Fish Stock Survey of Transitional Waters in the Eastern River Basin District 2020

Avoca Estuary

IFI/2020/1-4533

Iascach Intíre Éireann
Inland Fisheries Ireland

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National Research Survey Programme

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CITATION: Wightman, G. Coyne, J. and Roche, W. (2020). Fish Stock Survey of Transitional Waters in the Eastern River Basin District 2020 – Avoca estuary. Inland Fisheries Ireland, 3044 Lake Drive, Citywest Business Campus, Dublin 24, Ireland.

Acknowledgements

The authors wish to gratefully acknowledge the help and co-operation of all their colleagues in Inland Fisheries Ireland.

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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 Avoca 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 the survey, a total of 13 species and 222 individual fish were captured. Current data was also compared to previous surveys in 2008, 2010, 2015, and 2018 to assess how fish populations have changed in the intervening years.

2. Introduction

The Avoca Estuary is located in south Co. Wicklow, approximately 73km south of Dublin city. It covers an area of 0.17km^2 and divides the town of Arklow in two. The estuary is situated within an industrialised area with banks that are either walled or steep with heavy tree cover. It is a relatively small and narrow estuary with a high degree of physical modification to the lower portion below the bridge, primarily consisting of sea walls, boat moorings and piers.

The Avoca catchment contains some of the most polluted stretches of river in Ireland, with abandoned mines having a profound impact on the lower 15km of river. These mines leach high levels of lead, copper and zinc (ERBD, 2009). This catchment also has a wide variety of other polluting inputs along its length, including pharmaceutical, chemical and light engineering operations, along with several treated and untreated sewerage inputs. Furthermore, agriculture and forestry contribute to diffuse pollution loads (ERBD, 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 2008, 2010, 2015 and 2018 it was possible to examine any changes in population structure in the intervening years.

3. Methods

The Avoca estuary covers an area of 0.17km^2. Fish stock surveys were conducted to ensure sufficient coverage of the water body so that stocks could be assessed. Sampling took place between 12th - 13th October 2020. Habitat type across the site ranged from soft mud to cobble substrate and salinity ranged from freshwater to brackish water. 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 10.6-11.7 °C (mean = 11.2°C) and salinity ranged from 0.0 to 5.8 (mean= 2.0)

In the Avoca estuary, 222 individual fish were captured, counted, and identified to species level prior to release. Thirteen different fish species were encountered over the course of the survey (Table 1).

