the last four WFD surveys of the Barrow Suir Nore Estuary.

4.1.4 Brown Trout

The majority of Brown Trout captures were between 10 and 30 cm. Length ranges were consistent between years (Fig 8). Capture numbers were down on previous years as a result of not sampling the upper Suir estuary in 2019. All specimens were recorded in the upper sections of the estuary.

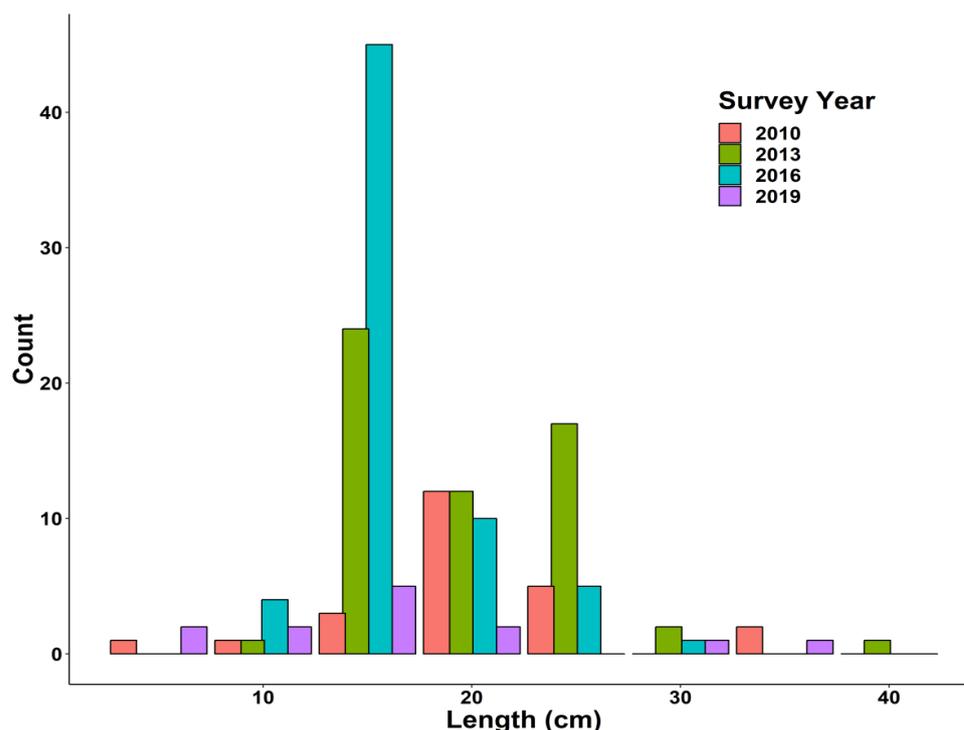


Fig 8: Length frequency analysis of Brown trout captured during the last three WFD surveys of the Barrow Suir Nore Estuary.

4.1.5 Smelt

Smelt captures in the estuary reduced from 2016 when juvenile captures made up a relatively high proportion of total captures in the estuary (Fig. 7). Only 23 individual specimens were caught in 2019 across the whole estuary complex. The largest was 11cm and the mean Smelt length 6.5cm. Smelt were sporadically abundant, making up a large proportion of the catch in the Upper Barrow Nore. Otherwise, capture rates were low compared to previous surveys (Fig. 9).

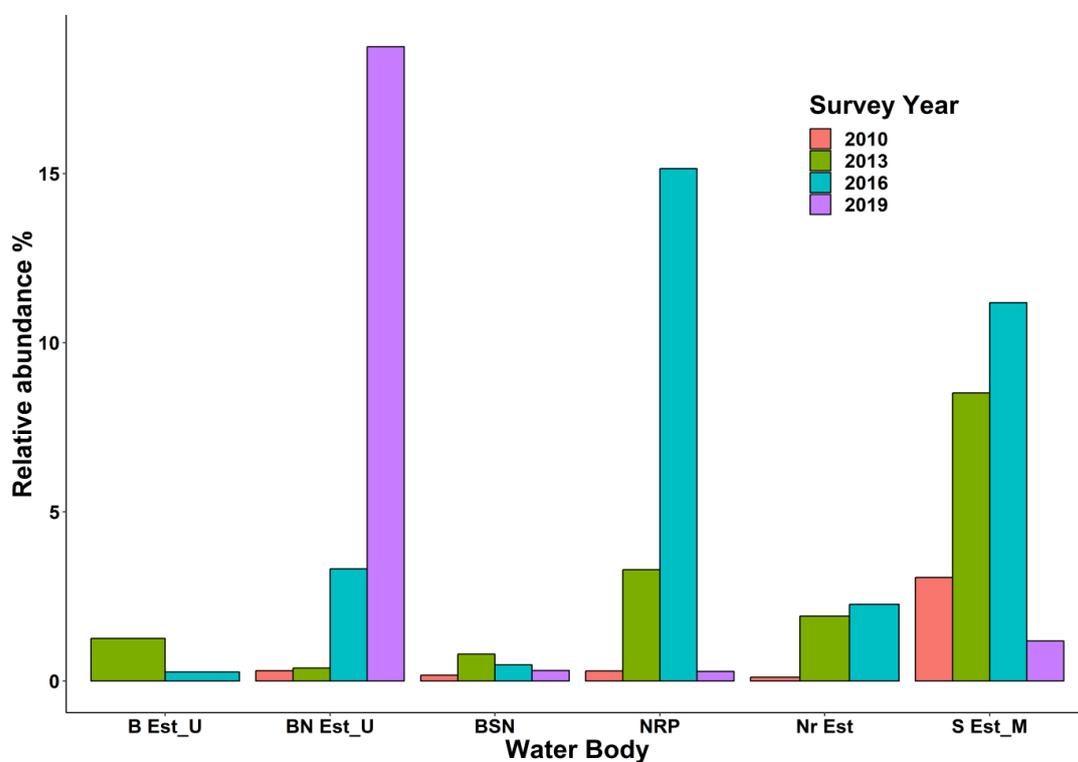


Fig 9: Relative abundance of Smelt captured within each site during the last four WFD surveys of the Barrow Suir Nore Estuary: B Est_U, Barrow Upper; BN Est_U, Barrow Nore Upper; BSN, Barrow Suir Nore estuary; NRP, New Ross Port; Nr Est, Nore estuary; S Est_M; Suir Middle.

