The Thames European Eel Project Report

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Estuaries & Wetlands Conservation Programme
Zoological Society of London
Regent's Park
London, NW1 4RY

marineandfreshwater@zsl.org

www.zsl.org/eels

Acknowledgements

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1. Introduction

Since 2008, the European eel (*Anguilla anguilla*) has been listed as Critically Endangered on the International Union for the Conservation of Nature (IUCN) Red List of Threatened Species (Pike et al., 2020). European eel recruitment remains critically low (International Council for the Exploration of the Sea (ICES) stock advice, 2022) (Figure 1) and well below safe biological limits (Harrison et al., 2014). Declines in recruitment have been attributed to anthropogenic, climatic, and oceanic factors, and can affect all stages of their life cycle (Gollock et al., 2011). Direct inland anthropogenic factors affecting glass eel recruitment and adult escapement include habitat loss, pollution, barriers to dispersal, hydropower and commercial overextraction (Feunteun, 2002).

The Thames River Basin District (RBD) comprises 11% of the freshwater and lake habitat within England and Wales (EA, 2010), and provided important habitats for the historical eel populations that once existed in the catchment. However, eel recruitment continues to be low within the Thames RBD. A previous study showed that between 2005-09, a 99.4% decrease in Catch per Unit Effort (CPUE) was seen in the River Roding, while the Darent saw declines of 99.8% in total eel numbers caught between 1985 and 2009 (Gollock et al., 2011). Although much progress has been made restoring connectivity and improving water quality within the Thames RBD, it is clear much more work is required to improve annual upstream elver recruitment and silver eel escapement.

