

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

Broad Lough Estuary

IFI/2020/1-4534



Iascach Intíre Éireann
Inland Fisheries Ireland

Inland Fisheries Ireland

National Research Survey Programme

Fish Stock Survey of Transitional Waters in the Eastern River Basin District 2020– Broad Lough estuary

Inland Fisheries Ireland, 3044 Lake Drive, Citywest Business Campus, Dublin 24.

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

Cover: © Inland Fisheries Ireland

© Inland Fisheries Ireland 2020

Acknowledgements

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

Project team

Senior Research Officer

Project Manager

Technician

Fisheries Assistant

Dr. William Roche

Mr. Glen Wightman

Mr. John Coyne

Mr. Emmet Burke

The report includes Ordnance Survey Ireland data reproduced under OSI Copyright Permit No. MP 007508.

Unauthorised reproduction infringes Ordnance Survey Ireland and Government of Ireland copyright.

© Ordnance Survey Ireland, 2020.

Contents

1. Summary	5
2. Introduction	5
3. Methods.....	7
4. Results.....	7
4.1 Data summary – 2020 survey	7
4.2 Comparative analyses	9
4.2.1 Abundant species.....	9
4.2.2 Key species.....	9
4.2.3 EMFI quality rating.....	10
5. Discussion.....	10
6. References	12

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 Broad Lough 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 23 species and 524 individual fish were captured. Current data was also compared to a previous survey in 2008 and 2010 to assess how fish populations have changed in the intervening years.

2. Introduction

Broad Lough Estuary is situated just north of Wicklow town, on Ireland's east coast approximately 35 kilometres south of Dublin. The estuary is formed by the Vartry River and is separated from the open sea by a long grassy spit of land called the Murrough (Fig 1). The estuary covers an area of 0.80km², and is divided by a causeway and narrow bridge, built to carry the Dublin-Wexford railway line. A new bridge (R-999) 100m north of the railway bridge was constructed between 2010 and 2020. The upper section (above the new R-999 bridge) is relatively shallow and free of anthropogenic changes and consists of a partly tidal salt marsh, with intertidal flats exposed at low tide. It is extremely shallow, and access was limited even at high tide. The lower section has been modified to accommodate small and large boat traffic. The large boats are restricted primarily to the Wicklow harbour area.

The estuary is known as an angling mark for flounder.

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 and 2010, it was possible to examine any changes in population structure in the intervening years.