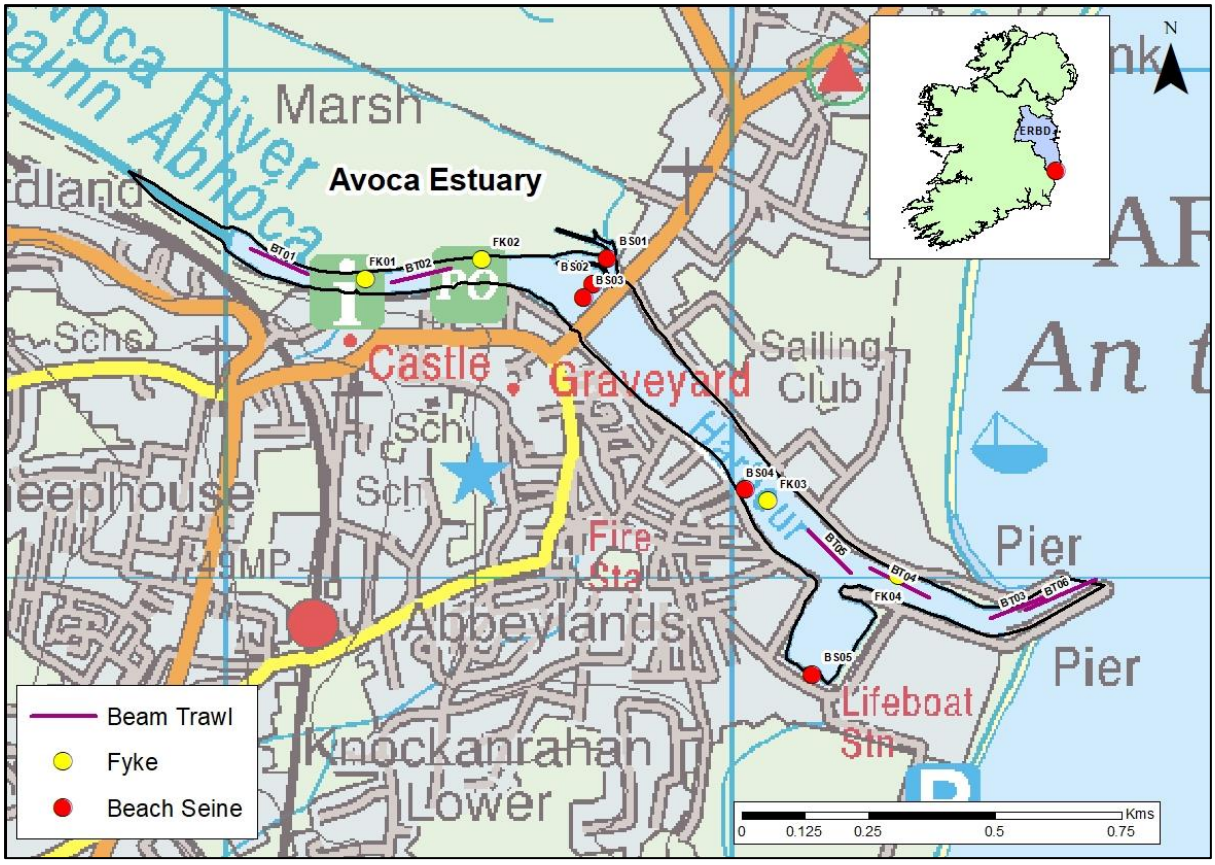

Fig. 1: Map of the Avoca Estuary showing all samples taken during the October 2020 survey.

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

Species	Total count	Count measured	Ave length(cm)	Max length(cm)	Min length(cm)	Standard deviation (cm)	Relative abundance %
Brown trout	2	2	30.4	30.6	30.1	0.4	0.9
Common dragonet	1	1	11.3	11.3	11.3	N/A	0.5
Common goby	1	1	2.8	2.8	2.8	N/A	0.5
European eel	2	2	8.1	10.5	5.7	3.4	0.9
Five-bearded rockling	5	5	16.5	21	12	4.1	2.3
Flounder	79	79	8.7	31.2	3.7	5.2	35.6
Plaice	5	5	4.7	8.1	3.4	1.9	2.3
R/B Lamprey (Ammocoete)	1	1	7.0	7	7	N/A	0.5
River lamprey	1	1	30.0	30	30	N/A	0.5
Salmon	1	1	9.7	9.7	9.7	N/A	0.5
Sand goby	20	20	3.3	6.1	2.4	0.9	9.0
Sand smelt	1	1	14.2	14.2	14.2	N/A	0.5
Thick-lipped grey mullet	98	30	3.6	5.7	3	0.7	44.1
Three-spined stickleback	5	5	3.2	3.7	2.6	0.4	2.3

4.2 Comparative analyses

4.2.1 Abundant species

Thick-lipped grey mullet was by far the most abundant species within the estuary in 2020, making up over 44% of the total catch (Fig. 2). Flounder and sand goby were also common, making up 35.6% and 9.0 % of the total catch, respectively. Flounder is the most prevalent species caught when compared with previous surveys (Fig. 2).

