# The importance of acoustic telemetry for restoring fish stocks

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All around the world fish stocks have declined tremendously during the last decades, both in the marine as in the freshwater environment. Multiple causes can be addressed, working on different levels of the ecosystem: overfishing, habitat destruction and modification, pollution, migration barriers (especially for migratory species), diseases, competition with invasive species and climate change.

Since fish are an important protein source, they have a high economic value; a large part of the human population depends on fish stocks both in the primary and secondary sector (7.1 billion in 2012 according to the FAO, SOFIA 2014 report). Since the majority of global fish consumption relies on natural stocks, it is necessary to maintain/restore stocks to healthy population levels. Currently, many fish stocks are outside safe biological limits.

To restore stocks, a better understanding of fish movement and behaviour in relation to habitat use and environmental requirements is needed. Due to lacking knowledge about fish migration, it is unsure whether current management measurements are sufficiently adapted to fish migration routes. Industry, harbours and dredging may cause changes in seabed morphology, current patterns, the amount of dissolved sediment and oxygen level in the water, which could be detrimental to fish. Also, fishing might happen at places which are important recruitment areas. A state-of-the-art technique to unravel fish movement, is acoustic telemetry: fish are provided with an acoustic tag, which emits a signal that can be detected by receivers. The LifeWatch ESRI observatory funded a network of such receivers in inland Belgian freshwater systems, the Scheldt Estuary and the Belgian Part of the North Sea. This gives us the ability to track fish over a wide area and between different habitats (e.g. marine versus estuarine environment). We selected Atlantic cod (Gadus morhua) and European eel (Anguilla anguilla) as indicator species for marine and diadromous behaviour. Both fish have an economic value and have known a strong population decline.

During this study, there is a lot of cooperation with stakeholders of different fields of interest (e.g. Rijkswaterstaat, Waterwegen en Zeekanaal, nature conservationists, fishermen…). By exchanging information with each other, win-win situations for both fish populations and human society can be created. Also, the accessibility of acoustic telemetry contributes to ocean literacy and links science with technology. The technique allows to reveal migratory routes and frequently crossed habitats, so management actions can be applied specifically to these areas. As such, eel and cod populations can be protected more efficiently. It is necessary to communicate the results of this study and not only make people aware of the need for protection of the sea ‘s heritage, but also that this can be achieved efficiently with the application of acoustic telemetry.