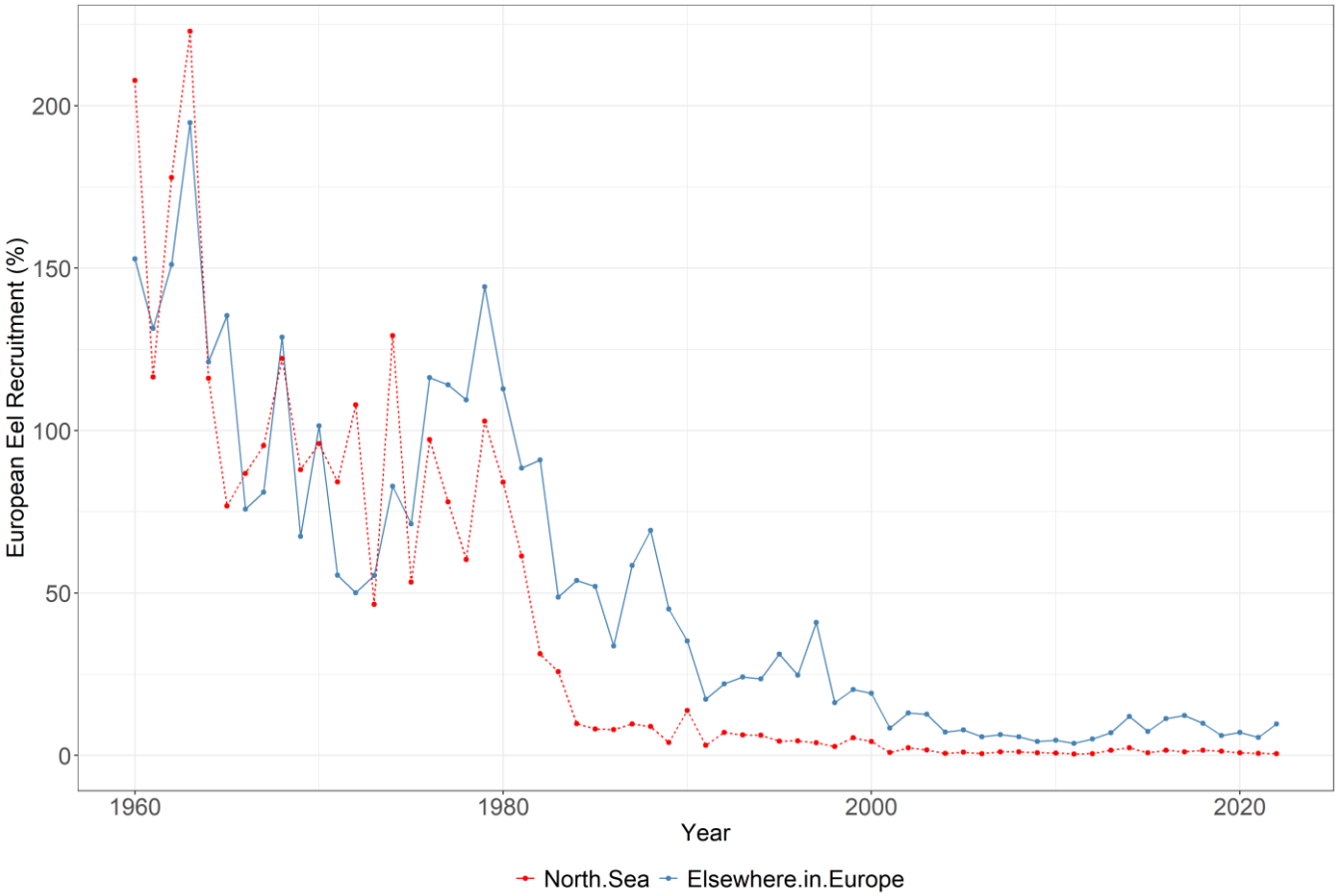


Figure 1, European eel stock recruitment indices from 1960-2022 for the North Sea and "elsewhere in Europe". Index values represent eel recruitment, as a percentage relative to the geometric mean of 1969-1979 values. Data obtained from ICES stock advice (2022).

2. Aims of the Zoological Society of London's Thames Eel Conservation Project

2.1. To inform local conservation activity

Within the Thames RBD, some sites are monitored for a shorter duration of approximately three years. This is done to investigate the impact of barriers to migration and provide evidence to help prioritise where conservation action is required, or to determine the effectiveness of newly installed passes. Since 2013, ZSL's Thames European Eel Project has been involved with the construction of 12 eel passes within the Thames RBD. Restoring connectivity within catchments and allowing migrating elvers access to upstream habitats is a key conservation action in freshwater. An estimated 139ha of habitat has been made accessible to eels as a result, allowing many more elvers to continue their life cycle and increase their chance of survival. Previous annual reports for the Thames Eel Conservation Project are available with further details.

In addition, the Thames European Eel Project has supported local partners in taking measures that contribute to the conservation of the European eel. Examples of this work include the development of the Eel Barrier Assessment Tool (EBAT), designed to rate structures based on their passability for eel, which was incorporated into the ObstacEELS project to systematically survey and assess river structures. Other research projects have also been developed through the Thames Eel Conservation Project that include a fyke netting survey of yellow eel in 2019, several MSc projects and evidence gathering on the impact of tidal control devices on eel migration into the North Kent Marshes.

2.2. To contribute to regional and national management of European eel

ZSL co-host the Thames Eel Management Plan Implementation Group (EMPIG) with the EA. EMPIGs were setup to support a partnership approach to delivering regional Eel Management Plans (EMPs). Annual meetings are held to keep stakeholders up to speed with priorities for eel in the Thames and to share best practice so that collectively we make the most for eel conservation from the available resources.

2.3. To support policy and international management of the European eel stock

Genetic evidence suggests that eels are panmictic (a single stock with random mating) which demands coordinated conservation and management across its range to ensure recovery. To support international management of the European eel stock, long-term data on recruitment trends is collected through the Thames European Eel Project from three index sites within the Thames RBD: Roding – Redbridge, Thames – Molesey Weir, and Medway – Allington Weir. Data from the Roding is annually fed into the joint European Inland Fisheries and Aquaculture Advisory Commission (EIFAAC)/ICES/General Fisheries Commission for the Mediterranean (GFCM) Working Group on Eels (WGEEL) and used as supplementary evidence to inform the annual stock assessments. ZSL also facilitates the new UK Eel Forum, established in 2022, which aims to improve communication and information sharing across stakeholders with regards to policy frameworks such as the ICES advice and Convention on the Conservation of Migratory Species (CMS).

3. Monitoring in 2022

3.1. Method

Data are collected between April to September, during the peak upstream elver migration season, using specially designed traps located at potential migratory barriers, typically the tidal barrier. For a full description of the monitoring method please refer to Pecorelli et al (2019) or contact ZSL. All work is completed under licence from the Environment Agency.

