Agenda Item B5

By: Principle Scientific and Conservation Officer

To: Kent & Essex Inshore Fisheries and Conservation Authority – 6 August 2025

Subject: PhD project: *"Shellfish fisheries under pressure from increasing frequency and intensity of marine heatwaves"*

Classification Unrestricted

Summary:

This paper informs Members of the successful establishment of a new research partnership between the University of Essex, the Fishmongers' Company, and KEIFCA to co-fund a PhD project. The study will investigate the temperature tolerance and climate-related responses of key shellfish species in the Thames Estuary, providing evidence to support future sustainable fisheries management.

Recommendations:

Members are asked to **APPROVE:**

1. KEIFCA's involvement with the PhD project: *Shellfish fisheries under pressure from increasing frequency and intensity of marine heatwaves; and*

2. The contribution of £40,000 to part fund the PhD project from KEIFCA. With the funds for the project to be taken from funding we have received from DEFRA to support our FMP and MPA work, with £20,000 taken from each reserve.

Summary

Shellfish are a vital part of the inshore fisheries in the Thames Estuary, supporting the livelihoods of local fishing communities. However, rising

sea temperatures and more frequent marine heatwaves are already impacting marine ecosystems, shellfish stocks, and fishers' ability to maintain viable fisheries. These environmental changes are expected to intensify in the years ahead.

This PhD project aims to better understand how key shellfish species — including cockles, whelks, and Manila clams — will respond to a warming sea. It will investigate how rising temperatures affect their biology, behaviour, reproduction, and survival. It will also explore whether the composition of shellfish species in the Thames Estuary may shift towards different species, and what this could mean for future fisheries.

The project builds on earlier work by KEIFCA and the University of Essex, where a study led by Dr Michael Steinke and student Lillie Elving helped validate methods for measuring temperature stress in whelks using oxygen consumption. This was a critical first step, laying the foundation for broader research across multiple species. The outputs from this work have been vital to provide scientifically robust feedback to our concerned fishers.

The new PhD is a collaboration between the University of Essex, Kent & Essex IFCA, and The Fishmongers' Company (Homepage - The Fishmongers' Company). It will combine laboratory trials, field sampling, and climate data analysis to provide the evidence needed for long-term, sustainable shellfish management by arming us with critical knowledge around key shellfish species responses to water temperature stress.

By understanding how shellfish are likely to respond to large scale environmental drivers, KEIFCA will be better equipped to support coastal fisheries and develop the adaptive tools and strategies needed to manage future challenges.

---

1. Project Title

The following working titles reflect the focus of the proposed PhD on climate impacts to Thames Estuary shellfish fisheries:

- *"Shellfish fisheries under pressure from increasing frequency and intensity of marine heatwaves"*
- *"Impacts of Rising Sea Water Temperatures on Shellfish Physiology and Distribution in the Thames Estuary"*

2. Rationale and Context

The Thames Estuary is already experiencing the effects of climate change. Since 2014, sea surface temperatures have risen markedly, leading to more frequent days exceeding 20°C during summer and a sharp increase in the frequency and intensity of marine heatwaves (MHWs). These trends

are driving ecological shifts that have direct consequences for local fisheries, and us as fishery managers.

In August 2022, fishers reported moribund and unusually high numbers of dead whelks from fishing pots along the north Kent coast. KEIFCA investigated the incident, and laboratory trials led by Dr Michael Steinke (University of Essex) confirmed that elevated temperatures caused physiological stress in whelks, leading to moribund behaviour, lasting damage to internal metabolic processes and mortality. These findings were widely shared through Authority meetings, *Fishing News*, and the 2024 ICES conference.

Growing concerns about ecosystem change prompted KEIFCA to host a mini-conference in November 2024: *Changing Seas of Kent and Essex*. Scientists from the Environment Agency, Cefas, Natural History Museum, Wildlife Trusts, and ZSL presented two decades of evidence documenting wide-ranging ecological changes — from water quality and plankton, to shellfish, finfish, and top predators. A KEIFCA-led survey of commercial and recreational fishers echoed this evidence, highlighting the decline in traditional fishery species and rising concern over the health of coastal waters.

These signals of change have helped refocus KEIFCA's priorities, strengthening collaborations with academic and research institutions. A key outcome of this is and identification of the need for adaptive tools to help manage climate-driven risks — including:

- Real-time marine heatwave "trigger points" to protect shellfish stocks.
- Pre-spawning temperature forecasting to support cockle fishery planning.

This PhD project is a direct result of that strategic shift. Building on earlier KEIFCA-University of Essex research, it will help assess the vulnerability of a broader range of shellfish species to climate change, equipping KEIFCA with the evidence and tools needed to respond to a warming sea.

The research also aligns with national fisheries priorities. It addresses several evidence gaps identified in the Defra-funded Fisheries Management Plans (FMPs) for cockles and whelks, including:

- Monitoring climate-driven changes in species abundance and distribution.
- Assessing options for adaptive fisheries management.
- Identifying risks and forecasting climate-related impacts.
- Supporting ecosystem-based approaches to management.

The work also contributes to Cefas's Coastal Health and Livelihoods (CHLE) programme, which seeks to develop a coordinated national response to unexplained mass mortality events.

