

## **Game Theory and Fisheries – Special Session Report**

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At the IIFET2016 conference held in Scotland a special session on game theory and fisheries were held. The session was open for papers to be submitted and received such a great attention that it was expanded to include two full sessions. In addition to the great attention for paper submission the sessions also had a large audience despite the fact that the sessions were early morning sessions on the last day of the conference.

The aim of the sessions was partly to give paper presentations and partly to set a frame for fruitful discussions among leading scholars in IIFET dealing with game theory and fisheries management. The discussions were facilitated using online-active response systems. The outcome of the session was a highlight of the need for game theory in fisheries management and a collection of ideas for the future challenges in the application of game theory to fisheries management.

### **Description of the special session**

Fisheries involve multiple actors: fishermen, managers, countries, NGOs - the list is long. Game theory has been for a few decades the main tool to address issues related to the strategic interaction among these groups, called players in the game theory language. Thus far most of the contributions have concentrated on international issues, e.g. United Nations agreements like the Law of the Sea and the formation and stability of Regional Fisheries Managements Organizations. A recent survey of this literature can be found in a recent article by Pintassilgo, Kronbak and Lindroos (2015).

While there remains a wide set of unexplored international fisheries issues, it is the intention of the session to also explore the application of game theory to domestic fisheries management issues, and the inter-linkage between domestic and international fisheries strategic issues. There are already a few contributions in the area of game theory and domestic fisheries, primarily initiated with stage games (Ruseski 1998), which were then expanded to incorporate coalition formation (Kronbak and Lindroos, 2006). However, many more are needed as shown in a recent Marine Policy article by Wallace, Munro et al (2015). Also in the EAERE 2015 conference in Helsinki several papers in this theme were presented applying principal agent type of game and contract modeling, taking into account the important role of incomplete information in fisheries management.

The purpose of the session is to invite key international scholars to present their latest results and discuss future avenues for research on game theory and fisheries,. This session aims to make contributions not only at the academic level but also to practical fisheries policy.

### **Session Papers presented at the conference**

#### **Session 1 (chaired by Pedro Pintassilgo):**

##### **Introduction** Marko Lindroos

Welcoming participants to the special session.

##### **Application of game theory to intra-EEZ fisheries management** Gordon Munro, Marko Lindroos, Lone Grønþæk

Presented by Gordon Munro, the paper introduced several new research avenues that were further discussed at the end of the session.

##### **The Number of Players in a Fisheries Game:Curse or Blessing?** Rögnvaldur Hannesson

The paper addressed in which circumstances it may be that less players are not beneficial (contrary to previous results in the literature).

##### **The political game of European fisheries management** Margrethe Aanesen, Claire Armstrong

Margrethe Aanesen presented a paper published in Environmental and Resource Economics that included many future research options.

##### **Kahoot!**

#### **Session 2 (chaired by Gordon Munro):**

##### **International Fisheries Agreements and Non-consumptive Values** Pedro Pintassilgo, Marita Laukkanen, Lone Grønþæk, Marko Lindroos

Pedro Pintassilgo presented results according to which non-consumptive values are not stabilizing international fisheries agreements.

**The new entrant problem in transboundary migratory fisheries and the importance of sunk costs** Maarten Punt

Maarten Punt presented an interesting contribution to the important issue of new members in international fisheries agreements.

**Multispecies Fishery Contracts with Asymmetry of Information** Yulia Pavlova, Antti Iho, Kimmo Ollikka, Marko Lindroos

Yulia Pavlova presented a principal-agent model to multispecies fisheries.

**Cooperation and Noncooperation in North Atlantic Pelagic Fisheries** Fredrik Salenius

The paper studied a three-species model (blue whiting, herring, mackerel) in a game-theoretic context.

**End Discussion** using PollEverywhere

**Forthcoming special issue**

As announced at the IIFET2016 conference there will be a forthcoming special issue on Game Theory and Fisheries in Fisheries Research. Papers presented at the conference are invited to submit papers to the special session. Furthermore, we have invited through the IIFET mailing list contributions to the special issue on the topic. The submission deadline in early January and the process will be finished at the end of 2017.

**Dissemination**

Information about the session were disseminated at the web-page:

<http://www.mv.helsinki.fi/home/mjlindro/IIFETgamefish.html>

We made the sessions interactive by using online response systems: Kahoot! and PollEverywhere. Kahoot! (see appendix) was used to get the audience engaged in the discussion and to draw their attention and PollEverywhere was applied for summarizing the discussion when closing the two sessions. From PollEverywhere we collected notes on ideas for future challenges.

Further we took some photos and used twitter.

**Responses on future important challenges – collected notes in bullet form from PollEverywhere**

Multiple uses of the resources and the link to game theory

Sunk costs and entry deterrence

Game theory within the value chain

Political games - which interaction are most important

Co-management and domestic fisheries

Socioeconomic impacts of EBM

Empirical games

How can games help future management of fisheries


Reputation effects for retailers & fishermen  
Quotas for multiple species & auctions - optimal bundling  
Empirical estimations of fisheries games  
Uncertainty in fisheries agreements - stability and sharing issues  
Application of empirical industrial organization methods to fisheries  
Political economy/lobbying games  
How to combine non-cooperative and cooperative approaches in one and the same model  
Dynamic games & unstable nature & coalition  
Negotiations of actual agreements - how to model - how to get information

The organizing team will continue special sessions on the topic in future IIFET conferences. This will enable continuous development of game theory models applied to fisheries issues.

#### **References:**

- Kronbak, L. G. and M. Lindroos (2006). An Enforcement-Coalition Model: Fishermen and Authorities Forming Coalitions. *Environmental and Resource Economics* 35, 169-194.
- Pintassilgo, P., L.G. Kronbak and M. Lindroos (2015). International Fisheries Agreements: A Game Theoretical Approach. forthcoming in *Environmental and Resource Economics*.
- Ruseski, G. (1998) International Fish Wars: The Strategic Roles for Fleet Licensing and Effort Subsidies. *Journal of Environmental Economics and Management* 36, 70-88.
- Wallace, S., B. Turrís, J. Driscoll, K. Bodtke, B. Mose, G. Munro (2015). Canada's pacific groundfish trawl habitat agreement: A global first in an ecosystem approach to bottom trawl impacts. *Marine Policy* 60, 240-248.

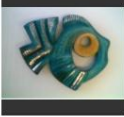
## Appendix

 Exit

K! Overview


Save


**Description**




**IIFET**

Conference quiz

 Only me






**Game Creator**




**1**

Who was the first speaker of this session?

Time limit  
20s ▼









**2**

Who presented the paper on the political game in EU fisheries management?

Time limit  
20s ▼









**3**

Who will be the first presenter in the subsequent session on GT and fisheries?

Time limit  
20s ▼





Add question