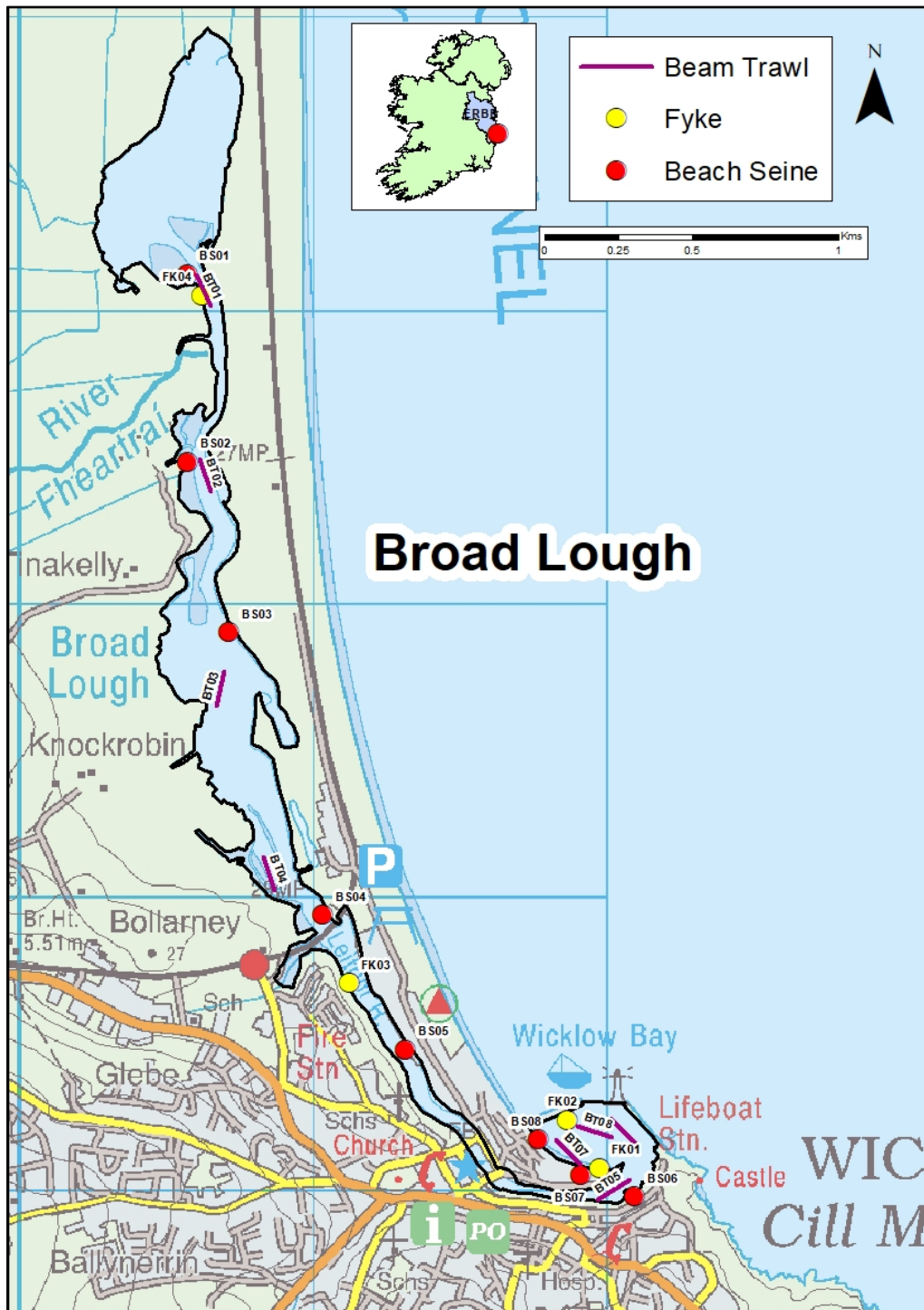


Fig. 1: Map of the Broad Lough Estuary showing all samples taken during the October 2020 survey.

3. Methods

The Broad Lough estuary covers an area of 0.80km². Fish stock surveys were conducted to ensure sufficient coverage of the water body so that stocks could be assessed. Sampling took place between 14th - 15th October 2020. Habitat type across the sites ranges from soft mud to hard sandy substrate 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 20 samples were taken using three different sampling methods (8 beach seine, 4 fykes and 8 beam trawls), over the course of the sampling programme (Fig.1). Temperatures

ranged from 12.1-14.5 °C (mean = 13.2°C) and salinity (PPT) ranged from 4.0 to 32.9 (mean= 25.8)

In the Broad Lough estuary, 524 individual fish were captured, counted and identified to species level prior to release. Twenty three 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 Broad Lough estuary