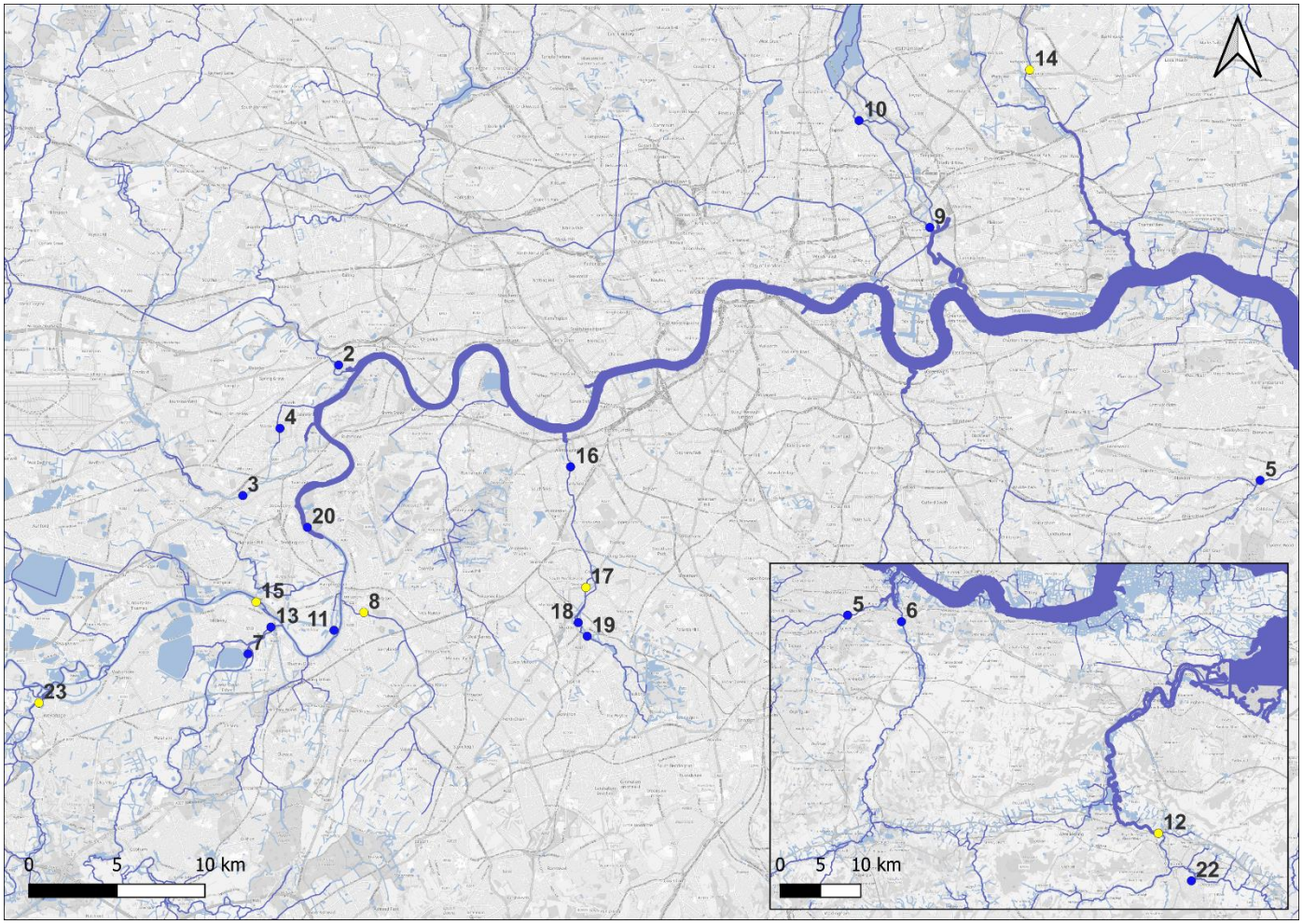
3.2. Monitoring Locations in 2022

Six sites were monitored in 2022 (Figure 2) using eel traps:

- Hogsmill – Middle Mill
- Thames – Molesey Weir
- Medway – Allington Weir
- Roding – Redbridge
- Wandle – Merton Abbey Mills
- Wey – Weybridge.