4.1.6 Twaite Shad

Twaite Shad were present in low numbers during the 2019 survey. The average length was 12.2cm and the largest was 18.5cm. Relative abundance remained reduced through 2016 compared to the previous two surveys (Fig. 7). Although dispersed throughout the estuary, capture numbers were consistently low.

4.1.7 Eel

European Eel were recorded throughout the estuary in 2019. Lengths ranged from 9 to 66cm (Fig. 10). Relative abundance recovered from a low in 2016 to 4.8% (Fig. 7). Relative abundances varied between the various waterbodies but were present throughout (Fig. 11).

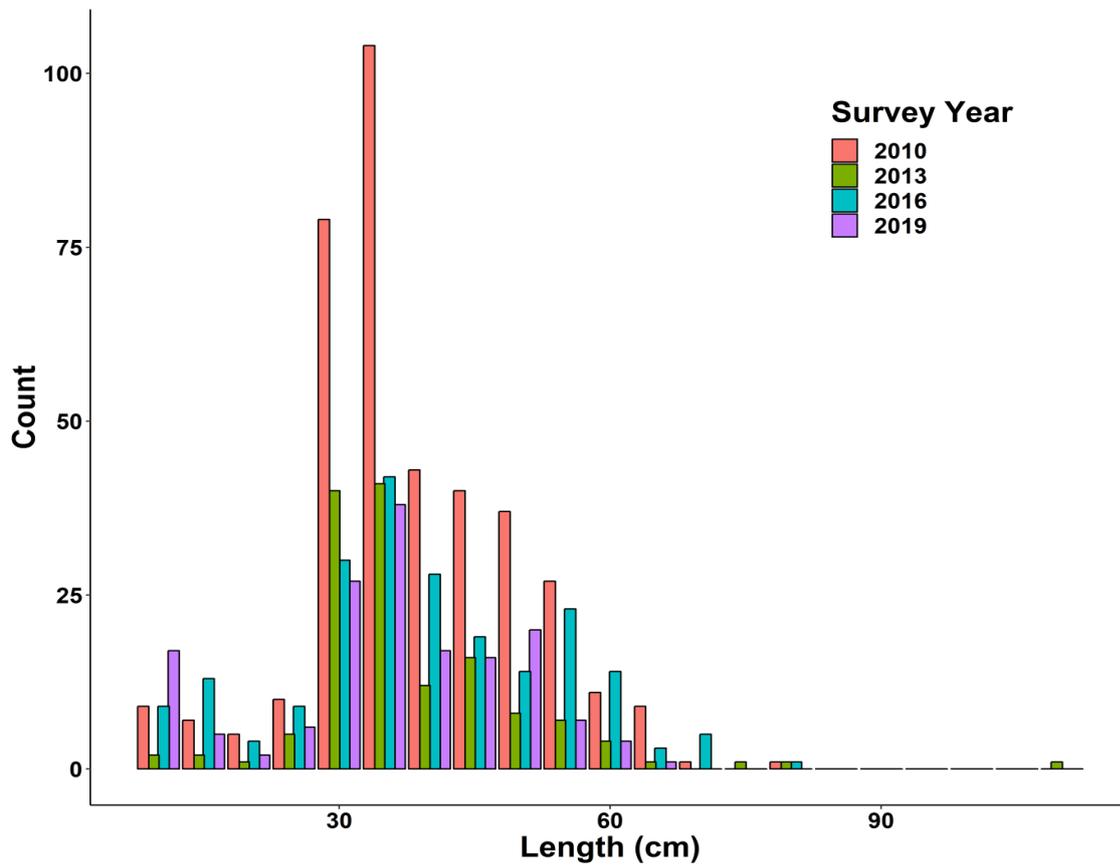


Fig 10: Length frequency analysis of European Eel captured during the last three WFD surveys of the Barrow Suir Nore Estuary.