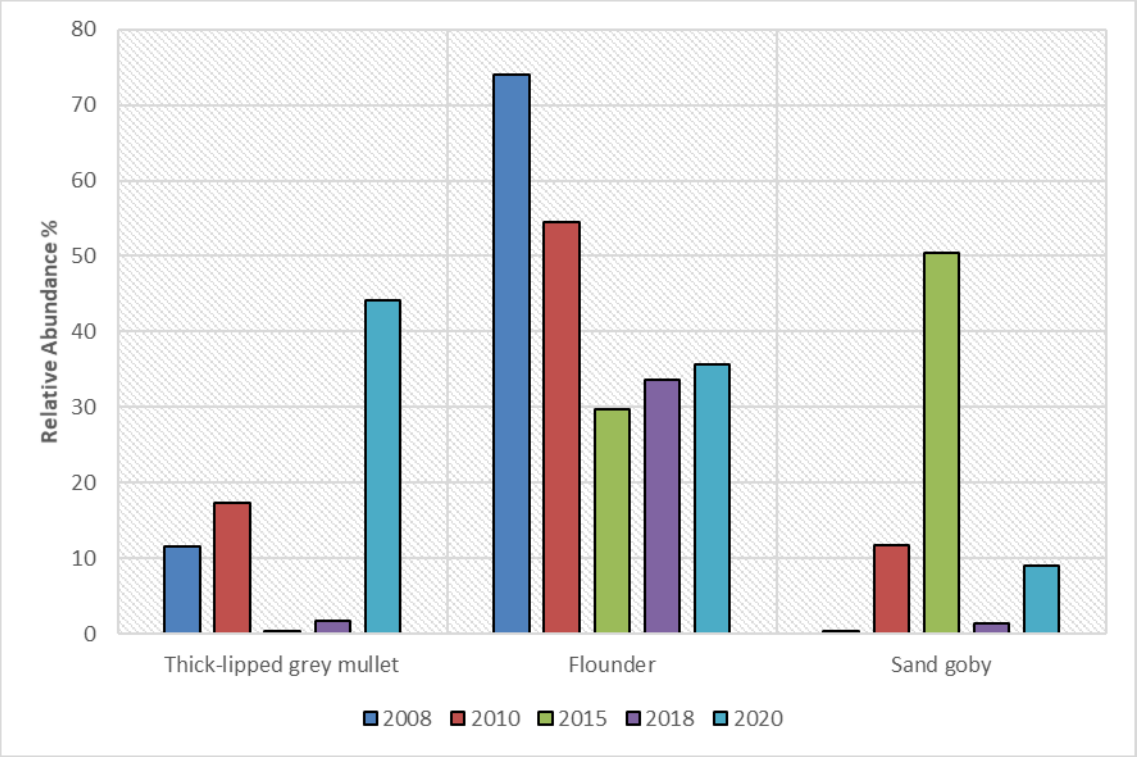

Fig 2: Relative abundance of the most abundant species captured during the 2020 WFD survey of the Avoca estuary and comparison with the 2008, 210, 2015 and 2018 surveys.

4.2.2 Key species

Flounder made up 74.0, 54.5, 29.7, 33.7 and 35.6% of the total catch in 2008, 2010, 2015, 2018 and 2020 respectively (Fig.2), indicating a possible nursery function for these popular angling species as the majority of them are between 3-20cm (Fig 3). A single river lamprey was captured. River lamprey have been captured during previous surveys of this estuary. The Avoca is one of the few estuaries where they are consistently captured making it an important estuary for this highly protected species.