3.3. Trap design

Traps vary in their ability to catch passing eels, and therefore, direct comparisons between sites will not be valid. By calculating Catch Per Unit Effort (CPUE) and monitoring sites for multiple years, relative changes in recruitment over time can be determined for each site. For more details on trap design, refer to ZSL's 2021 eel report.



No.	River	Site	No.	River	Site	No.	River	Site
1	Ash	Colne Off-Take	9	Lee	Bow Locks	17	Wandle	Merton Abbey Mills
2	Brent	Stoney Sluice	10	Lea	Lea Bridge	18	Wandle	Morden Hall
3	Crane	Crane Park Island	11	Longford	Home Park	19	Wandle	Ravensbury Park
4	Crane	Mogden STW	12	Medway	Allington Lock	20	Thames	Teddington Lock
5	Cray	Hall Place	13	Mole	Zenith Weir	21	Chess	Chenies Bottom
6	Darent	Acacia Weir	14	Roding	Redbridge	22	Loose	Woodbridge Drive Weir
7	Ember	Island Barn	15	Thames	Molesey Weir	23	Wey	Weybridge
8	Hogsmill	Middle Mill	16	Wandle	Garratt Lane			

Figure 2, Locations of all traps monitored in 2022 (yellow) and those monitored in the past (blue).

3.4. Data Processing

Trapping duration at each site varies between years due to occasional trap failures. Trap failure is documented to enable a record of the total number of days the trap is active over the monitoring period, termed “effort”. The total number of eels caught is divided by the total number of successful trapping days to calculate the CPUE. This accounts for annual variability in trapping effort due to trap failure. Catch totals and CPUE’s for all sites are supplied to the Thames RBD Eel Management Plan (EMP) annually; eels ≤120mm (elvers) are recorded and reported separately.

4. Results

4.1. Eel Catches

In total, the seven traps (including left and right trap at Redbridge) caught 402 eels. Table 1 shows the breakdown of number of eels, elvers (≤120mm), and size variations caught. All traps except Weybridge caught elvers in 2022 (Table 1).

Table 1, Summary of eel numbers and sizes caught during the 2022 monitoring season.

Location	Total Eels	Total Elvers	Size (mm) Min	Max	Mean
Hogsmill - Middle Mill	19	4	100	400	217.1
Medway - Allington Weir	140	136	65	425	82.6
Roding - Redbridge Roundabout (LEFT)	140	130	50	140	85.2
Roding - Redbridge Roundabout (RIGHT)	70	60	50	142	90.4
Thames - Molesey Lock	16	13	20	170	81.9
Wandle - Merton Abbey Mills	14	2	90	300	192.1
Wey - Weybridge	4	0	150	675	312.5

4.2. Annual CPUE's

Annual CPUE's were calculated for five sites (excluding Weybridge due to no elvers being caught) (Table 2). All sites showed a decline in CPUE compared to previous years when data were collected (2021 for all sites except Redbridge, where data were last collected 2019). Figure 3 shows the annual trends of CPUE for all the index sites that are being monitored, with the addition of the ICES estimated elver recruitment (%) for the North Sea and "elsewhere in Europe". Percentage values of the ICES index correspond to recruitment as a percentage of the 1960-79 geometric mean.

Table 2, Annual CPUE scores for sites surveyed this year from 2012-22.

Trap Location	Annual CPUE										
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Middle Mill	0.01	0.04	0.08	0.08	0.18	0.21	0.12	0.21	NA	0.13	0.03
Allington Lock	10.90	133.30	66.68	2.34	0.48	1.49	0.76	0.87	NA	3.29	0.81
Redbridge	0.08	0.47	7.20	2.36	0.83	1.15	3.61	1.79	NA	NA	0.73
Molesey Weir	0.82	14.63	2.10	1.68	1.63	0.82	0.67	0.57	0.61	0.90	0.09
Merton Abbey Mills	0.97	0.64	2.46	0.50	1.41	11.34	0.79	0.92	NA	1.23	0.02