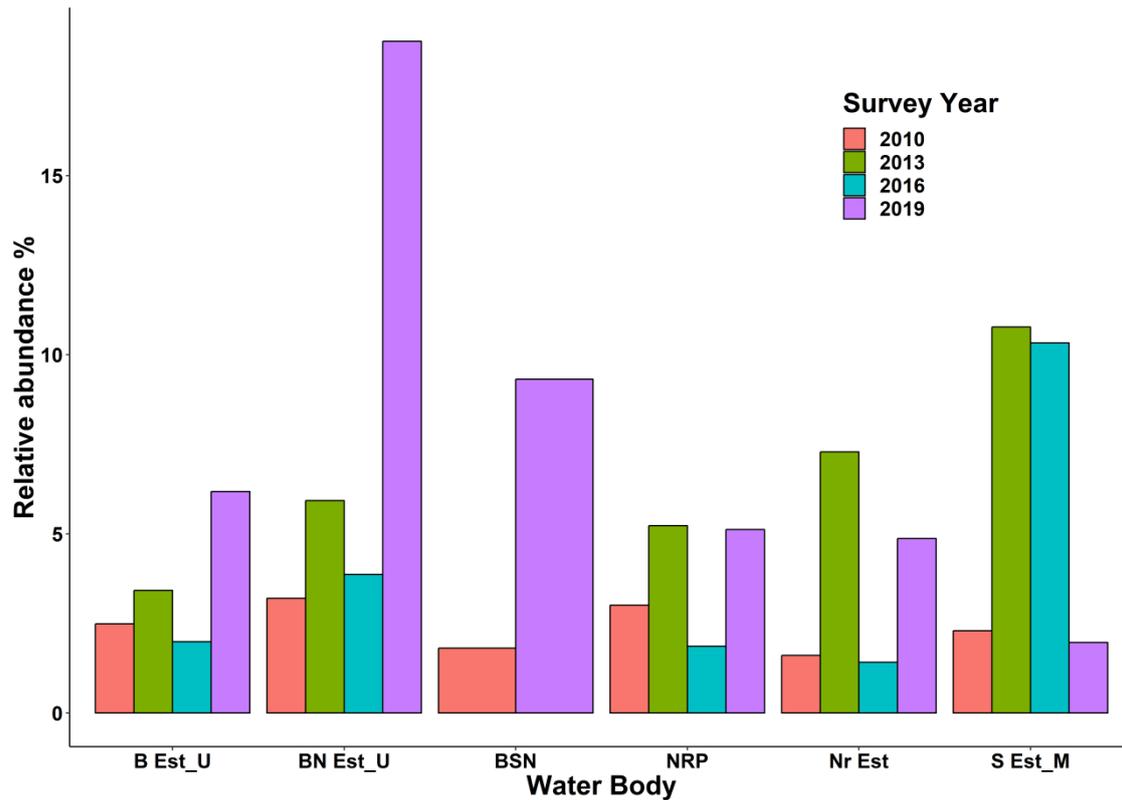


Fig 11: Relative abundance of European Eel captured within each site during the last four WFD surveys of the Barrow Suir Nore Estuary. : B Est_U, Barrow Upper; BN Est_U, Barrow Nore Upper; BSN, Barrow Suir Nore estuary; NRP, New Ross Port; Nr Est, Nore estuary; S Est_M; Suir Middle.

4.1.8 Bass

Numbers of juvenile European sea bass captured were less overall than 2016 but remained high compared to previous sampling years (Fig. 12). However, the juveniles were larger and caught lower in the estuary than in 2016. Overall relative abundance continued to increase between years (Fig. 7). Juvenile bass were captured in relatively large numbers at few sites, highlighting their patchy distribution. Sizes ranged from 7.6-21cms.

4.1.8 Thick Lipped Mullet

Very low numbers of juvenile thick lipped grey mullet were captured in the estuary in 2019, a reduction on previous years (Fig. 7).

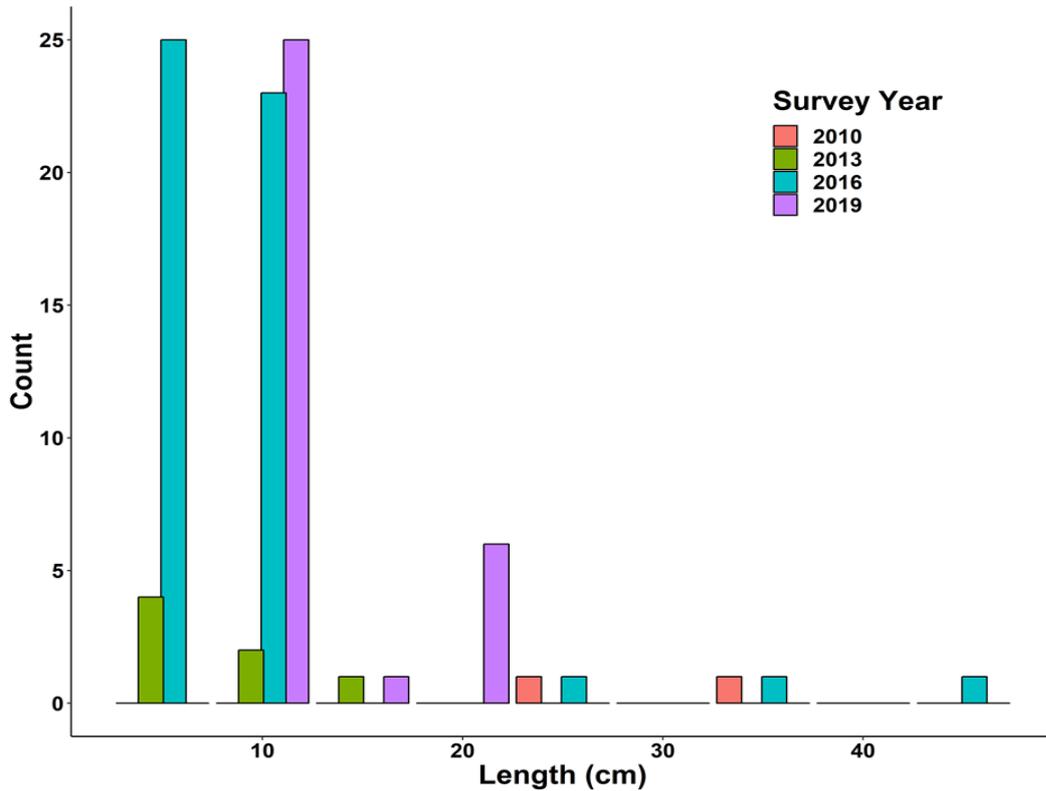


Fig 12: Length frequency analysis of Sea Bass captured during the last four WFD surveys of the Barrow Suir Nore Estuary.

4.1.9 Dace

Relative abundance of dace in the Upper Barrow estuary section reduced considerably from 2016. Although they remained abundant, flounder and goby Sp. were more common. However, in the Nore Estuary, they were the most abundant species, unlike previous years where flounder and/or gobies were more common (Fig. 13). The population structure of dace within the estuary complex indicates that there continues to be a reduction in small individuals compared to previous years (Fig. 14).

4.1.10 Other Species of interest

A single sea trout was captured in the upper section of the Nore estuary. Six salmon parr were captured in the upper sections of the Barrow and Nore estuaries.

Three juvenile plaice were captured (6.6-10.8cm) in the lower section of the estuary within the Barrow Suir Nore water body in 2019. As per previous years the plaice specimens (albeit in lower numbers) were captured in the same location on a gently sloping sandy beach, in high saline conditions.

