Fishing for Beads: Simple Games, Serious Insights

Gunnar Knapp University of Alaska Anchorage Gunnar.Knapp@uaa.alaska.edu

James J. Murply University of Alaska Anchorage (USA) JMurphy@cbpp.uaa.alaska.edu

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Summary

- We have developed simple and fun "fishing games" which can be played easily and quickly with cheap supplies.
- The key common feature of the games is that players physically engage in a "fishing" activity.
- The games demonstrate many important and sometimes subtle economic characteristics of fisheries.
- We have found these seemingly simple games to be powerful and effective tools for instruction, outreach, and experimental research.
- Similar simple games can be devised to examine a very wide variety of fisheries situations and issues.

Game supplies and their analogies to fisheries

Bowl of beads Fish stocks

Scoops *Fishing gear*



Rewards Fishing profits

Cups Fishing ports







The games can be played with any similar supplies. All that matters is the *relative* sizes of the scoops and the volume of "beads."



20 lbs of pinto beans

1/8-cup to 1-cup scoops

The key common feature of the games is that players physically engage in a "fishing" activity—using scoops to "harvest" beads out of the bowl. As in real fisheries, their earnings are based on how much they harvest, the "prices" of the beads, and their "costs".



General rules for all games

- At the start of the game, the bowl (stock) contains one full cup of beads.
- You "fish" for beads by using a scoop to "deliver" beads to your cup.
- Your cup must remain on the table behind the white tape



- No talking with other players (communication with other fishermen) is allowed unless specifically permitted.
- Spilled beads (lost fish) may not be retrieved
- No deliberate interference is allowed with other players (fishermen)
- A game round (fishing season) ends when everyone stops scooping (fishing).

Rules for the GEAR CHOICE GAME (IIFET 2012 version)

- You may "fish" for beads using any size scoop. If you wish, you may switch scoops during the round.
- After each round (fishing season), you must pay for your scoop (gear) by putting five full scoops of your beads from your cup back into the bowl—of the largest size scoop you used.
- You will be paid in an amount of beer equal to the volume of beads remaining in your cup.

Five full scoops



What typically happens in the Gear Choice Game . . .

At least some players choose larger scoops.



(fishing for M&Ms candy)

The players who choose the largest scoops get most of the harvest.

Gross harvests before paying for gear



A large share of potential profits (rents) are dissipated as gear costs. The players who use smaller, lower cost scoops do worst.

Total harvest costs (five full scoops from each player's harvest)



Net profits after paying for gear

The simple economics of the gear choice game

- Total costs would be minimized, and profits would be maximized, if all players chose the smallest and lowest cost scoops.
- (Costs would be even lower if they contracted with just one player to harvest all the beads with just one of the smallest scoops.)
- But the individual profit-maximizing strategy is to choose a larger scoop because the marginal revenue from a higher catch share exceeds the marginal cost of the larger scoop.
- A significant share of potential rents is dissipated as gear cost.
- The share of total rents which are dissipated depends on the game parameters:
 - The unit cost of a scoop
 - The relative sizes of scoop options
 - The volume of quota relative to scoop sizes
 - The number of players

Game strategies can be analyzed, predicted and tested for different game parameters. This can be an interesting and instructive assignment for students.



Parameters: Total quota = 100 small scoops; Gear cost = 5 scoops; Ratio of large scoop size to small scoop size = 3.

We have conducted formal experimental research using a version of the gear choice game.

Voluntary Approaches to Transitioning from Competitive Fisheries to Rights-Based Management¹: Bringing the Field into the Lab

Gunnar Knapp and James J. Murphy

This paper describes a novel experiment designed to examine how rent dissipation may occur in fisheries in which the right to participate is limited and fishermen compete amongst themselves for shares of an exogenous total allowable catch. We demonstrate that rent dissipation may occur through multiple mechanisms, and that the heterogeneity of fishermen has important implications for how rent dissipation occurs and the extent to which different individuals may benefit from the implementation of rights-based management. We apply this approach to investigate the concept of voluntary rights-based management under which managers divide the total allowable catch between two separate fisheries, and fishermen may choose between fishing for a guaranteed individual harvest quota and competing for a share of the total catch in a competitive fishery.

