

# Project Proposal

## 1.0 Project Background

For over half a century, the annual City of London Thames Fishery Research Experiment has been conducted on the River Thames. This engaging event not only honours the region's rich angling tradition but also gathers valuable data on fish catches, thereby enhancing the understanding of the river biodiversity and health.

The Experiment actively involves the local community, particularly anglers, who are increasingly aware of, and concerned about, the environmental condition of the river. Subsequently the angling community play a pivotal role in any future research.

Over the years, data has been collected from the event but not used for any other purpose beyond reference. In recent years, significant efforts have been undertaken to establish a more robust scientific foundation for the Experiment. It is therefore recommended to integrate the Thames Fishery Research Experiment with a scientific initiative.

The aim of this project is to ensure that the valuable information and data obtained from any future City of London Thames Fishery Research Experiments are incorporated into a scientifically robust initiative with broader implications. This will support ongoing scientific research into the health status of the River Thames.

## 2.0 Proposed Project Title

To examine the impact of Polychlorinated Biphenyls (PCBs) on the health status of fish in the River Thames and assessment of climate change trends.

## 3.0 Project Overview

This project aims to assess factors affecting fish health in the River Thames using data from the annual City of London Thames Fishery Research Experiment, in order to understand current fish contamination and identify climate change trends.

### 3.1 Fish contamination

The River Thames flows through a densely populated and industrialised area of the UK and has a history of Polychlorinated Biphenyls (PCBs) contamination.

The Kent and Essex Inshore Fisheries and Conservation Authority (KEIFCA) has reported concerns from fishers about estuary conditions, particularly related to sewage releases and water quality. Fish are seen as indicators of aquatic health, and worries have been raised about pollutants such as PCBs, which persist in the environment and are reported to be toxic to wildlife and humans (Ngoubeyou et al, 2022). The River Thames has a history of PCB contamination due to its industrialised region.

The stomach contents of several fish taken at the 2024 Experiment were subject to analysis, which revealed the ingestion of synthetic materials. This could provide further evidence to support the presence of PCBs within the River Thames.

Therefore, this project will evaluate PCB levels, heavy metal contamination, microplastic ingestion, and biological trends in fish collected from the study.

### 3.2 Climate change trends

Lamon et al. (2012) found that climate-induced changes in marine environments greatly affected PCB presence. Previous research by Lu et al. (2015) supports this finding, predicting PCB distributions under climate change scenarios, with Paul et al (2012) suggesting an increase in water temperature as one of the most influential factors.

Anecdotal data collected from previous Experiments have indicated variations in water temperature, with a maximum increase of 4.5°C observed over a two-year period.

The experimental data collected in 2024 has shown a change in the number and types of species, with a decrease in whiting, eel, and pouting populations, and an increase in bass numbers. This may suggest that water temperature also impacts the type and number of fish species observed in the river.

Jeppesen et al (2023) found that rising sea levels impact on the salinity of water, consequently impacting on the biodiversity of species and pollutants. Prior to 2024, water salinity was not recorded at the Experiment, therefore the project will also record salinity at the event, to assess the impact of water salinity as part of a climate induced change on PCB presence as well as river species diversity.

Therefore, this project will support ongoing analysis of these potential climate induced changes to inform future studies and align with any wider environmental monitoring.

### 4.0 Project objectives

1. Collecting data from fish samples at the 53<sup>rd</sup> Thames Fishery Research Experiment.
2. Analysing PCB concentrations in fish through laboratory tests.
3. Comparing current PCB levels with 2015 projections.
4. Examining fish year class and condition, including pre- and post-spawning, nursery, and feeding activities.
5. Recording fish parasite activity and infestation levels.
6. Analysing heavy metal and microplastic contamination.
7. Assessing climate change impact on PCB distribution by correlating findings with recent environmental data, recording water temperatures, water salinity and noting changes in species visiting the river section.
8. Producing a detailed report with findings and recommendations for future monitoring and pollution control.