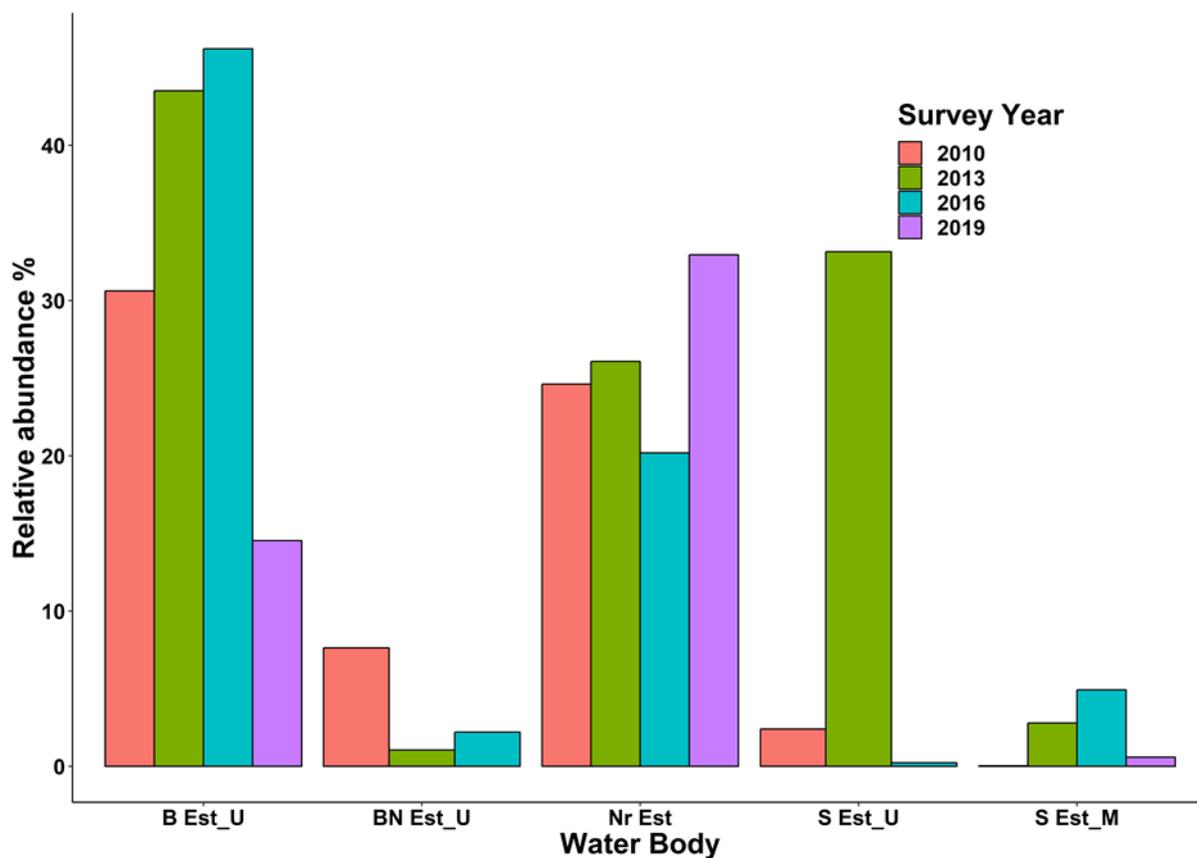


Fig 13: Relative abundance of dace captured within the upper sites during the last three WFD surveys of the Barrow Suir Nore Estuary. B Est_U: Barrow Upper, BN Est_U: Barrow Nore, Nr Est: Nore, S Est_U: Suir Upper, S Est_M: Suir Middle.

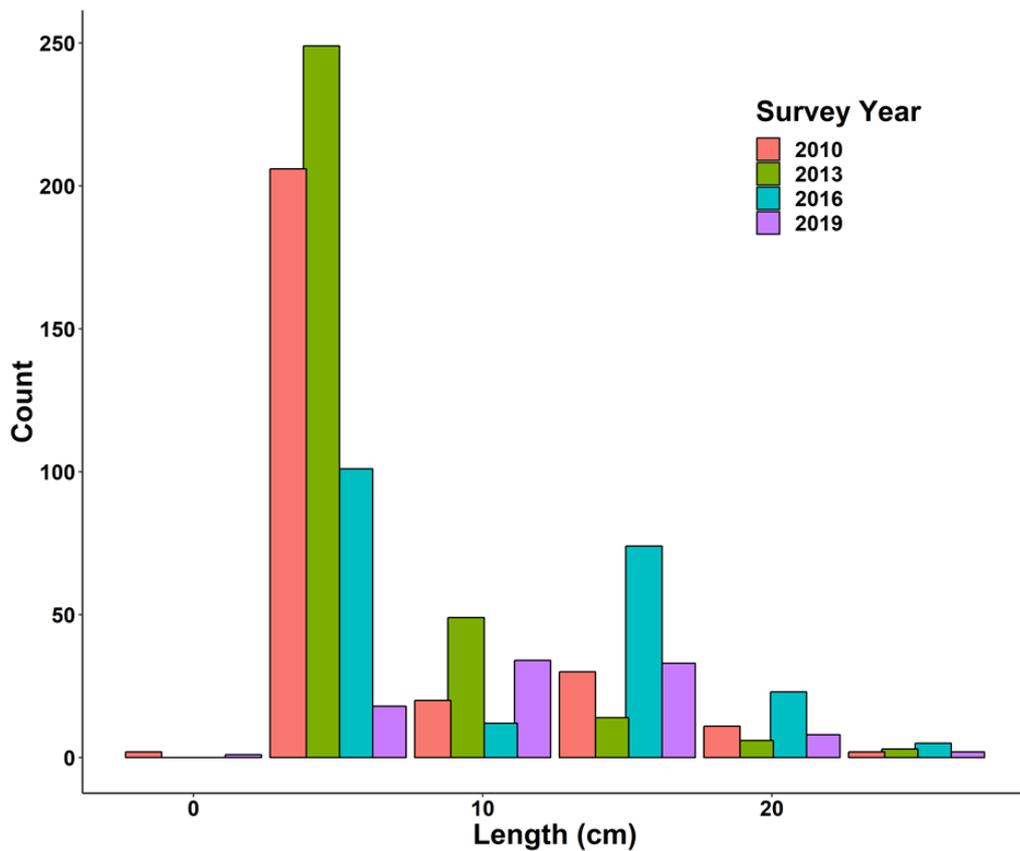


Fig 14: Length frequency analysis of Dace captured during the last four WFD surveys of the Barrow Suir Nore Estuary.