Agricultural and Resource Economics Review 39/2 (April 2010) 245–261 Copyright 2010 Northeastern Agricultural and Resource Economics Association More subtle and interesting insights of the gear choice game . . .

Significant numbers of beads are spilled, leading to significant additional rent dissipation (foregone potential profits)



More subtle and interesting insights of the gear choice game . . .

- As in real fisheries, players are heterogeneous:
 - In gear choices
 - In how skilled they are at fishing
 - In how aggressively they fish
 - In how much they enjoy fishing
- Even when real money is at stake, some players are clearly significantly motivated by their *relative catches* rather than only their own profits.
- Gear choices and fishing behavior evolves over time
- Institutional changes (such as individual quotas) drastically change not only gear choices but the entire character of the fishery:
 - Speed, aggressiveness, spills, enjoyment

Rules for the PORT CHOICE GAME (IIFET 2012 version)

- Place another cup on the floor near the table where you can reach it.
- Use your 5 ml (1 TSP) scoop to "fish."

- You can choose where to "deliver" your beads (fish).
 - To your cup (the port) on the table (behind the white tape)
 - To your cup (the port) on the floor
- After each round, the volume of beads in your cup on the floor will be doubled (an amount will be added equal to the amount you delivered).
- After the volume of beads in your cup on the floor has been doubled, pour all your beads together in one of the cups. You will be paid this amount of beer.

The Port Choice Game (Ainsworth & Dunham, 2010)

- All subjects use the same size scoops and have no costs.
- Subjects can choose between delivering to a "near" pitcher or a "far" pitcher
- They get paid a higher price for beans delivered to the far pitcher
- But because it takes longer they won't catch as much if they deliver to the "far" pitcher

The Port Choice Game: Experimental Results ... (Ainsworth & Dunham, 2010)

Percentage of Total Bean Deliveries

The Port Choice Game: Experimental Results ... (Ainsworth & Dunham, 2010)

Average Disposition of Potential Value, by Price Paid for "Far" Pitcher Deliveries

Rules for the HARVEST CHOICE GAME (IIFET 2012 version)

• Use your 5 ml (1 TSP) scoop to "fish."

- You will fish for two rounds (fishing seasons).
- Round #1 will end when all players (fishermen) stop scooping (fishing).
- After round one, more beads will be added to the bowl (fish will be added to the stock).
- The amount added to the bowl will be equal to the volume remaining in the bowl after round one—but only up to the level of a full bowl.
- Round #2 will end when all players (fishermen) stop scooping (fishing).
- You will be paid an amount of beer equal to the volume of beads in your cup after both rounds.

Similar simple games can be devised to examine a very wide variety of fisheries situations and issues . . .

Effects of paying different prices for beads of different colors Similar simple games can be devised to examine a very wide variety of fisheries situations and issues . . .

Blue beads are "bycatch"

Entire fishery is shut down if more than (for example) 2 blue beads are caught. Similar simple games can be devised to examine a very wide variety of fisheries situations and issues . . .

Blue beads may only be fished with tweezers but are worth 20 times as much as red beads which may be fished with scoops. "Fishing for Beads" vs. more sophisticated computer games

- Advantages
 - Cheaper
 - Easier and quicker to set up and explain
 - Easier to change game structure and rules
 - More intuitive and "real" for players
 - Easier to observe subtle and unexpected results
 - Heterogeneity, spills, aggression, collaboration, etc.
 - Is an actual (if extremely simple) physical resource harvesting activity
 - Easier for student research projects
- Disadvantages
 - Harder to simulate dynamic fishery situations (e.g. stock growth)
 - Harder to incorporate trading
 - Harder to conduct formal, standardized experiments)
 - Harder to control for and measure factors affecting outcomes
 - Calculation of "results" and payoffs more difficult and slower
 - Games may seem more "childish," "simplistic" or "unrealistic"