Research Theme: Environment

Case Study

New Genetic Methods Support Sustainable Fisheries Management

RESEARCHERS

Professor Paul Shaw
Dr Niall McKeown

THE OVERVIEW

Demand for seafood and advances in technology have led to fishing practices that are depleting fish and shellfish populations around the world. Conserving biodiversity and protecting threatened populations and species through sustainable fishing practices is critical.

Advances in DNA techniques have enabled Aberystwyth University (AU) researchers to produce genetic definitions of fished stocks and provide the scientific evidence required to improve accuracy and sustainability in the management of exploited wild populations.

Fishery managers, governments and NGOs have been empowered through knowledge transfer to implement critical changes to policy and guidelines, resulting in improved fishing practices and a greater understanding of the power of precise genetic information. This has had positive economic benefits to fishing communities and aided conservation of marine biodiversity, securing the future of multiple fish and shellfish species globally.

THE RESEARCH

Fishery management relies on accurate data-based definitions of fished stocks. Genetic methods of stock description are more accurate, and more biologically meaningful than historical, or geo-political delimitations of fished populations.

Led by Professor Paul Shaw and Dr Niall McKeown, and collaborating with fishery managers, government agencies and NGOs, the AU research group developed genetic approaches to improve stock definitions and management, and to provide DNA markers for testing the provenance of fishery products to help police fishery regulations. Stock definitions and advice were provided for finfish, shellfish and cephalopod fisheries in the Western Indian Ocean, NE Atlantic (including UK), North America, Chile, Brazil, South Africa and Angola.

Three relationships are provided as examples of impact resulting from this body of work: with the Indian Ocean Tuna Commission (IOTC) and International Commission for the Conservation of Atlantic Tunas (ICCAT) on yellowfin tuna; with fisheries managers in regional government in the Falkland Islands and Wales; and with artisanal fisheries managers in the Western Indian Ocean.

THE IMPACT

IMPACT ON INTERNATIONAL GUIDELINES AND POLICY

The research has resulted in changes to international organisation guidelines, and has influenced policy regarding the collection of data and its use in the management of global commercial fisheries. For example, our study on yellowfin tuna was used to inform changes to guidelines on fisheries data gathering and analysis by the Indian Ocean Tuna Commission (IOTC), and transfer to the International Commission for Conservation of Atlantic Tunas (ICCAT). As an invited External Expert, Professor Shaw put to the IOTC Working Parties that their international boundaries, and so landing statistics and management models, should be changed to reflect the biogeographic rather than geopolitical boundary between the two areas and their yellowfin tuna stocks. Changes to the IOTC and ICCAT boundaries from November 2019 will have significant impact on how tuna should be managed, particularly in the Indian Ocean.

IMPACT ON PRACTICE AND POLICY

Our research has also had impact on practice and policy regarding management of regional commercial fisheries. The Welsh Government commissioned studies of fisheries genetics of whelk, seabass, brown crab and razor clam populations in Welsh waters to inform their sustainable management of these resources. The data and advice from these studies have been used in preparation for post-Brexit negotiations on reopening of the seabass fishery, and in whelk fishery management through changes to policy and regulations on minimum landing sizes.

IMPACT ON PRACTITIONERS

A series of research projects for the Falkland Islands Government resulted in knowledge transfer and input to management of commercial fisheries resources vital to the Falklands economy. Based on earlier studies of toothfish that resulted in Marine Stewardship Council sustainable fishery accreditation of the South Georgia fishery, the aim has been to apply similar studies to wider areas and different species of finfish (e.g. Southern Blue Whiting, Rockcod) and cephalopods (Shortfin squid), to better define transboundary stocks across territorial waters of the Falklands, Argentina and Chile. As the Falkland Islands fisheries use a sustainable management method based on Total Allowable Catch linked to real-time catch data, it is vital that the geographical and demographic definition of fished stocks is accurate in the models used. The resultant knowledge transfer, data and advice have helped refine models for sustainable catch regulation for the Falkland Islands Government and fisheries managers, leading to increased sustainability and commercial value.

IMPACT ON THE ECONOMY AND BIO-DIVERSITY

The Rodrigues octopus fishery in the Indian Ocean had been in decline over many years due to over-exploitation. A study by the Aberystwyth group established that the octopus population of Rodrigues was isolated from other populations in the SW Indian Ocean, and therefore unlikely to be replenished by larval input from external sources if the Rodrigues population crashed due to overfishing. Consequently, the local administration implemented a change in policy through a series of closures to fishing. This management approach has resulted in both sustainable management and improved local incomes from artisanal fisheries.