Fish Stock Survey of Transitional Waters in the Neagh-Bann International River Basin District 2020

Castletown Estuary

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National Research Survey Programme

Fish Stock Survey of Transitional Waters in the Neagh-Bann International River Basin District 2020– Castletown estuary

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1. Summary

This report presents fish capture data collected during Inland Fisheries Ireland (IFI) surveys of transitional waterbodies. This report focuses on the survey which was conducted within the Castletown estuary on the east coast of Ireland. It was conducted primarily to designate an ecological status based on fish populations, as per the requirements of the Water Framework Directive (Directive 2000/60/EC). The populations of species of angling and conservation importance are also discussed.

A number of fish sampling methods were used to ensure 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 11 species and 1633 individual fish were captured. Current data was also compared to a previous survey in 2009 to assess how fish populations have changed in the intervening years.

2. Introduction

The Castletown estuary is situated on Ireland's east coast, adjacent to the town of Dundalk, Co. Louth and covers an area of 1.88 km² (Fig. 1). The estuary exhibits anthropogenic impacts in terms of channelisation, urban and shipping pressures. The main channel is regularly dredged to create suitable navigation conditions for shipping, with steep reinforced banks along the southern shore. The estuary receives leachate from the Newry Road landfill, located in the upper estuary between the two road bridges (Marine Institute, 1999).

The Castletown Estuary is situated within Dundalk Bay SAC, which is important for several habitats listed in the EU Habitats Directive, such as stony banks, tidal mudflats, salt marshes, mudflats and estuaries. These extensive mud and sand flats have a rich fauna that provide the main food source to the tens of thousands of waterfowl, inhabiting the Dundalk Bay (NPWS, 2001). The Castletown River flows into the estuary and is known to have a run of salmon and an excellent run of sea trout (O'Reilly, 2002). The estuary was previously surveyed in 2009.

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 examine fish population dynamics in the estuary.
- To provide scientific advice to support conservation measures within the estuary complex.

According to the WFD, 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 estuary was surveyed in 2009, it was possible to examine any changes in population structure in the intervening years.

