Coastal Wetlands for Fish – building foundational knowledge to guide effective habitat restoration

Wetlands provide key ecosystem services, such as water quality improvement, shoreline protection, and nursery habitats for many fish species. However, our understanding of the importance of coastal wetlands in supporting fish life cycles and population growth remains poorly resolved for many species. Targeted fish habitat research is essential to understand how fish use coastal wetlands to successfully complete their life cycles and sustain healthy populations. Gathering detailed knowledge of the fundamental processes underpinning services that coastal wetlands provide for fish will inform effective management, investment, and activities to protect Queensland's coastal wetland ecosystems.

Framework for fish habitat research

Fish habitat research is essential for describing the links between coastal wetlands and nearshore marine habitats, and the environmental processes that enable key fish species to successfully complete their life cycles and sustain healthy populations. These needs align with Queensland's *Whole-of-System, Values-based Framework* (WOS-VBF) and the *Aquatic Ecosystem Rehabilitation Process*. These are best-practice approaches that guide holistic aquatic habitat management, by developing a detailed understanding of components (parts) and processes, and how they interact to deliver the services and values coastal wetlands provide.

Why is this project needed?

Queensland's population is concentrated along its coastlines and many livelihoods, culture, and day-to-day activities, including recreation, depend on the health of coastal systems. Fish and fishing are tightly interwoven with traditional culture and the commercial, recreational and tourist sectors. The success and productivity of fish populations are closely tied to the robustness, health, and connectivity of the coastal wetland mosaic along the Queensland coast.

However, there are substantial gaps in our understanding of the wetland components required by fish at different life-history stages, and of the processes that underpin their successful growth and recruitment. This can hamper effective management of wetlands to support the values of provided by fish and lead to poor environmental, social, and financial outcomes. Addressing these knowledge gaps is an urgent priority as fishers, fisheries managers and wetland managers seek to enhance the sustainability of fish stocks and reduce impacts and risks to coastal wetlands from the joint threats of anthropogenic development and climate change. Without this knowledge, interventions such as habitat rehabilitation may be unsuccessful, and strategic investment misdirected. A collaborative knowledge partnership across management, research, and the community is needed.

Figure 1. Tidal flats are an example of essential habitat used during critical life stages of many fishes and invertebrates, image by M. Sheaves, JCU Marine Data Tec Hub

Links to policy, legislation and end users

Ensuring the long-term health and resilience of coastal wetlands is integral to maintaining matters of national environmental significance (e.g. the Outstanding Universal Value of the Great Barrier Reef's World Heritage Area GBRWHA) and supports Ramsar wetland criteria and wise use of wetlands. Matters that are prescribed environmental matters under the Environmental Offsets Regulation 2014 can include fish habitats. Marine plants, declared Fish Habitat Areas and waterways providing for fish passage are examples of matters of state environmental significance.

Detailed science-informed understanding of the components and processes supporting Queensland's inshore fish habitats is directly relevant to these goals, criteria and policies. It will inform key strategic directions, such as **Queensland's Sustainable Fisheries Strategy** (e.g., fisheries ecological risk assessments, harvest strategies, stock assessments and multi-species ecosystem-based fisheries management). It will also inform management strategies implemented under the Queensland water planning framework (Water Act 2000), to protect environmental flows to estuaries that support fisheries values.

What will be delivered?

This project will connect the logic of the WOS-VBF, and **Ecological Constraint Mapping** (Sheaves *et al, 2021)* to collect and synthesise information of the use of inshore habitats by key fish species. The information synthesis (literature review and expert opinion) will connect fish habitat use to the processes that support the lives of these key fish species and will reference the specific services these habitats provide. Focal species include finfish and invertebrate species of commercial, recreational and/or iconic value, reliant on estuarine, coastal wetlands and inshore waters, particularly during their early life-history stages. When critical knowledge gaps are identified, targeted research will be conducted at key representative locations along the Queensland coast.

Project outputs will include:

- information synthesis products
- a report to fisheries expert panels
- scientific papers
- targeted stakeholder training courses
- reporting & customised educational products, e.g. critical habitat maps for local stakeholder groups including Traditional Owners, recreational fishing clubs, etc.
- ecological constraint maps and rehabilitation best management practice guides targeted to local Councils and other land management groups (Natural Resource Management (NRM) groups, Landcare groups, etc.)
- communication and extension products e.g. network/spatial visualisation tools, spatial habitat datasets and information base for sharing on websites (Department of Agriculture and Fisheries website, Wetland*Info*, Wetland*Maps*, Queensland Globe, Open Data and environmental reports online)
- a list of remaining knowledge gaps to inform targeted further research.

Who is involved?

The project is led by the Department of Environment and Science (DES) and the Department of Agriculture and Fisheries (DAF) in collaboration with JCU Marine Biology. Collaborations are being sought with other research organisations. Essential non-government partners will include First Nations groups, NRM groups and catchment groups, angling groups, community groups and citizen science organisations.

These groups are critical to the success of the project, as members have personal connections to fish and the landscape/seascape, providing access to a vast store of

firsthand knowledge. This provides potential for research data collection at scale, and the ability to effectively feed results back to interested parts of the community. Citizen scientists and involved participants will be included as full research partners.

Potential end-users will include managers and decision-makers at all levels, from government departments, through NRMs and local government to involved First Nation and community groups.

Figure 2. A juvenile barramundi, known to be highly dependent on a range of inshore habitat types. Image by Amos Mapleston
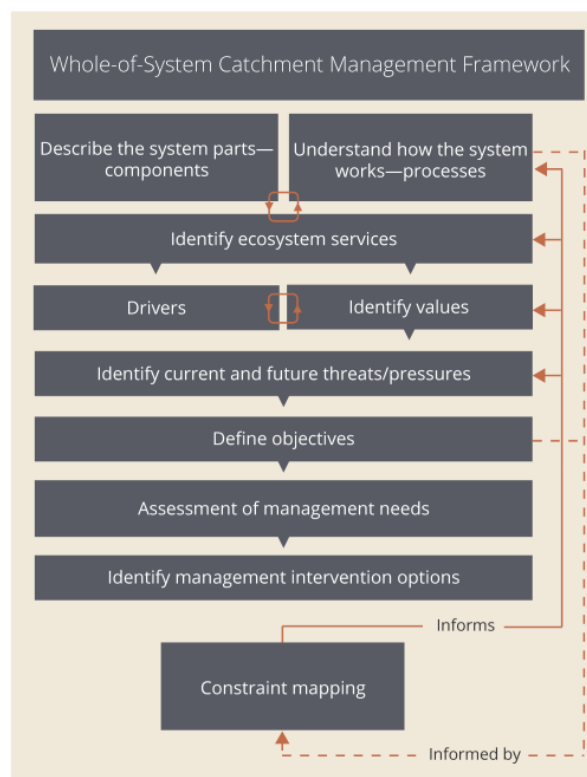

Figure 3. Ecological constraints mapping (Sheaves *et al,* 2021) links directly to the logic of the Whole-of-System, Values-Based Framework (WOS-VBF).