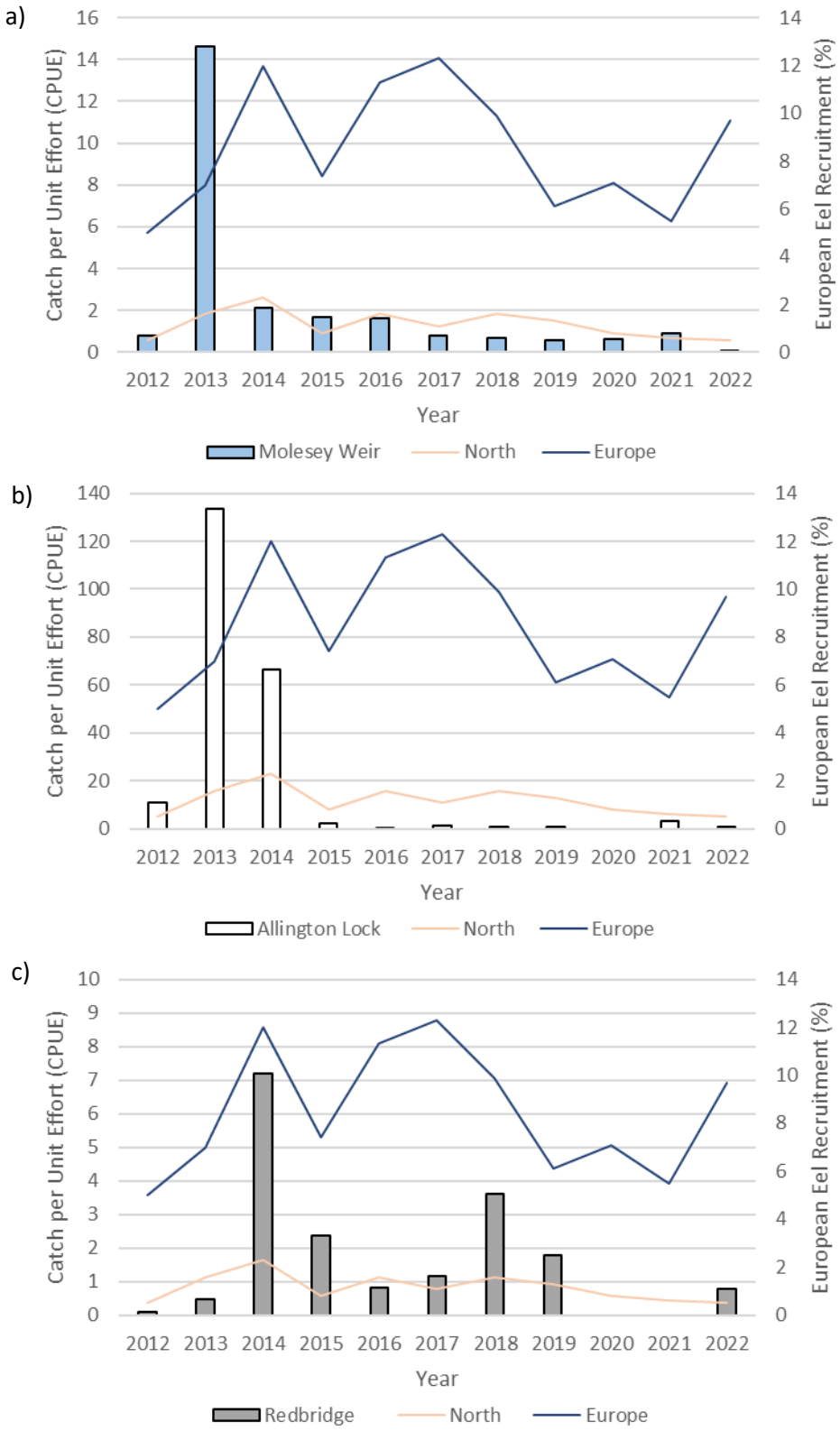


Figure 3, Annual CPUE for a) Molesey Weir, b) Allington Lock and c) Redbridge and ICES recruitment index (%) for the North Sea and the Europe (ICES stock advice, 2022). Data missing for Allington Lock (2020) and Redbridge (2020-21) CPUE was due to Covid disruptions.

5. Discussion

5.1. Annual CPUE for long term sites

All the traps monitored in 2022, except for the trap at Weybridge, have been monitored since 2012. Long term trends in CPUE show some variability across these sites, though more recent trends show continued low CPUE (such as at the Hogsmill and Medway traps) or continued declines in CPUE (Redbridge, Merton Abbey Mills and Molesey Weir traps). Merton Abbey Mills had the largest decline in CPUE, closely followed by Molesey Weir.