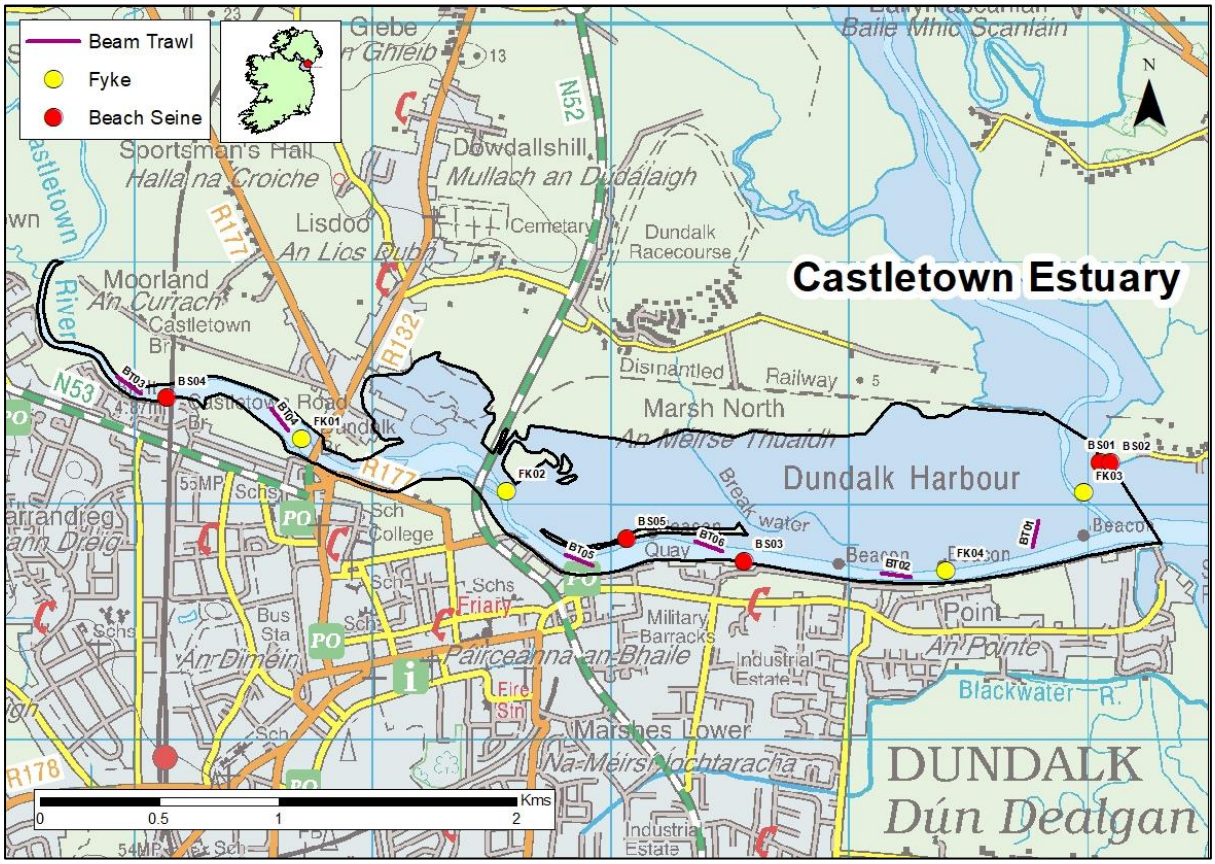

Fig. 1: Map of the Castletown Estuary showing all samples taken during the September 2020 survey.

3. Methods

The Castletown estuary covers an area of 1.88km^2. Fish stock surveys were conducted to ensure sufficient coverage of the water body so that stocks could be assessed. Sampling took place between 1st - 2nd September 2020. Habitat type across the sites ranges from soft mud to shingle beaches 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 for the WFD monitoring program.

In 2020, due to Covid-19 (i.e. social distancing) and manual handling considerations a lighter beach seine and reduced numbers of fykes in each fyke set were utilised. Beach seining was conducted using a 30m x 2.5m net (14mm mesh size side panels 12m x 2.5m with the middle/bunt of the net 6.5mm mesh size 6m x 2.5m) to capture fish in littoral areas. 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 littoral areas. Previous surveys used 3 fyke nets tied together to form a set whereas 2 fykes were tied together to form a set in 2020. 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 beach seine site.

4. Results

4.1 Data summary – 2020 survey

A total of 15 samples were taken using three different sampling methods (5 beach seine, 4 fykes and 6 beam trawls), over the course of the sampling programme (Fig. 1). Temperatures ranged from 14.7-15.9 °C (mean = 15.1°C) and salinity (PPT) ranged from 0.2 to 27.4 (mean= 11.3).

In the Castletown estuary, 1,633 individual fish were captured, counted and identified to species level prior to release. Eleven different fish species were encountered over the course of the survey (Table 1).

Table 1: List of species captured during the 2020 WFD survey of the Castletown estuary

Species	Total count	Count measured	Ave length(cm)	Max length(cm)	Min length(cm)	Standard deviation (cm)	Relative abundance %	% Relative abundance without sprat
European eel	2	2	24.8	33.5	16	12.4	0.1	0.4
Fifteen-spined stickleback	1	1	3.6	3.6	3.6	N/A	0.1	0.2
Flounder	90	90	9.3	19	4.1	3.2	5.5	20.1
Herring	1	1	11.0	11	11	N/A	0.1	0.2
Lesser sandeel	1	1	12.4	12.4	12.4	N/A	0.1	0.2
Nilsson's pipefish	7	7	7.3	10	5.9	1.3	0.4	1.6
Plaice	3	3	8.8	9.5	7.5	1.1	0.2	0.7
Sand Goby	336	109	5.2	7	2.8	1.0	20.6	75.2
Sand smelt	3	3	4.3	5.2	3.8	0.8	0.2	0.7
Sprat	1186	122	6.0	9.7	3.7	1.0	72.6	
Thick-lipped grey mullet	3	3	51.8	60	45.5	7.4	0.2	0.7

4.2 Comparative analyses

4.2.1 Abundant species

Sprat were by far the most abundant species within the estuary in 2020, making up over 72% of the total catch (Fig. 2). Sand goby and flounder were also common, making up 20.6 and 5.5 % of the total catch, respectively. The relative abundance of flounder fell dramatically from 2009 where it made up 52.9% of the catch to 5.5% in 2020 (Fig. 2). Excluding sprat, the relative abundance of flounder remained lower (20.1%) than in 2009. The relative abundance of sand goby increased in 2020.