4.2 EMFI Quality Ratings

For the purposes of assigning quality status, the estuary complex is broken up as three self-sustaining transitional waterbodies made up of various combinations of the waterbodies described in Table 1. Barrow Nore Suir T (all eight water bodies), Barrow Nore T (Nore Estuary, Barrow Upper, Barrow Nore Upper, New Ross Port, Barrow Suir Nore) and Suir T (Suir Upper, Suir Middle, Suir Lower, Barrow Suir Nore). All transitional waterbodies remained at good status for 2019.

Transitional waterbody	Survey Year				
	2007	2010	2013	2016	2019
Barrow Nore T	Moderate	Moderate	Good	Good	Good
Barrow Nore Suir T	Good	Good	Good	Good	Good
Suir T	Good	Good	Good	Good	Good

Table 3: EMFI quality ratings of the three self-sustaining transitional waterbodies within the Nore-Barrow-Suir estuary complex and their variation between sampling times.

4.3 Trawling Survey

Species (common name)	Species (scientific name)	Total count	Number measured	Average length (cm)	Max length (cm)	Min length (cm)	St dev (cm)	Relative Abundance (%)
European seabass	<i>Dicentrarchus labrax</i>	291	291	19.8	54.5	15.1	4.4	9.5
Brill	<i>Scophthalmus rhombus</i>	2	2	11.6	16	7.1	6.3	0.1
Brown Trout	<i>Salmo trutta</i>	1	1	77.5	77.5	77.5	NA	0.0
Cod	<i>Gadus morhua</i>	6	6	13.5	15.9	11	1.8	0.2
Dab	<i>Limanda limanda</i>	94	33	16.8	31.5	7	7.8	3.1
Flounder	<i>Platichthys flesus</i>	1193	337	19.2	40	5.1	7.6	38
Goby	<i>Gobius Sp.</i>	9	9	6.7	7.6	6	0.6	0.3
Hake	<i>Merluccius merluccius</i>	1	1	16.5	16.5	16.5	NA	0.0
Herring	<i>Clupea harengus</i>	3	3	21.2	22.1	20.1	1.0	0.1
Lesser Spotted Dogfish	<i>Scyliorhinus canicula</i>	13	13	59.0	64	54	3.7	0.4
Mackerel	<i>Scomber scombrus</i>	1	1	21.4	21.4	21.4	NA	0.0
Painted Ray	<i>Raja microocellata</i>	1	1	49.0	49	49	NA	0.0
Plaice	<i>Pleuronectes platessa</i>	167	130	13.9	32.5	6.5	5.2	5.4
Pogge	<i>Agonus cataphractus</i>	22	22	9.4	11.2	5	1.4	0.7
Pollack	<i>Pollachius pollachius</i>	9	9	13.9	17.8	10	2.8	0.3
Pouting	<i>Trisopterus luscus</i>	4	4	12.7	13.5	11.6	0.8	0.1
Red Mullet	<i>Mullus surmuletus</i>	6	6	18.4	21.6	16.5	1.9	0.2
Sand Smelt	<i>Atherina presbyter</i>	4	4	13.7	16.8	11.6	2.4	0.1
Scad	<i>Trachurus trachurus</i>	95	60	14.4	24.5	7.6	5.1	3.1
Twaite Shad	<i>Alosa fallax</i>	113	60	18.5	23.5	15.1	1.4	3.7
Smelt	<i>Osmerus eperlanus</i>	15	15	17.4	20	11.1	2.2	0.5
Smoothound	<i>Mustelus asterias</i>	2	2	80.5	81	80	0.7	0.1
Sole	<i>Solea solea</i>	23	23	22.8	31.5	12.8	5.9	0.7
Sprat	<i>Sprattus sprattus</i>	22	22	9.3	11.5	4.5	1.6	0.7
Thick Lipped Grey Mullet	<i>Chelon labrosus</i>	32	32	44.5	54.4	18.8	7.4	1.0
Thin Lipped Grey Mullet	<i>Chelon ramada</i>	17	17	32.1	44.3	18.2	9.3	0.6
Tub Gurnard	<i>Chelidonichthys lucerna</i>	50	50	24.0	30.8	6.4	5.8	1.6
Lesser weever	<i>Echiichthys vipera</i>	1	1	16.5	16.5	16.5	NA	0.0
Whiting	<i>Merlangius merlangus</i>	873	109	13.6	21.9	8.1	2.9	28.4
Ballan wrasse	<i>Labrus bergylta</i>	1	1	13.5	13.5	13.5	NA	0.0

Table 4: List of species captured during the 2019 IFI Trawling survey of the Barrow Suir Nore estuary. Species not encountered in the WFD survey highlighted in **bold**.

A total of 16 trawls were made in the lower sections of the estuary complex over two days (Fig. 15). 3071 individual fish were captured, counted and identified to species level prior to

release. In total 30 different fish species were caught. This included ten species which were not encountered during the WFD survey (Table 4).



Fig 15: Map of the lower Barrow Suir Nore estuary, showing trawl tracks during the 2019 IFI trawl survey.

