Cefas
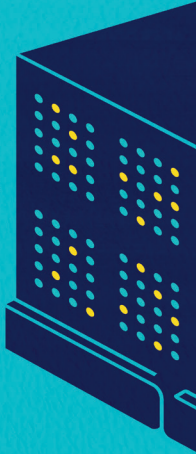
MODELLING A FISH COMMUNITY USING SUPER COMPUTERS

Discover our 20 highlights of world class
science research at www.cefas.co.uk

Centre for Environment
Fisheries & Aquaculture
Science

MODELLING A FISH COMMUNITY USING SUPER COMPUTERS

Fisheries management science is traditionally applied to stocks of a single species in one region of the ocean at a time i.e. each separate fish stock is treated as if it is isolated. However, we know that fish stocks may compete for the same food, and individuals of one stock may eat another. Not only that, but fishing fleets may capture fish of several different species at the same time, so in practice, only rarely are stocks and fisheries isolated from each other.

Ideally, the interactions between fish species and the fisheries should be considered when designing management measures so that multispecies and mixed fisheries effects are properly taken into account. Cefas have pioneered the incorporation of these effects into the fish stock assessment process. For example, in 2004 Cefas published a ground-breaking study on the multispecies pelagic fishery in South Africa, showing how managing the sardine and anchovy stocks together has improved the management process.

Subsequently, Cefas has developed new methods based on fish size as well as species, that represent the complex food web of a multispecies fishery using only a modest set of parameters. This allows more rigorous treatment of the many uncertainties involved in fish stock modelling.

In 2017 this approach was used to undertake an evaluation of the concept of "pretty good yield" (PGY – as opposed to "maximum sustainable yield", or MSY) in North Sea fisheries. ICES has championed the PGY concept on the basis of stock by stock analysis, and Cefas were the first to look at PGY ranges whilst taking account of both multispecies and fishing fleet interactions. Cefas' study showed that fishing in the upper half of the PGY ranges leads to a high risk to stocks and of missing ecosystem sustainability targets, but provides only a minimal additional reward.

Cefas are now a leading centre for "management strategy evaluation", a process by which fisheries management strategies are tested for their robustness to uncertainty relating to stock biology, survey measurement, and implementation of management approach. Cefas continues to develop new methods and modelling tools to inform the fisheries advice of the future. These methods take an integrated view of fish communities and their fisheries whilst also quantifying the uncertainties involved. By developing and implementing these new methods, they will provide fishery managers with confidence that their management approaches will safeguard ecosystems from overfishing.