Species	Total count	Count measured	Ave length(cm)	Max length(cm)	Min length(cm)	Standard deviation (cm)	Relative abundance %
Cod	2	2	13.4	13.7	13.1	0.4	0.4
Common dragonet	5	5	4.9	5.4	4.1	0.5	1.0
Common sole	1	1	8.7	8.7	8.7	N/A	0.2
Conger eel	1	1	37.0	37	37	N/A	0.2
Corkwing wrasse	2	2	4.4	4.9	3.9	0.7	0.4
Dab	1	1	14.8	14.8	14.8	N/A	0.2
European seabass	8	8	21.4	52.3	8.1	13.1	1.5
Five-bearded rockling	5	5	17.0	21	13.9	2.8	1.0
Flounder	42	41	12.8	27	7.6	4.3	8.0
Hake	1	1	38.5	38.5	38.5	N/A	0.2
Lesser sandeel	8	8	8.2	9.7	6.3	1.4	1.5
Lesser weever	1	1	10.5	10.5	10.5	N/A	0.2
Long-spined sea scorpion	4	4	11.5	17.6	6.7	4.5	0.8
Plaice	27	27	7.5	15.4	5	2.2	5.2
Pogge	1	1	5.3	5.3	5.3	N/A	0.2
Pouting	1	1	13.1	13.1	13.1	N/A	0.2
Sand goby	231	128	5.4	8.5	2.9	1.4	44.1
Sand smelt	133	82	8.5	15.4	3.7	3.0	25.4
Short-spined sea scorpion	1	1	8.4	8.4	8.4	N/A	0.2
Sprat	32	32	6.8	12.7	4.9	1.3	6.1
Thick-lipped grey mullet	11	11	39.2	50.1	25.1	6.9	2.1
Tub gurnard	2	2	7.7	9.9	5.5	3.1	0.4
Whiting	4	4	12.2	15.5	9.5	2.7	0.8

4.2 Comparative analyses

4.2.1 *Abundant species*

Sand goby were by far the most abundant species within the estuary in 2020, making up over 44% of the total catch (Fig. 2). Sand smelt and flounder were also common, making up 25.4 and 8.0 % of the total catch, respectively. Sand smelt was present in greater abundance than in 2008 and 2010 (Fig. 2).

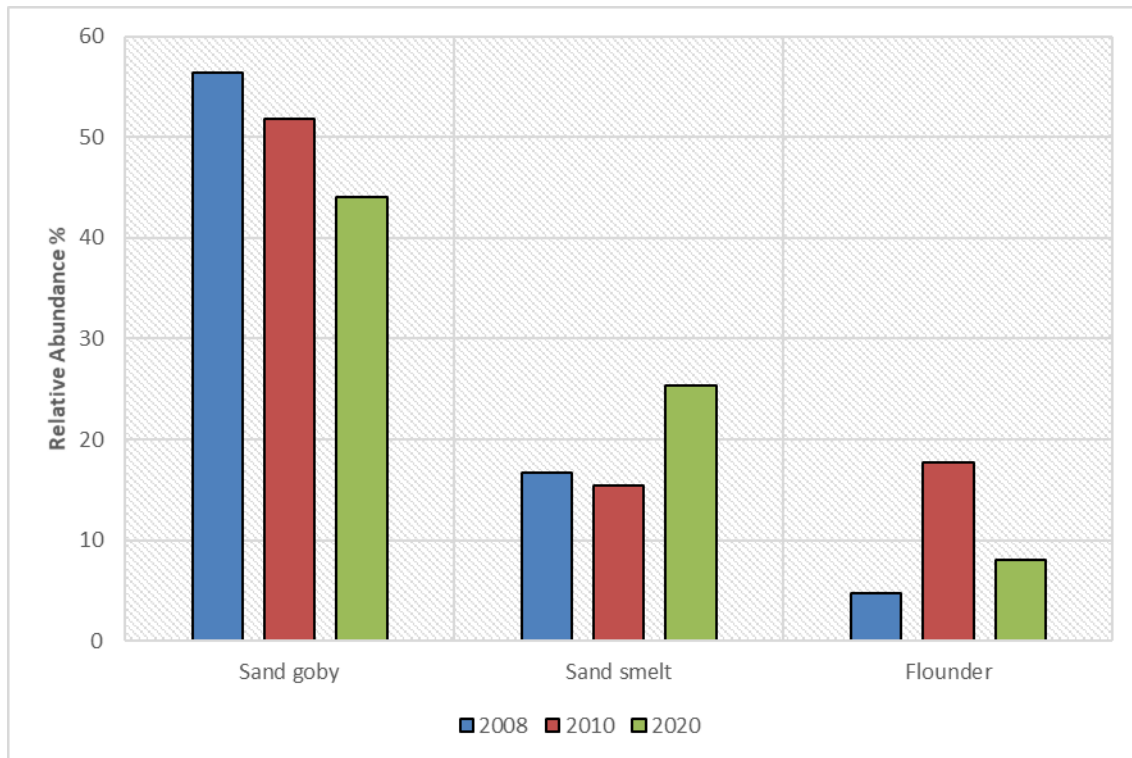


Fig 2: Relative abundance of the most abundant species captured during the 2020 WFD survey of the Broad Lough estuary and comparison with the 2008 and 2010 surveys.

