Bridge between fishery dependent and fishery independent data - Design of Fishing Derbies for use in Recreational Fisheries Management

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Abstract

Abstract is the last thing to write - keep that with line at the beginning of the code

Author summary

I don't publish in plos One so I'm not sure why this is here.

Text based on plos sample manuscript, see
https://journals.plos.org/ploscompbiol/s/latex

Introduction

Collecting and synthesizing data that are aligned with fishery management goals is essential for the long term sustainability of fishery resources. Data used to manage fisheries are derived from two principle sources: fishery-independent data (scientific surveys) and fishery-dependent data (collected from active participants in the fishery). The collection of fishery-independent data for the purpose of stock assessment and management is generally preferred as it is less prone to bias and confounding effects that can arise from individual fisher behavior including skill and gear selection that can be difficult to correct for. Although preferred, fishery-independent data can be expensive to collect thus fishery-dependent data as an attractive alternative despite its shortcomings.

Depending on the value of the fishery, the use of fishery-dependent data can have dire consequences. Indeed, one of the causes of the worlds greatest fishery collapse (Atlantic cod) was a result of weighing commercial fishery catch-and-effort data in the analyses of population trends (see my thesis for reference for this). There are however, ways to include fishery independent data and it plays a large role in the management of large commercial fisheries (Tuna - see Maunder GLM paper). This is possible for large scale fisheries where catches of individual vessels can be accounted for in the analysis but this is less practical for relatively small scale recreational fisheries.

New technologies are allowing for the easy and remote collection of recreational fishing data. These data are collected by mobile apps where fishers opportunistically enter their catches and include other informataion such as size, species and even location. These apps collect individual fishing behaviour so that can be controlled in the analysis but still suffer from gear and effort issues.

See outline - this is a test
Ways to control for this

- Structure surveys via derbies
- Model individual fisher behaviour (maybe we could use age for experience?)
- Use derbies as a way to build catchability effectiveness of gear types?

How this paper should proceed

- Simulation?
- make a table of warts of recreational fishery data
-

Here are two sample references: [1,2].
#Bridge between fishery dependent and fishery independent data

Structure of the paper

Recreational fishing derbies Angling data alone

- truncated measure of size structure
- relative abundance
- Table of common fishery metrics - fishery independent - fishery independent

limitations of fish independent - expensive, high effort
limitations of fishery dependent - more effort
Fixed gear - choice of single or multiple lures
increased power using both methods

#Confounding factors

Mark recapture monitoring

Equations

Here is an equation:

$$f_X(x) = \left(\frac{\alpha}{\beta}\right)\left(\frac{x}{\beta}\right)^{\alpha-1} e^{-\left(\frac{x}{\beta}\right)^{\alpha}}; \alpha, \beta, x > 0.$$

Here is another:

$$a^2 + b^2 = c^2. \tag{1}$$

Inline equations: $\sum_{i=2}^{\infty}\{\alpha_i^{\beta}\}$

Figures and tables

Figure 1 is generated using an R chunk.

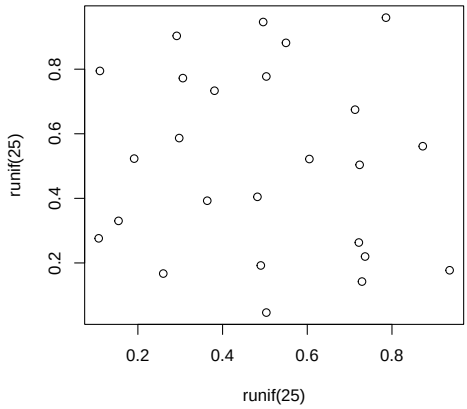

Fig 1. A meaningless scatterplot.

Tables coming from R

Tables can also be generated using R chunks, as shown in Table 1 for example.

```
knitr::kable(head(mtcars)[,1:4],
    caption = "\\label{tab1}Caption centered above table"
)
```

Table 1. Caption centered above table

	mpg	cyl	disp	hp
Mazda RX4	21.0	6	160	110
Mazda RX4 Wag	21.0	6	160	110
Datsun 710	22.8	4	108	93
Hornet 4 Drive	21.4	6	258	110
Hornet Sportabout	18.7	8	360	175
Valiant	18.1	6	225	105

References

1. Feynman RP, Vernon Jr. FL. The theory of a general quantum system interacting with a linear dissipative system. Annals of Physics. 1963;24: 118–173. doi:10.1016/0003-4916(63)90068-X
2. Dirac PAM. The lorentz transformation and absolute time. Physica. 1953;19: 888–896. doi:10.1016/S0031-8914(53)80099-6