BUILDING BLOCK: FISHER GAME

Understanding of complex systems

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Date: November 2012

1. The problem of overfishing

„For more than 18 hours, the agrarian ministers of the European Union have negotiated on a fishing reform. And, nevertheless, they could only agree on a minimum compromise. Environmentalists are still concerned - central core demands of the European Commission were not accepted by the member states.

For example, the EU commission wanted to restrict the dumping of undesirable bycatch by fishermen, ensuring that fishermen take them back onshore. However, the member states could only reach an agreement for a step-by-step introduction for a ban on discarding fish.

Furthermore, the EU countries came to an agreement on the annual total allowable catch. However, such restrictions will only be implemented as soon as reliable data about fish stocks are made available. There is no foreseeable date for this however. Environmentalists had hoped for far more, just as Brussels had.

The commission wanted to enforce a quota of maximum fishing per species by 2015. This permanent quota would provide a framework detailing how much of each species could continue to be cultivated without damaging the overall stock. European national governments have not readily adopted this framework, pushing the deadline back to 2020, and providing a host of exceptions for their fishermen.

Environmental associations and scientists welcomed the original proposal of the EU commission last year as a milestone… Agrarian ministers however, have annually haggled these catch amounts amongst themselves, and have exceeded the recommended maxima provided by oceanographers. The result: Nearly three quarters of all the fish stocks in Europe are overfished; worldwide there are only 25 percent." (Spiegel, 6/13/2012)

The situation of the fish stocks is alarming. This also applies to other common pool resources, such as the annual decrease in tropical rain forests, the overall increase in atmospheric greenhouse gases,

and the increased quantity of fertilizer and pesticides in drinking water reservoirs. Up to now, humanity has got a grip on only those problems where cause and effect are situated quite close to one other – e.g. smog in European cities. But in situations where the negative effects of actions are not felt immediately, humanity has struggled to combat them. The question is: Why is this the case? Is it the result of ignorant decision makers? Or does humanity exhibit a difficulty in understanding temporal dynamics of situations?

2. Understanding of complex systems playfully

All unsolved environmental problems are linked together within complicated natural systems. In the case of overfishing, complexity means that no one can be sure which interventions cause which effects. For example, a certain fish stock may be able to tolerate an annual loss of 10,000 fish to fishing. Should 11,000 fish be caught however, the fish stock may not be able to recuperate. . In this case, the stocks become smaller and smaller, because less and less young-fish can hatch. It should be noted that in this hypothetical case, the catching of 10,000 fish may be tolerable one year, but the next it is not. For example, environmental conditions may change, and thereby the food becomes scarce for the fish.

To make these problems to understandable to students, you can prepare examples for them and explain to them how these systems work. The chances for an understanding of complicated systems are clearly higher if you confront the students themselves with the dynamics. With the help of the fisher game, students can understand the dilemmas that the European fishing enterprises and government authorities face when considering fishing quotas.

3. Short description of the game

The casting is easy: There are four fishing enterprises (groups/individual students) and one game supervisor. The detailed rules are explained on the work sheets in the appendix. The following points are important to consider:

- The four fishing enterprises exclusively live of the fish which they catch in the lake.
- The students are recommended to “catch as many fish as possible". The supervisor should say no more than this, or explain the rationale.
- The single enterprises cannot discuss the matter with each other... They do not know the recovery behavior of the fish, however, before every new catch season starts they get the information from the game supervisor about how much the other enterprises have fished in the past season and how high the new fish stock is in the lake.
- If the fish stock has strongly decreased, it´s up to the game supervisor to let pass a "miracle". It corresponds to the nature of a miracle that the fishermen could not count on it. The intention is to give the students a second chance. It could be, at least that they have learnt, and that they choose more co-operative strategies in the meantime.
- Vice versa the game supervisor can also announce a sudden fish disaster with dramatically dropped stocks.
- The game supervisor decides which moment is the best moment to open up discussions between the fishing enterprises. The negotiations become really interesting particularly after some enterprises have become “rich”, and others “poor”
- The fishermen do not know the numbers of the catch season; the game instructor determines the end of the game.

4. Interpretation of the results

In the game, fish stocks will always be reduced, even with groups who may be aware of the motives of the game. It is important to allow students to analyze the results of the game after it has been concluded. A particular emphasis should be put on the implications of little dialogue between fishing enterprises. It should be clear that external management is a vital component of controlling fishing stocks.

The next step is to analyze, as a group, the evaluation form in which the game instructor has documented the results. This allows the following conclusions:

1. The amount which can be caught, without affecting the fish stock continuously, lies at 39 tonnes per season. Under 10 tonnes the stock completely breaks down because the population is too small to survive on a continuing basis.
2. More overfishing leads to less possible catch amount. If everybody overfishes, the catch amount is lower for each one on a continuing basis.
3. The enterprise which overfishes, for a short time, will have an advantage, regardless of the fishing habits of other enterprises
4. Those who overfish also have an individual advantage in the long term if other enterprises underfish in response to dwindling fish stocks.

This is made especially clear when we look at the evaluation forms (excel sheets, see appendix).

Result: For single fishing enterprises it is worthwhile to overfish, and it is also rational for them. For the totality of the fishermen this is extremely disadvantageous. Individual use and common use drift apart; the individually rational utility maximization brings damage for everybody.

5. Solution of the problem

According to the analysis of the results there will appear the question: How can this problem be solved? The lecturer puts this question to the audience and takes down the ideas of the students on a board or flipchart. It will appear the fact that an obliging regulatory framework is necessary to avoid an overexploitation of natural resources. Nevertheless, this framework has to be formed flexibly because it concerns complex systems. The annual fishing quotas, for example, must be chosen in such a way that an overfishing can de facto be excluded. This is the only way to protect the yields in the long-term for all fishing enterprises.
Moreover, the game shows the unsustainability of the maximization of personal benefits, without the consideration of other users.

6. Time management

The time management is defined by the game instructor. For a 90-minute unit, the following itinery will be suitable:

- 00:00-00:10: Explanation of the game, division of the groups
- 00:10-01:00: Game time (max. 5 minutes per round)
- 01:00-01:15: Interpretation with the students and joint analysis
- 01:15-01:30: Searching for solutions; conclusions

If there is more time available, the game can be repeated – especially when the fish stocks are eliminated during the first attempt.

Sources and further readings

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Appendix

- Game Instruction and protocol tables for the fishermen
- Instruction for the game supervisor (incl. growth tables of fish population)
- Evaluation form for the game instructor (Word and Excel)