



Modelling Recreational Fishing Behaviour

Node 4.5.2

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Overview of Issue

- Rec fisheries
 - share resource with commercial sector,
 - some fisheries now predominantly recreational
 - minimally managed
- Rec fishers
 - different drivers
 - different reaction functions and parameters
 - valuation of time, environment, fish species, experience, sport and catch*
 - values as inputs versus values as outputs*

- Need to understand these differences in order to:
 - Devise appropriate management regimes
 - Devise appropriate sharing regimes for inter and intra sectoral allocation
- Need to understand rec fishing drivers/values to determine how balance might be struck between
 - Monitoring and compliance
 - Self regulation, voluntary compliance

Context

- Almost all recreational fisheries share a fish stock with a commercial fishery
- Traditionally, commercial fishing has dominated recreational fishing in most shared fisheries, but this is changing.
- While many commercial fisheries are well managed, almost all recreational fisheries are minimally managed
 - Politically very difficult to limit entry and/or limit the size of the recreational catch.

Recreational Fishery Management

- Essentially open access - no property rights
 - No limit on numbers of recreational fishers
 - Often no requirement to hold a fishing licence
- Effort limitation
 - Seasonal closures
 - Spatial closures
 - Gear restrictions
- Catch limitation (often non binding)
 - Bag (possession) limits
 - Size limits

Underlying Research Premise

- Recreational fisheries more challenging to manage than commercial fisheries
- Effective and efficient management of recreational fishing is biggest impediment to implementation of IFM & potentially EBFM
- Need more comprehensive theory of recreational fishing and a better understanding of interaction between different categories of recreational fisheries and fishery management policies

Research Objective

- Develop analytical model of recreational fishing that allows:
 - simulation of fishing behaviour based on defined drivers of behaviour and recreational fisher typology
 - simulation of behaviour and choices in minimally managed recreational fisheries
 - simulation of alternative management regimes that could be implemented
 - And as a potential by product
 - Improved methods, including surveys for assessing marginal benefit from recreational fishing

Previous Models

- No fully satisfactory analytical framework yet for economics of recreational fishing
- Previous analysis fits into two area
 - Survey based valuation studies where objective is to estimate WTP for recreational fishing depends on # fishing trips & on trip quality/experience - often measured by catch rate
 - Limited in application by lack underlying choice model, especially where rec fishery is open access
 - Optimization models designed to analyse specific choice situations such as size and bag limits and their relationship to utility maximization behaviour
 - Woodward and Griffin (2003) Size and Bag Limits in Recreational Fisheries: Theoretical & Empirical Analysis

Multi dimensional motivation for recreational fishing

- Need a model that can account for
 - Variation in fishing behaviour by type of fisher and type of fishery
- Requires a specific accounting of the multidimensional nature of recreational fishing
 - First pass at model is based on individual fishers deriving 3 types of benefits:
 - quantity and size of retained fish for consumptive purposes.
 - sport value of quantity and size of fish landed and either kept or released, and
 - experiential value from time spent on, in, or adjacent to a marine or freshwater environment

Basic Idea of a Recreational Fishing Model

- “utility” from fishing depends on:
 - Time spent fishing, e.g # of days = d
 - Quality of fishing quality per trip, $q(t, h, k, s)$ where:
 - t = total time (hours) per trip
 - s = minimum size of retained fish
 - h = # of minimum size fish harvested (landed)
 - k = # of minimum size fish kept or retained; where $k \leq h$
 - other “goods”, O , other time = ot , other days = od

- Objective of recreational fishers is to maximise their individual welfare (“utility”) subject to 3 constraints:
 - fishing day time constraint: $t+ot \leq 24$
 - annual time constraint: $d+od \leq 365$
 - income constraint: $c*d + z*O \leq \text{Income}$; where c =cost/fishing trip, & z = unit cost for other “goods”

Model will allow analysis of

- Recreational fishing choice variables:
 - number of days spent fishing, d
 - total hours per fishing trip, $t=w$ where w is hours spent on, in, or adjacent to water
 - hours spent fishing (i.e. with “line in water”), f
 - hours spent retaining minimum size “landed” fish, r
 - NB $r \leq f \leq w$
 - minimum size of “harvested” fish to retain, s
 - number of “harvested” fish (size $\geq s$) to retain, k
 - number of “harvested” fish (size $\geq s$) to release, $h-k$

Outcomes

- By approaching analysis of rec fishing in this way we hope to facilitate improved understanding as to:
 - Drivers of marginal net benefits from recreational fishing, in particular how this is affected by changes in abundance conditional upon changes in management and allocation
 - Potential to increase rec fishing value from introduction of management in minimally managed fisheries and