Flounder made up the largest proportion of the catch, with 38% of all captures, followed by whiting and European sea bass (28% and 10% respectively). The most common species encountered in the current survey were largely similar to the survey carried out in 2016). Five species (bass, flounder, scad, whiting and plaice) made up 75% and 85% of the total catch in 2016 and 2019 respectively (Fig. 16). The most notable difference between sampling years was the lack of twaite shad captures in 2016 compared to the relatively large catch in 2019, where they made up nearly 4% of the total catch (Table 5).

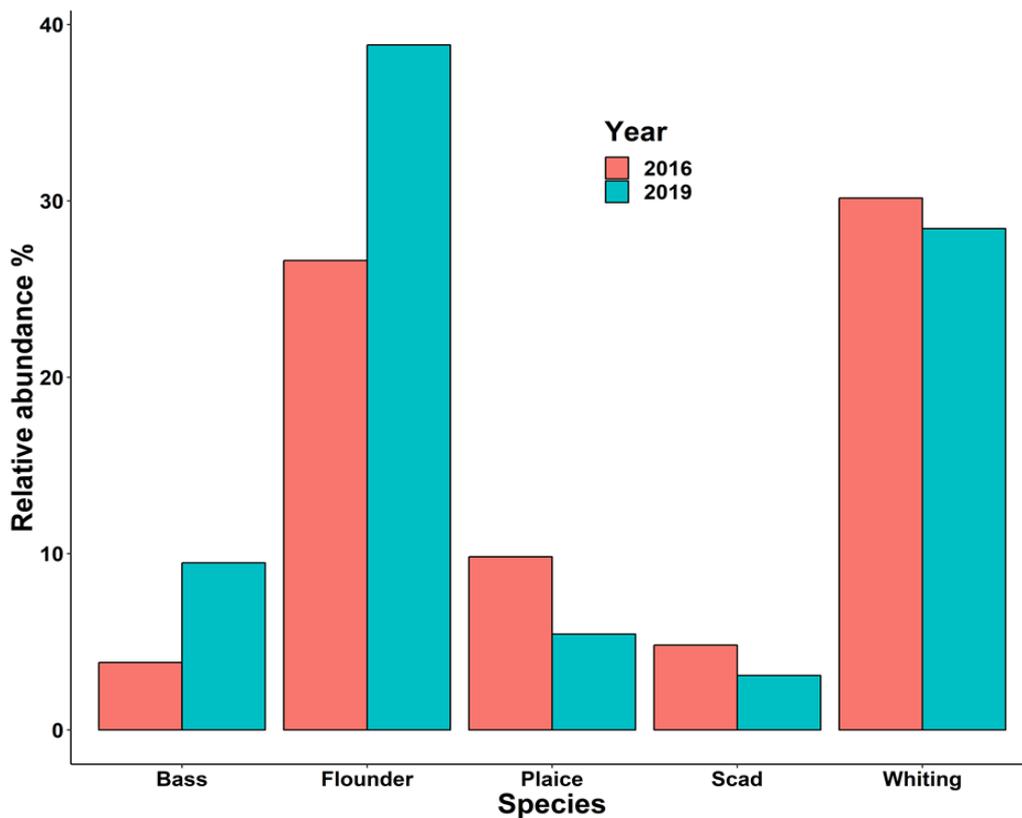


Fig 16: Relative abundance of named species within waterbody sections in the lower Barrow Suir Nore estuary complex captured during the WFD trawling surveys 2016 and 2019.

Large numbers of juvenile bass were caught compared to 2016 (Fig. 17). The vast majority were 2 year olds. They were encountered throughout the sampling area in all but three trawl transects.

Large juvenile populations of whiting and plaice persisted between sampling years (Figs. 18 and 19). The average length of 167 plaice captured was 13.9cm, while the largest was 32.5cm. In total, 873 whiting were caught. The vast majority were under 20cms in length.

In total 113 twaite shad were caught during the trawling survey. The majority of which were caught in a single trawling transect. Most captured were between 18 and 20cms (Fig. 20). No twaite shad were encountered in 2016.

As with 2016 adult thick-lipped mullet were again encountered in certain sections of the estuary (Fig. 21), the largest was 54.4cm.

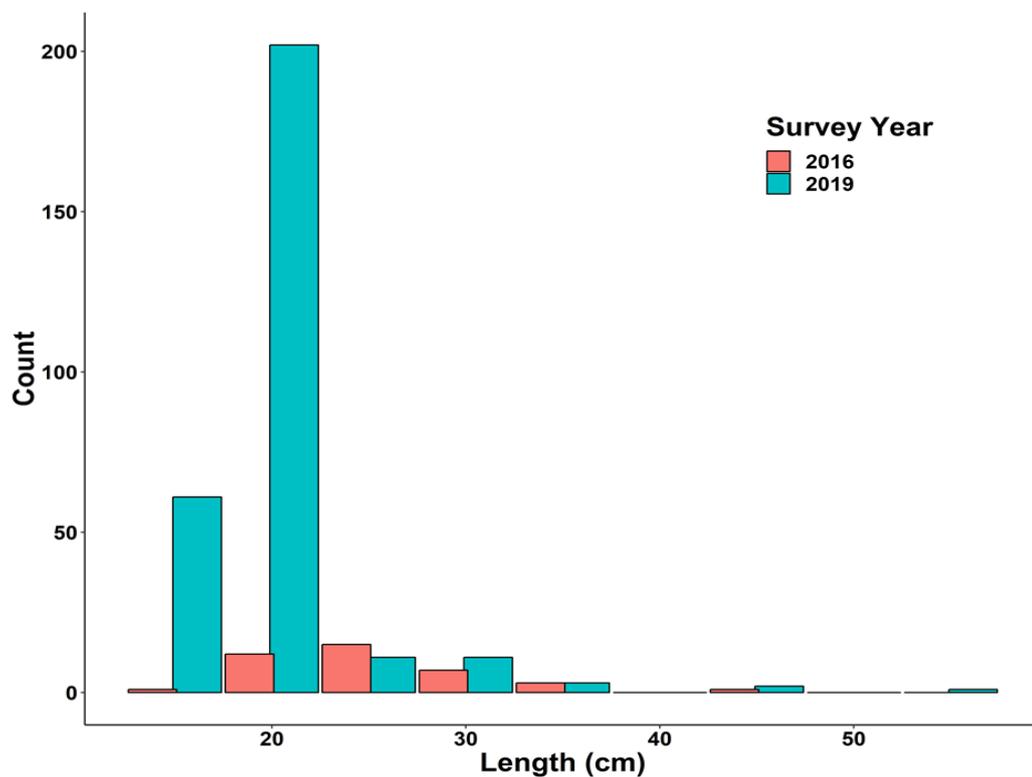


Fig 17: Length frequency analysis of Bass captured during the Barrow trawl surveys of 2016 and 2019.