This research is therefore both timely and necessary. In summary:

- Clear ecological changes are already being observed:
    - Increased sea temperatures and more frequent/intense MHWs.
    - 2022 whelk mortality event.
    - Declines in cod, flatfish, crab, and lobster (*Changing Seas* conference).
    - Increases in Manila clams and finfish like bass.
- Shellfish now underpin the District's inshore fishery economy:
    - Cockles (>£8 million annually) and whelks (>£1 million) are key target species.
    - Manila clams present an emerging opportunity for coastal communities.
- KEIFCA has a statutory duty to manage fisheries sustainably under the Marine and Coastal Access Act 2009:
    - Anticipating climate-driven changes in species' physiology and distribution is essential to meeting this responsibility.
- The Manila clam case highlights a broader shift in thinking:
    - Naturalised, warm-water species may offer new fishing opportunities.
    - Future management may need to evolve from a focus on control to one of sustainable integration.

3. Research Objectives

The project will address the following core research aims:

- Assess thermal tolerance in commercially important shellfish species, namely
    - Whelk
    - Cockles
    - Manila clams
- Quantify physiological, behavioural, and reproductive responses to elevated temperatures:

    - Including oxygen consumption, condition indices, and reproductive effort
- Integrate observed biological data with local sea water temperature trends to forecast species shifts & identify implications for fisheries.
- Provide robust, applied evidence to inform KEIFCA's adaptive management and policy.

4. Project Partners

The PhD will be delivered through strong collaboration between scientific, management, and funding partners:

- **Lead Research Institution**: University of Essex
- **Co-funder/ Host Organisation**: Kent & Essex IFCA
- **Co-funder / Supporters**: The Fishmongers' Company

5. Supervision Team

The student will be supported by an experienced, interdisciplinary supervisory team with academic and applied research staff:

- **Dr. Michael Steinke** (University of Essex, primary supervisor)
- **Dr. Philip Haupt** (KEIFCA, co-supervisor)
- **Dr. Will Wright, Dom Bailey** (Advisors)
- **Prospective advisors:** Experts in species responses to changing environments John Pinnegar (CEFAS), Rodney Forster (University of Hull)

6. Timeline

The project is expected to begin in January 2026 and follow a typical PhD structure over 3–4 years. Field work and sample collection will be carried out in close collaboration with local fishers to ensure that samples are collected at the right time of year.

- **Start Date**: January 2026
- **Key milestones:**
    - Year 1: Experimental setup, lab work and literature review, initial fieldwork, stakeholder engagement
    - Year 2: Field sampling continues; climate modelling initiated
    - Year 3: Data analysis, synthesis, and reporting
    - Year 4: Thesis write-up, stakeholder engagement, knowledge exchange

Year	Phase	2026 H1	2026 H2	2027 H1	2027 H2	2028 H1	2028 H2	2029 H1	2029 H2
1	Student Recruitment & Start-Up	●●●							
1	Experimental Setup & Method Development	●●●	●●						
1–2	Laboratory Work & Physiology Trials	●●	●●●	●●●					
1–2	Field Sampling & Fieldwork	●	●●●	●●●	●				
2–3	Data Modelling & Integration with Climate			●●	●●●	●			
3	Data Analysis		●	●●	●●●	●●●	●		
3–4	Drafting Publications / Thesis Chapters		●	●	●●	●●●	●●●		
4	Final Write-Up & Thesis Submission					●	●●	●●●	●
4	Knowledge Exchange & Stakeholder Outreach	●		●		●	●	●●●	●

Legend

- ● = Key activity period (heavier ●●● = intensive focus)
- H1 = Jan–June; H2 = July–Dec

7. Anticipated Outputs and Benefits

The research will deliver both academic and applied outcomes, including:

- PhD thesis and peer-reviewed scientific publications
- Evidence to inform KEIFCA shellfish management strategies
- Contribution to KEIFCA's broader understanding of environmental change
- Outreach and dialogue with local fishing communities via KEIFCA and the Fishmongers' Company
- The practical outputs from this work not only shows how and why KEIFCA is adapting to changes of its fisheries to the changing environment, it also provides the practical tools to enact new management strategies.

8. KEIFCA Involvement

KEIFCA will play a central role in facilitating, guiding, and applying the research

- Provision of access to:
    - Local fishers, fisheries datasets, field sites, and vessel support
- Ongoing knowledge exchange between KEIFCA staff and academic partners
- The student will be embedded within the KEIFCA team for part of the project to maximise applied impact.

Funding

The funding for the project will be drawn down from the funding we have received from DEFRA to support our Fisheries Management Plan work (FMP) and our DEFRA Marine Protected Area (MPA) work, with £20,000 taken from each reserve. The results of this research will help address the climate change objective in the Fisheries Act and in the Whelk and Cockle FMPs. In addition, the research will also help inform the Conservation Objectives of MPA sites in our district, like the Essex Estuaries SAC, where healthy cockle populations are a key component of the structure and function of the site.

Recommendations:

Members are asked to **APPROVE:**

1. KEIFCA's involvement with the PhD project: *Shellfish fisheries under pressure from increasing frequency and intensity of marine heatwaves; and*

2. The contribution of £40,000 to part fund the PhD project from KEIFCA. With the funds for the project to be taken from funding we have received from DEFRA to support our FMP and MPA work, with £20,000 taken from each reserve.