Sprat, especially juvenile sprat, can be found in vast shoals in inshore waters and estuaries. This shoaling behaviour is a key aspect of their ecology and survival and their presence in surveys like this occurs periodically. Where they dominate a sample sprat can influence status.

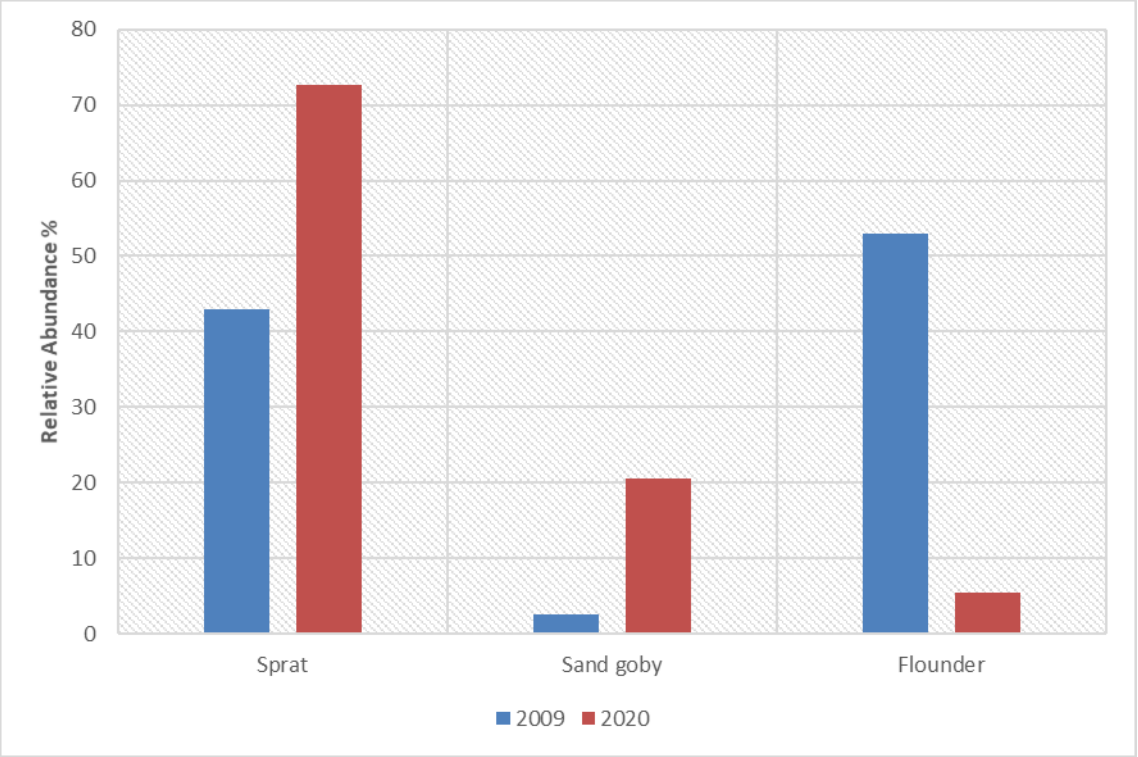

Fig 2: Relative abundance of the most abundant species captured during the 2020 WFD survey of the Castletown estuary and comparison with the 2008 and 2010 surveys.

4.2.2 Key species

The Castletown estuary is noted fishing venue for mullet and flounder, with occasional seatrout and bass featuring also. No sea trout or bass were captured in the survey. A few thick-lipped grey mullet were captured with one specimen measured at 60 cm which is would be a specimen size based off the lengths of previous thick-lipped mullet claimed at the Irish Specimen Fish Committee (ISFC) (Plate 1). The total of 90 flounder were captured, representing several age classes (Fig. 3).