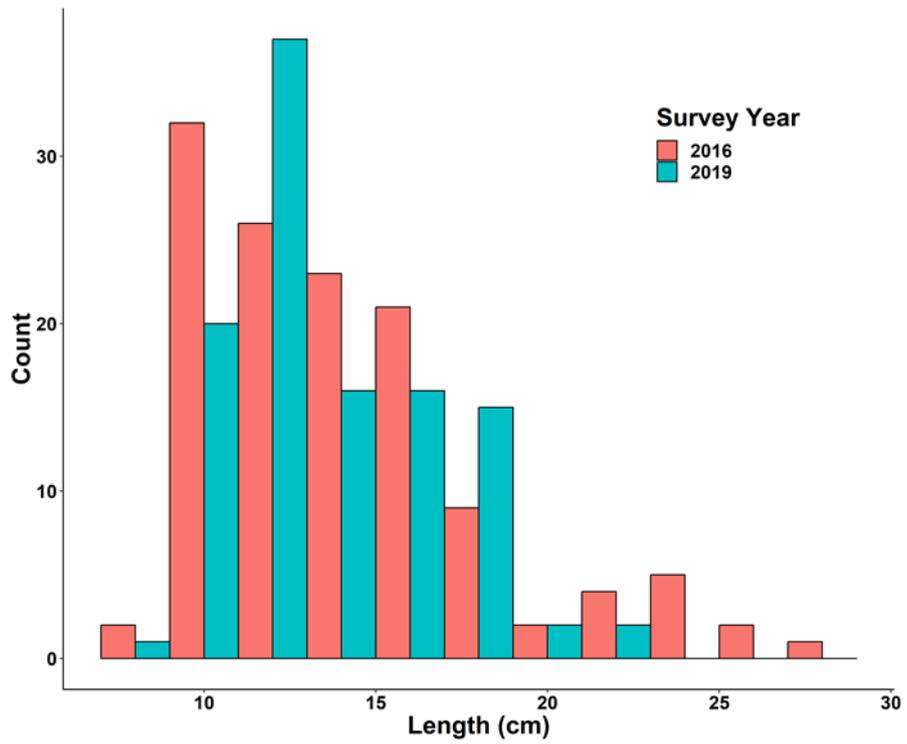


Fig 18: Length frequency analysis of Whiting captured during the Barrow trawl surveys of 2016 and 2019.

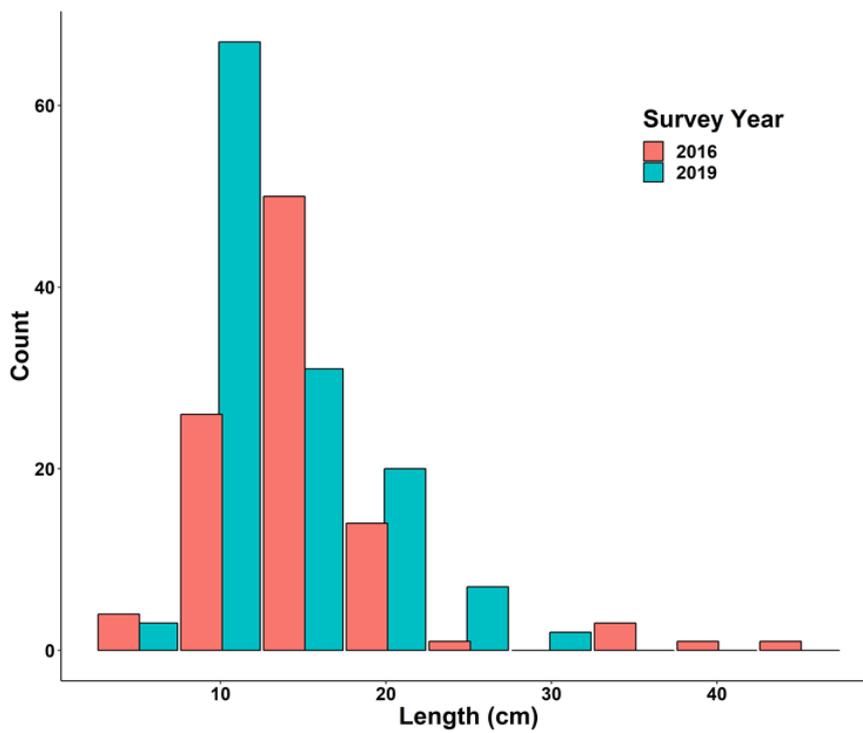


Fig 19: Length frequency analysis of Plaice captured during the Barrow trawl surveys of 2016 and 2019.

