Ramsey Marine Nature Reserve Fisheries Management Zone: A novel approach to mitigating the socioeconomic impacts of an MPA

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Summary

In 2009 Ramsey Bay, a small but nonetheless economically important area in the Isle of Man (IOM), was closed to scallop dredging. Subsequently the area was designated a Marine Nature Reserve (MNR), within which a Fisheries Management Zone (FMZ) was established. The lease to manage fishing within the FMZ is held by local fishermen through their Producer's Organisation, the Manx Fish Producers Organisation (MFPO). In December 2013, following extensive cooperation between fishers, scientists and government a strictly controlled fishery, targeting *Pecten maximus*, was prosecuted within the FMZ for the first time since its closure. The MFPO adopted a novel cooperative approach contracting three of their member boats to attain the total allowable catch (TAC) and sharing the profits between its members. The fishery afforded a unique opportunity to evaluate the efficacy and socioeconomics of such a strategy. The fishing strategy demonstrated extensive interaction between economic and ecological interests and resulted in the restoration of a portion of the economic capital lost to fishers whilst maintaining the ecological integrity of the MNR.

Introduction

In November 2009 Ramsey Bay was closed to dredging for scallops as stocks were seen to have become depleted. Later the Ramsey Bay Marine Nature Reserve (RBMNR) was created, part of which (45.9 km^2) was designated a fisheries management zone (FMZ). In 2013 a lease to manage the FMZ was granted to the Manx Fish Producers Organisation (MFPO). Subsequently, scientific surveys showed *P. maximus* stocks were increasing so a decision was made by the MFPO to undertake a limited fishery in the area. Following scientific advice the MFPO decided to restrict the fishery to an area of approximately 20% (9.1 km^2) of the FMZ and imposed a Total Allowable Catch (TAC) of 23200kg. In addition, for economic, enforcement and ecological reasons, the MFPO decided that the fishery should be prosecuted using a novel cooperative approach with only three of its member boats fishing and the profits shared as a dividend by its members.

Materials and Methods

Vessels participating in the fishery were required to carry GPS loggers, with a 5 second polling interval, in addition to their Vessel Monitoring System (VMS). These loggers were necessary in order to compensate for the fact that the 2 hour polling interval of VMS describes vessel movements at too low a resolution for fishing effort to be accurately mapped within the limited confines of the fished area. The data obtained from these loggers allowed the spatial distribution of fishing effort during the

fishery to be represented at a fine scale. Additionally, fishers were requested to record the start and end coordinates, time, and catch for each tow on a log sheet. Onboard observers also collected data related to the size and ages of the scallops and the proportion of undersized animals caught in the dredges.

In order to estimate Green House Gas (GHG) emissions during the Ramsey Bay fishery it was first necessary to quantify fuel use. Fishers were asked to estimate their average speed and fuel consumption when a) fishing and b) steaming. Based on the fuel use per hour for each activity and the known steaming and fishing times, fuel use during the fishery was calculated. Using values calculated in a previous study by Walsh (2010), relating to fuel use and emissions in the Isle of Man *P. maximus* fishery, it was also possible to assess the environmental impact of the fishery in Ramsey Bay in the context of the wider Manx *P. maximus* fishery. It is important to note that in both instances only direct emissions as a result of the burning of fossil fuels were considered.

Capture fisheries may be thought of as industrial systems whose primary focus is on the production of food energy. Quantification of the energy efficiency of a fishery may therefore be extremely useful and this is traditionally done by calculating the edible energy return on investment (EROI) ratio. As the nutritional component of shellfish is primarily a function of their protein content, edible protein energy output is the most appropriate basis for comparison in this instance (Tyedmers *et al.*, 2004). Therefore the edible protein EROI (ep-EROI) was calculated for both the Ramsey Bay fishery and the Manx *P. maximus* fishery as a whole.

Results and Discussion

In total approximately 181 hectares (1.81 km^2) of seabed were affected by the fishery (approximately 2.9% of the FMZ). Catch rates from the fishery averaged 1.37 bags per dredge per hour. *P. maximus* from Ramsey Bay were on average seen to be larger and faster growing than the Island-wide average for autumn 2013, with individuals reaching MLS (110 mm) at a lower age. Indeed only 14% of observed catches during the fishery were below Minimum Landing Size (MLS). Yields from the fishery were approximately 27.5kg of scallop meat or circa £300 per hectare. The initial intention had been to fish the area in May 2013 when the price for *P. maximus* was approximately £9.50 per kg meat weight. However, the MFPO, in deciding to delay the fishery until December 2013, achieved a price of £13.50 per kg meat weight and a gross profit 42% greater than would have been achieved had the same catch been landed in May.

Total GHG emissions resulting directly from the fishery would have been in the region of 3.6 tonnes, of which 3.54 tonnes were estimated to comprise CO_2. The calculated edible protein Energy Return On Investment (ep-EROI) ratio for the Ramsey Bay fishery was approximately 0.712 which meant that, for every kg of chemical energy expended, in the form of fuel, 712 grams of edible energy, in the form of protein were obtained. The Ramsey Bay fishery was as a result of its high capture rate, the extremely short steaming distances involved and the lack of interference competition between vessels, as much as nine times more energy efficient than the Manx *P. maximus* fleet as a whole.

References

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