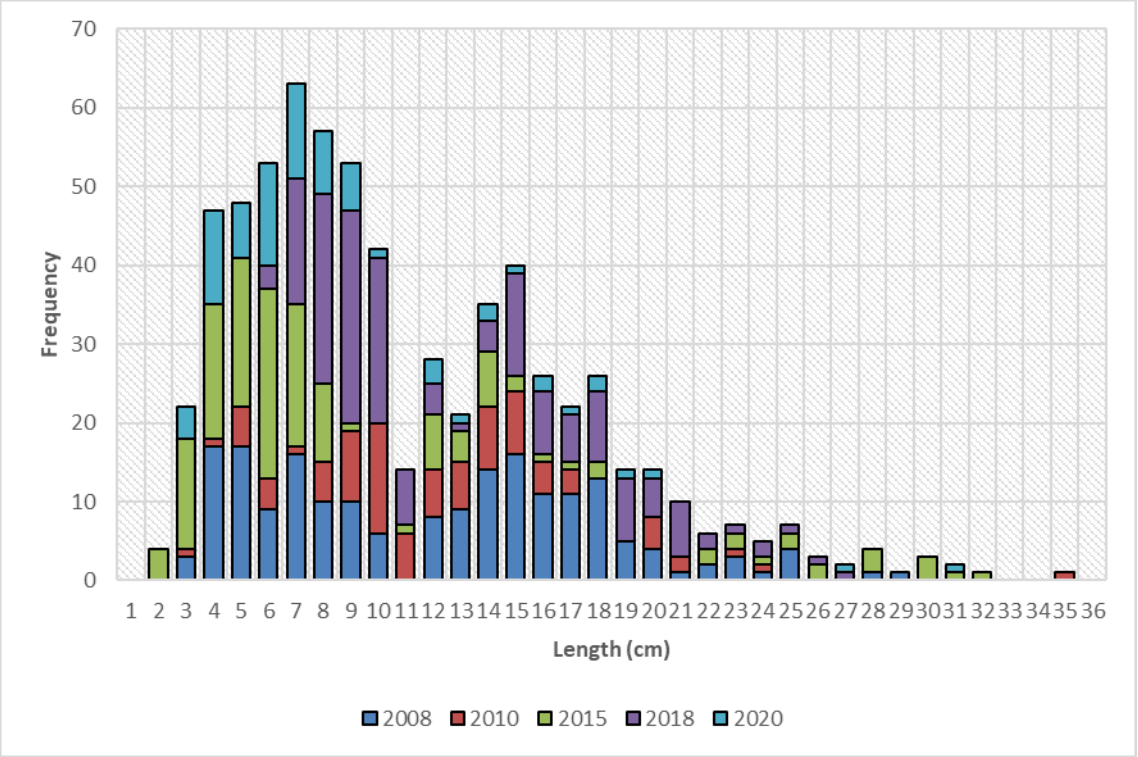

Fig 3: Length frequency analyses of flounder captured during the last five WFD surveys of the Avoca Estuary.

4.2.3 EMFI quality rating

The Avoca Estuary achieved good status in 2020, which is the same as the previous three surveys. (Table 2). The Avoca was classified as moderate in 2008.

Table 2. EMFI quality ratings of the Avoca estuary

Name	Year	EMFI	EQR	Classification
Avoca	2008	49	0.63	Moderate
Avoca	2010	55	0.73	Good
Avoca	2015	63	0.88	Good
Avoca	2018	61	0.84	Good
Avoca	2020	53	0.70	Good

5. Discussion

Thick-lipped grey mullet, flounder and sand goby made up over 88.7% of the catch. Gobies (9%) and juvenile flounder (35%) are associated with muddy substrates caused by fluvial deposition, where they feed on plant matter and invertebrates associated with mud (Aarnio *et al*. 1996). As the substrate is largely mud within the lower estuary and gravel in the upper estuary, the dominance by both species was not unexpected. These species can provide an abundant and important food source for piscivorous fish feeding within the shelter of the estuary. All of the Thick-lipped grey mullet were captured in the fifth beach seine (BS05) at the site located in the boat basin in the lower estuary (Fig. 1). This is the same area where they were captured in 2008 and 2010 when decent number were captured indicating this is an important area within the estuary for this species.

Although the EQR score classified the Avoca estuary is good it was slighter lower than the score received in 2015 and 2018. The salinity was substantially lower in 2020 compared to previous surveys as the River Avoca was in flood. This may have pushed some of the more marine species out of the estuary which led to a reduced number of species caught which will lower the EQR score.

6. References

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