

ICES CM 2003/V:06

FiSHU@LiS, a Computer Game on a General Pelagic Fish

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1. Abstract

Experience has shown that making political decisions that ensure sustainable use of natural resources is difficult. This has raised the question on how to include stakeholders and citizens in decision processes. ViRTU@LiS (social learning on enVIROnmental issues with the inTeractive information and commUnicAtion technoLogLeS) is an EU project that aims at developing ICTs (information and communication tools) for participatory processes. One of the outcomes of this project is an Internet game on a general pelagic fishery, FiSHU@LiS. The aim of the game is to let any citizen learn and judge information in an interactive way. The player can choose to be a migratory pelagic fish, a predator (a shark), a fisherman, a fisheries scientist or a politician. Through these characters, the player can learn in an interactive way about resource problems and societal aspects in the fisheries. An important part of the project, including this Internet game, is to undertake an extended peer-review. Stakeholders of different categories will be invited to evaluate the information presented: the information itself, how it is presented and how uncertainty is presented. The software will then be adjusted. This paper describes in short the dynamics of the game, indicates what kind of information will be available and how the extended peer-review will be carried out.

Keywords: Fisheries, Computer Game, ICT, Participatory Process

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2. Introduction

Experience has shown that making political decisions that ensure sustainable use of natural resources is difficult. This has raised the question on how to include stakeholders and citizens in decision processes. ViRTU@LiS (social learning on enVIROnmental issues with the inTeraCTive information and commUnicAtion technoLogIeS) is an EU project that aims at developing ICTs (information and communication tools) for participatory processes. Good communication between public authorities, private sector firms and citizens at large can contribute to public trust which is essential for mobilizing citizens' efforts for environmental policies in general. The aim of ViRTU@LiS is to explore how to and to enhance interfaces to scientific issues and modeling in order to enable any citizen to participate on the improvement of environmental quality and improvement of protection from environmental risk. The four domains selected for the project are agricultural pollution, climate change, freshwater resources and marine fisheries. Each of the domains are producing four types of ICTs:

- *Personal Barometer*, allowing quantification of environmental impacts of individual lifestyles;
- *Scenario Generators*, exploring changes in patterns of economic activity towards sustainable resource use;
- *Virtual Visits*, or interactive digital environments within which the learner take place; and
- *Multiplayer Games*, which allow individuals to learn about problems of governance and resource access.

The partners in the ViRTU@LiS group represent a wide specter of expertise: a computer game developing company, specialists in social learning, in ICT and virtual reality for environmental issues, resource scientists and education researchers specialized in computer learning.

The fisheries part of the projects is developing i) a personal barometer relating individual choices of fish consumption to the regional and global issues concerning fisheries; ii) a multiplayer game with up to six players being fishermen fishing, investing and with the possibility of influencing the total allowable catch; and iii) the virtual visit, FiSHU@LiS in which the iv) scenario generator will be included.

FiSHU@LiS is a multiplayer online game, which is a single Internet game where the possible number of players is unlimited. A player can choose between five characters: a migratory pelagic fish, a predator (a shark), a fisherman, a fisheries scientist or a politician. Through these characters, the player can learn in an interactive way about resource problems and societal aspects in the fisheries. In this paper we describe the plans for the characters the players can take in FiSHU@LiS, the dynamics of the game and the information available. An important part of the project will be to undertake an extended peer-review through questionnaires and focus groups. The description of the FiSHU@LiS project thus will end with a section on how we plan to include stakeholders in this extended peer-review.

3. FiSHU@LiS

FiSHU@LiS is a multiplayer online game, which is an Internet game where the possible number of players is unlimited. A player can sit anywhere in the world, log

himself/herself on the game and choose to be one of five characters. The player can be active for a time, influencing the dynamics of the game, and then be passive, still being a part of the game. The five characters in the game are migratory pelagic fish, predator (shark), a fisherman, fisheries scientist and politician. Their function in the game is described below. The information available and the expected learning outcome will depend on the character chosen. We imagine that young people will find the shark character more attractive than the decision maker, and adults with general interest in resource problems may prefer to play a decision maker or a fisheries scientist. The resource issues are seen through the eyes of the character and will thus be presented in different ways. Playing a pelagic fish or shark will introduce the player to biological information and issues on the resource situations while playing the decision maker can give some insight in political questions and conflicts within the fisheries. Each player will have access to a panel where she/he can make the character move, take actions or find information. The information available will be related to topics or objects the player can see on the screen, and will thus vary with the scenes and the situations. Some information is part of the game, and thus written for the project. In addition we have included links to related web pages, like the FishBase where the player can learn about different species and hear fish sounds.