Plate 1. Specimen thick lipped grey mullet captured during the survey

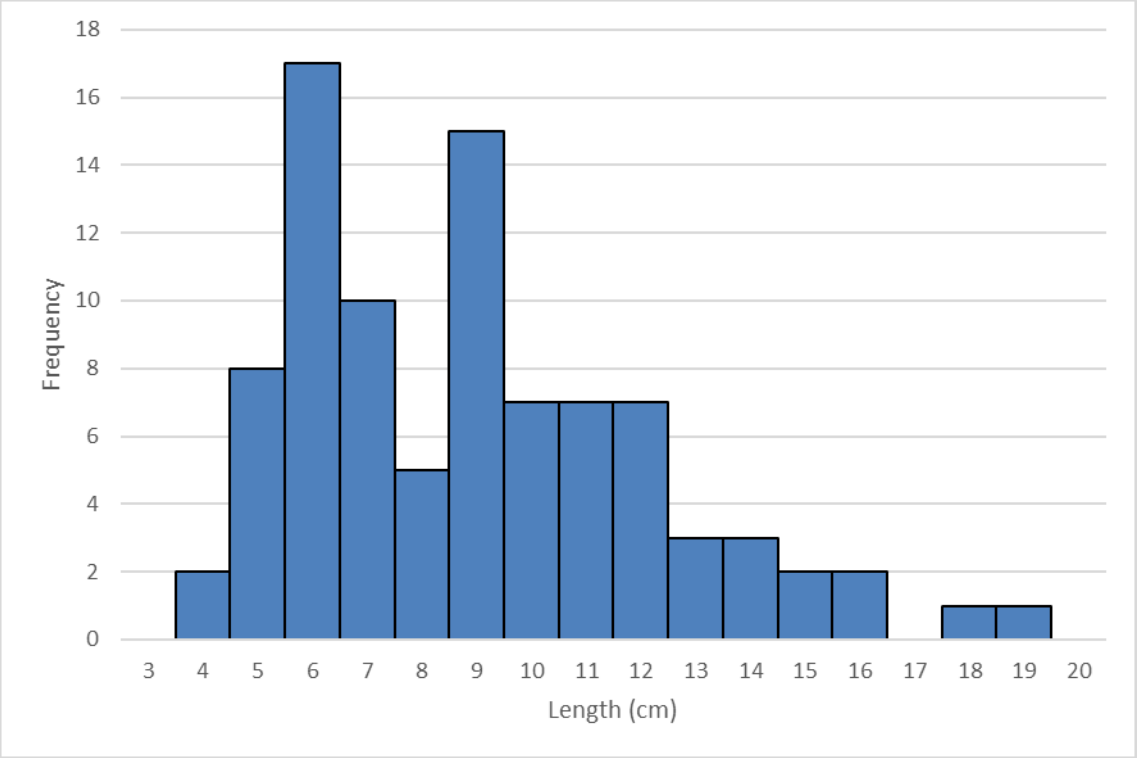

Fig 3: Length frequency for flounder captured during the 2020 WFD survey of the Castletown estuary.

4.2.3 EMFI quality rating

The Castletown estuary achieved moderate status in 2020 which equalled the status determined in 2009 (Table 2).

Table 2. EMFI quality ratings of the Castletown estuary 2009-2020

System	Year	EMFI	EQR	Classification
Castletown	2009	40	0.46	Moderate
Castletown	2020	42	0.50	Moderate

5. Discussion

Sprat, sand goby and flounder made up over 98% of the catch, with sprat comprising the bulk of the catch. Sprat comprised a significant portion of catch in 2009 (Fig. 2). Sprat and sand gobies are important prey species (Keinänen *et al.* 2017, Souza et al. 2015).

The lack of habitat diversity, the small size of the estuary, and pressures like poor water quality may contribute to the moderate status of the Castletown estuary. Habitat complexity and variability plays a significant role in promoting abundance, diversity, and persistence of species in a wide array of ecosystems (Moyle *et al.* 2010). Conversely the uniform habitat observed in the Castletown estuary could be limiting the species diversity which, in turn, is one of the factors driving the EQR score which is leading to the estuary's moderate status. The small size and modifications (dredging shipping channel and re-enforcement of the banks along the southern shoreline) may contribute to the lack of species diversity. Poor water quality in Castletown estuary could also be a contribution factor (O' Boyle *et al.* 2019).

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