4.2.2 *Key species*

Eight sea bass were caught during the survey with the largest bass measuring 52.3cm (Plate 1A). A scale sample was taken from all bass for ageing. The largest bass was tagged with a floy tag. The scales and floy tag information was passed on to IFI's National Bass Programme which collects data on bass in order to provide scientific advice to support management and conservation of Ireland's bass resource. Bass is Ireland's only marine fish species which is managed for angling.

A good variety of other angling species were captured during the survey: Cod, Conger eel, flounder, hake, plaice, tub gurnard thick lipped grey mullet and whiting. Several long-spined sea scorpions were captured (Plate 1B). These species are occasionally target by anglers in species hunt competitions. Relatively high fish species diversity was a feature of this site.

The data suggest that the Broad Lough has a valuable and broad fish nursery function, a feature of most estuaries.



Plate 1: A) Sea Bass

B) Long-Spined Sea Scorpion

4.2.3 EMFI quality rating

The Broad Lough estuary achieved good status in 2020 which was the same status it achieved in 2008 and 2010 survey (Table 2). It recorded the exact same EQR score in 2020 as in 2010.

Table 2. EMFI quality ratings of the Broad Lough estuary

System	Year	EMFI	EQR	Classification
Broad Lough	2008	57	0.77	Good
Broad Lough	2010	60	0.82	Good
Broad Lough	2020	60	0.82	Good

5. Discussion

Sand goby, sand smelt, and flounder made up over 77% of the catch. As the substrate is largely sand/mud within the estuary, this was not unexpected. 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 can provide an abundant and important food source for piscivorous fish feeding within the shelter of the estuary.

Although the estuary is dominated by mud/sand substrate there still a good mix of different habitats, with different bed slopes, depths, water velocities and salinities which are utilised by the wide array of species captured. 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). This was reflected by the overall diversity of species recorded and the 'Good' quality status.

Estuaries are often referred to as the "nurseries of the sea" because they provide critical habitats for many fish and other marine species, particularly during their early life stages. These sheltered, productive areas offer abundant food, protection from predators, and suitable conditions for growth and development (Sheaves et al., 2015). The Broad Lough fits into this category and with its Good status it is a valuable habitat in terms of ecosystem function and as fish nursery.

6. References

Aarnio, K., Bonsdorff, E. and Rosenback, N., 1996. Food and feeding habits of juvenile flounder *Platichthys flesus* (L.), and turbot *Scophthalmus maximus* L. in the Åland archipelago, northern Baltic Sea. *Journal of Sea Research*, 36(3-4), pp.311-320.

Harrison, T.D. and Kelly, F.L., 2013. Development of an estuarine multi-metric fish index and its application to Irish transitional waters. *Ecological indicators*, 34, pp.494-506.

Moyle, P.B., Lund, J.R., Bennett, W.A. and Fleenor, W.E., 2010. Habitat variability and complexity in the upper San Francisco Estuary. *San Francisco Estuary and Watershed Science*, 8(3).

Sheaves, M., Baker, R., Nagelkerken, I. *et al.* (2015). True Value of Estuarine and Coastal Nurseries for Fish: Incorporating Complexity and Dynamics. *Estuaries and Coasts* **38**, 401–414 <https://doi.org/10.1007/s12237-014-9846-x>

**Inland Fisheries Ireland
3044 Lake Drive,
Citywest Business Campus,
Dublin 24,
Ireland.
D24 Y265**

**www.fisheriesireland.ie
info@fisheriesireland.ie**

+353 1 8842 600