3.1 Pelagic fish

We have called the fish species in the game *pelagicus*, which is similar to real pelagic species in behavior and appearance. *Pelagicus* has pelagic eggs and spawn close to the coast in February – April. The eggs, larvae and juveniles live in coastal waters until the next spring, when they migrate to the juvenile feeding area where they stay until moving to the wintering area in October/November. In the wintering area they meet and mix with the mature (3+) part of the stock and join the rest of the stock in the migration for the spawning area in January. They are still immature and do not enter the spawning area but stay in the outskirts of the spawning area. After spawning the mature part of the stock move to a feeding area far out in the ocean while the immatures stay in the juvenile area until they enter the spawning area the following spawning season as three years old. The stock parameters as natural maturity, weight in catch (WECA), weight in stock (WEST) and the maturity are given the following values:

Age	M	WECA=WEST	
		Kg	Maturity ogive
0	0.3	0.070	0
1	0.2	0.140	0
2	0.16	0.200	0
3+	0.16	0.400	1

The relationship between a weak and strong year class is set at 1:20. There is a stock recruitment relationship giving higher probabilities of strong recruitment at higher levels of SSB than at lower levels of SSB and vice versa.

The *pelagicus* player will be able to move a school of fish around in a marine environment escaping from sharks or trawls, feeding, migrating or spawning. Every new situation will introduce possibilities to learn either by doing or reading additional information available from a panel on the screen. The player will be informed about

the simplifications on dynamics etc. Main topics from the fish player's point of view will be marine biology and fishing, introduced by the fishermen's appearance in the game.

3.2 Shark

The shark species in this game, named *shark*, is feeding mainly on pelagicus and are thereby caught as by-catch in the pelagicus fishery. The shark is able to detect its prey from long distances. They are also able to detect (hear) fishing vessels and thereby avoid being caught.

The shark player will hunt *pelagicus*, which will be a dramatic affair. The topics introduced to the shark player will be the same as for the pelagic fish.

3.3 Fishermen

The fishermen own a fleet of vessels. The vessels are small trawlers that are able to operate in the total distribution area of pelagicus. The maximum catching capacity of a trawler is 50 tons per trip. The fishing gear in this game is a midwater trawl. The vessels are equipped with fishfinding equipment like echo sounders and sonars.

The fisherman player will operate a vessel through a display on the screen. Here he/she can get various additional information. The main topics introduced to a fisherman player will be associated with the fisheries, but biological information will be available as well.

It is not decided yet how complicated the economy of the fisherman will be modelled in the game or how his opinion on fisheries issues will influence the management decisions made by the politician.

3.4 Politicians

The politician manages the fishery by measures like TAC, minimum landing size (mature/immature fish), closed seasons and areas. The politicians base their management on scientific advice, the economic situation and the political. Therefore the scientific advice need not be followed.

If it is possible to accomplish within the frame of the project, we will implement a scenario generator to guide the politician players. The scenarios will differ in management goals and priorities on resource and societal considerations

3.5 Fisheries scientists

The fisheries scientists act as both a researcher and an advisor to the politicians. The scientists have resources like monitoring instruments, laboratory infrastructure, modelling software, communication equipment and research vessels. They also take water samples to test pollution etc. Different types of pollution might endanger the recruitment or the stock itself.

4. Extended peer review

The aim of the FiSHU@LiS project is to create an interface to some rather general scientific issues to enable citizens to participate in the improvement of managing the marine resources. It is a future oriented project and meant as an example on what

interfaces to scientific knowledge can be developed. For this purpose we are developing pieces of software. To ensure quality in our product, the computer game, we wish to carry out an extended peer review where we invite representatives from different stakeholders to evaluate the product. This we call an extended peer review; the group of persons that carry out the review is extended from the traditional group of people inside a certain science community to including people outside this community like different stakeholders. The idea is that in policy issues it is important to get feedback on people's different perspectives on what questions are important, the relevance of different information and what solutions they prefer. The stakeholders in mind are fishermen, the fishing industry, fisheries managers, fisheries scientists, non-governmental organizations, software developers and the public. We have two different intentions with this evaluation. Our first purpose with the evaluation or extended peer review is to evaluate the quality and relevance of the scientific information. Our other purpose is to evaluate whether we succeed in communicating our ideas and concerns and whether the interfaces are appropriate.

The evaluation will be carried out in two ways, by questionnaires sent to relevant people and by focus groups where we invite stakeholders to spend some time with the software and afterwards discuss different aspects of the software.

5. Summary

We have described an ongoing project, FiSHU@LiS, that is developing a computer game on a general pelagic fishery. The aim of the project is to create interfaces to introduce different topics connected to fisheries management like resource problems linked to human activity, fishermen's needs, political situation and uncertain scientific knowledge. The game does not give detailed information on all relevant topics but is meant to be an introduction to the marine resource issue. A part of the project will be an evaluation of the computer game by representatives from different stakeholder groups. The feedback from this evaluation, focus groups and questionnaires, will help us in further improving the game and the presentation of issues.

The project is still on a developing stage, which means that the level of detail in the game is not decided yet.