### 5.0 Methodology

#### 5.1 Sample Collection

- Fish will be collected during the annual City of London Thames Fishery Research Experiment.
- Prior to the event, a predetermined range of species and quantities of fish will be established to ensure a representative sample of the river's fish population.
- If necessary, dispensations for undersized fish will be obtained from the local fisheries enforcement body.

#### 5.2 Laboratory analysis

- Fish samples will be collected and transported to a certified laboratory for analysis.
- PCB levels will be measured using Gas Chromatography-Mass Spectrometry (GC-MS) following standard protocols.
- Microplastics and heavy metals will be analysed to establish the concentration ingested by each fish from this section of the river.
- Internal and outer skin parasite identification will take place to determine common infestations.
- The year class of each species will be identified to establish the importance of this section of the river as a nursery and/or spawning ground.
- Gut content sampling will be conducted to identify food sources found in this section of the river.

#### 5.3 Data analysis

- PCB concentrations will be analysed and compared with the predictions made in the 2015 study.
- Statistical analysis will be conducted to identify any significant deviations from the predicted values.
- Water temperature and salinity levels taken on the day will be recorded and compared with previous results.
- The number of species, length, and number of fish will be recorded and compared with previous years.

#### 5.4 Climate Change Impact Assessment

- Recent climate data, such as temperature, salinity and rainfall, will be collected and analysed to assess their correlation with PCB bioaccumulation in fish.
- The project may also evaluate the impact of climate change (e.g. temperature, salinity) through the identification of new species and the absence of formerly common species in this river section.

### 6.0 Project expected outcomes

1. **Accurate PCB measurements** by obtaining a detailed assessment of PCB levels in fish from the River Thames.
2. **Validation of predictions:** Empirical data to validate or challenge the 2015 study's predictions.
3. **Climate Change Insights:** An insight into how climate change may be influencing PCB distribution and species diversity.
4. **Provide an up-to-date scientific basis for the Thames Fishery Research Experiment:** including sampling, analysis, and reporting methodologies.
5. **Submit fish sample data to the National data archive "Marine Recorder".**
6. **Policy Recommendations:** Formulating evidence-based strategies for future environmental monitoring and PCB management initiatives in the Thames.
7. **Stakeholder and wider collaboration:** This project will involve collaboration with:
  - a. The Angling Community: via the Angling Trust.
  - b. Environmental Agencies: aligning with current environmental monitoring efforts, including Kent and Essex IFCA, Environment Agency, and Natural England.
  - c. Academic Institutions: for data analysis and interpretation, involving the University of Essex and Hadlow College.

### 7.0 Conclusion

This project will examine PCB contamination in the River Thames, verify predictions, and assess climate change's impact on pollutant distribution. It will also explore temperature and salinity effects on fish diversity, assess the river's role as a nursery and feeding ground, and map common fish parasites. These results may inform environmental policy and conservation efforts.

Furthermore, this project's collaboration will offer an opportunity to engage with stakeholders, including government agencies and academic institutions. By continuing to collaborate with the wider angling community this enhances the understanding of the river health status.

The data obtained from future annual Thames Fishery Research Experiments may serve as a substantial basis for an expanded range of important research initiatives. These initiatives could significantly contribute to and shape the advancement of scientific studies dedicated to the biodiversity and health of the River Thames.

### 8.0 References

**Jeppesen, E., Canedo-Arguelles, M., Entrekin, S., Sarma, S., Padisak, J.,** (2023), *'Effects of induced changes in salinity and coastal water ecosystems'*

**Lamon, L., MacLeod, M., Marcomini, A., Hungerbuehler, K.**(2012), *'Modelling the influence of climate change on the mass balance of polychlorinated biphenyls in the Adriatic Sea'*

**Lu, Q., Johnson, A., Jurgens, M., Sweetman, A., Jin, L., Whitehead, P.,** (2015), *'The Distribution of Polychlorinated Biphenyls (PCBs) in the River Thames Catchment 2 under the Scenarios of Climate Change'*.

**Ngoubeyou, P., Wolkersdorfer, C., Ndibewu, P., Augustyn, W.,** (2022), *'Toxicity of polychlorinated biphenyls in aquatic environments – A review'*.