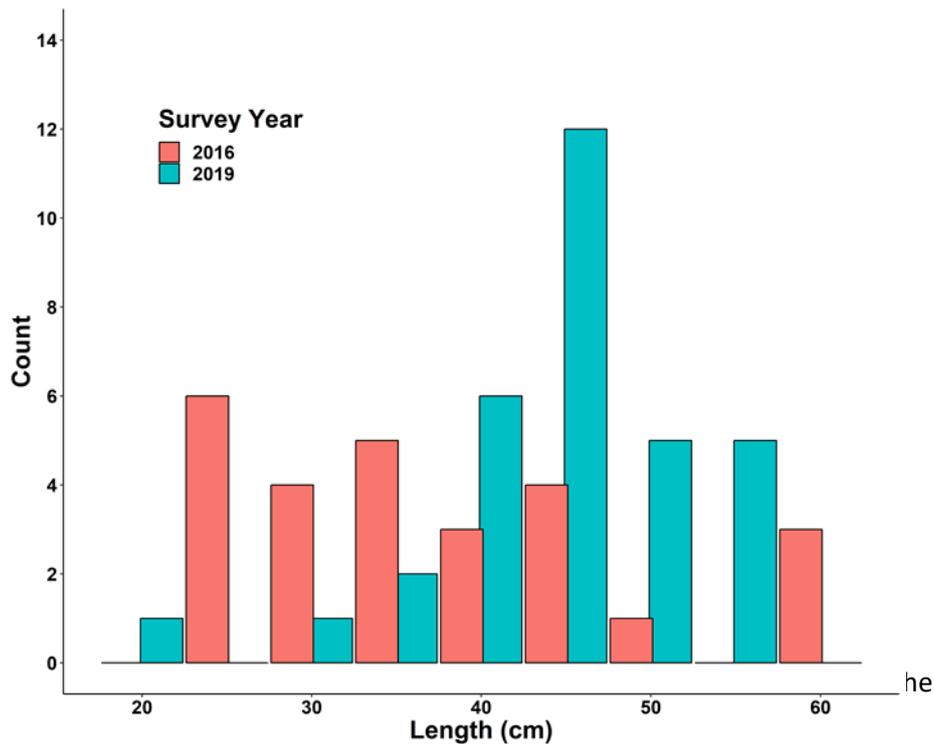


Fig 21: Length frequency analysis of Thick-Lipped Mullet captured during the Barrow trawl surveys of 2016 and 2019.

5. Discussion

The EMFI quality rating system found the fish population structure in the Nore-Barrow-Suir transitional waterbody to be of good quality, due to the range and composition of species caught. However, impacts due to enrichment from surface runoff and industrial discharge, as well as the presence of invasive species, means that the transitional waterbody will continue to be at risk of not achieving an overall good ecological status.

As per previous sampling, flounder and goby consisted of around half of all captures during the water framework directive survey, which is indicative of transitional waterbodies which have a relatively large fluvial influence. Both gobies and juvenile flounder are associated with muddy substrates caused by fluvial deposition, where they feed on plant matter and invertebrates associated with mud (Aarnio *et al.* 1996). Subsequently, these species provide an abundant and important food source for piscivorous fish feeding within the shelter of the estuary.

Sprat comprised almost 30% of BNS total fish captures during this survey. Sprat is an important species in the trophic web as it links between zooplankton and top predators

(which includes fish, birds and marine mammals). It has been shown that sprat has a key food web role in waters like the Baltic Sea as prey for Baltic salmon (Mäntyniemi et al., 2012), and birds (Österblom et al., 2006). Despite their importance no TAC is set for sprat in Irish waters. Although ICES provides a catch advice, there is insufficient information to evaluate stock trends and exploitation status. In 2021 Marine Institute initiated research to improve the knowledge, assessment and management advice of sprat populations in the Celtic Seas (MI Stock Book, 2021). In that context ICES recommends operating fisheries within a precautionary framework, because of concerns about depleting the sprat stock which poses unforeseeable risks for ecosystem functioning, and ultimately protection of species with particular conservation concern.

Comparisons between the current and previous WFD surveys suggest that there is a consistent increase in juvenile bass abundance within the estuary. The trawling survey encountered older juvenile Bass in the 1 and 2 age classes. These results provide evidence of a well-functioning and stratified nursery, in which juveniles are successfully developing within the estuary system.

The data collected over the previous nine years provides evidence that the estuary consistently supports a large population of juvenile mullet. It is likely that the estuary complex provides an important nursery function for the thick-lipped grey mullet population in and around the estuary.

Juvenile twaite shad numbers encountered have continued to drop sharply between sampling years, which is notable. However, a relatively large count of older specimens was caught during the trawling survey.

Dace were first reported in the Barrow in 1994. Since then they have thrived within the river system (Delanty *et al.* 2017). They have also established themselves in the upper Barrow estuary to such an extent that they are now continuously a dominant species in that particular section of the estuary complex. Although no dace fry were detected, it is possible that spawning is occurring in the upper estuary, as per dace populations in the Upper Thames estuary (Thomas 1998). Otherwise, the population must depend on migrants from the riverine habitat upstream. The fact that an introduced species is now a dominant species in some upper sections of the estuary is likely to have an effect on current and future ecosystem functioning.

The accumulated data provides good evidence that a gently sloping beach close to the limit of the Barrow-Nore-Suir Estuary complex is likely to be a highly productive nursery area for plaice populations around the south coast of Ireland. Larger juveniles were captured close by, but further into the channel, during the IFI trawling survey. This provides further

evidence of an important nursery function where is spatial stratification between age classes is evident.

A large number of species were recorded in the estuary during the IFI trawling survey, which were not caught during the WFD survey. These species are associated with the marine, but were captured well within the environs of the estuary. The work provides evidence that if a complete picture of species richness is required within larger estuaries, such as the Barrow - Suir-Nore complex, a method which can effectively sample deep sections of the water body should be considered.

The Barrow-Nore-Suir transitional waterbody is one of the largest in the country. Not only is the estuary a vital transit route for diadromous species of international conservation importance, such as salmon, eels and twaite shad, this report has shown its importance as a nursery for marine species of both angling and commercial importance. Currently fish populations are sufficiently diverse for it to achieve good status. However, it is located adjacent to some large population centres, namely Waterford city and New Ross. The invasion of dace throughout the upper sections of the estuary is another clear pressure which should continue to be monitored.

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