The decline in the CPUE seen at the three Thames European Eel project index sites mirrors the trend seen by the ICES "North Sea" eel recruitment index (ICES stock advice, 2022). Both the CPUE and ICES recruitment index showed declines between 2021 and 2022. The trend seen in "Elsewhere in Europe" showed a slight increase in recruitment, a trend not seen in any of the traps operated in 2022.

5.2. Trapping at other sites

- Hogsmill

Eel counts have been historically low on the Hogsmill, with 2022 showing no deviation from this trend. Age related damage on the trap, specifically the corner of the trap coming apart and brackets coming loose from the wall, meant that trapping days were lost. Trap efficiency may have been impeded, due to the potential for elvers to escape through the damaged area. Repairs will be undertaken on this trap during the winter months by the Environment Agency.

- Weybridge

The trap on the Wey at Weybridge only caught a total of four eels this season. All were greater than 120 mm, so no elver recruitment was observed into this section of the river. Environment Agency staff suggest that the small river structures and high flow downstream could have prevented elvers from reaching the trap. Actions to improve passage at the Weybridge site will be discussed during the winter.

5.3. Improving Connectivity

- River Brent- Stoney Sluice

Monitoring between 2012 and 2018 showed Stoney Sluice eel pass, at the tidal limit on the Brent, to be a very important site for eel migration in the region. The pump that supplies water to the pass stopped working in 2020. In 2021, ZSL worked with Canal and Rivers Trust to secure funding via the Environment Agency administered, 'Alternative Measures' scheme, to upgrade the eel pass.

In September 2022, contractors Installed a more robust pump and backup at the site and moved the new pumps away from their current location, where debris naturally collects and they are at risk of being washed away in spate flows.

Whilst on site the contractors saw that the power supply to the eel pass doesn't not confirm to safety standards, so they shut it off. At the time of writing, we are expecting CRT to modify the power supply so that it can be safely turned back on.

5.4. Other Projects

- North Kent Marshes

The coastal wetlands of North Kent, along the banks of the Medway Swale estuary, have the potential to be highly productive habitat for eel. A series of eel-specific barrier assessments undertaken in the North Kent Marshes in 2017 concluded that there were several water control structures such as tidal flap gates that were impeding eel migration in and out of the marshes, and that the priority for future monitoring and barrier mitigation should be those structures in the sea wall. Between May-July 2022, five sites in the North Kent Marshes were assessed for glass eel and elver passability using habitat collectors (or 'mopheads') as per the design by Robert Rosell of the Agri-Food and Biosciences Institute (AFBINI). The sites were selected and monitored with the support of the EA, The Faversham Society, Medway Swale Estuary Partnership, Kent Wildlife Trust, RSPB, and local citizen scientists. Elver presence was recorded upstream at all sites, however, few eels were recorded up or downstream at three of the sites limiting what could be said about eel passage there. The 'mopheads' provided qualitative data that suggested that the tidal flap gate modifications at Seasalter were allowing regular elver passage into the marshes but that those at Thorne Creek might be impeding access under certain conditions. Further work is needed to better understand the impacts of those structures on eel migration. The full report on the North Kent Marshes eel monitoring and plans for next steps can be found online at European eel conservation | Zoological Society of London (ZSL).

- Eel migration master's study at Molesey lock

Barriers continue to stop/reduce the migration and availability of habitat to eels, as well as for other fish species, within the Thames RBD. To date >500 barriers have been identified across the Thames RBD (Gollock et al., 2011), some of which have been scored on their passability via the barrier assessment tool (ZSL Eel Barrier Assessment Tool). Continued work is required to ensure that barriers are removed where possible or retrofitted to make them passable to eels. One such example, showing successful modification was completed on Weir C at Molesey lock. In this case, a weir with a vertical lip at the top was regraded, with the aim to improve eel migration. The study by James Doyle at UCL, supported by ZSL and the Environment Agency, as part of a master's thesis, showed that eel migration effectiveness, the number of eels passing over the crest of the weir, improved dramatically after the completion of the works (Doyle, J. 2022). Increasing habitat quality and improving connectivity through removal/modification of barriers remains a critical tool within freshwater habitats to boost the number of elvers that reach maturity.

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