

Running to Stand Still: Common Property Induced Inertia in the Spatial Commons

○Yutaro Sakai^{**}, Joshua K. Abbott^{††}, and Alan Haynie^{‡‡}

1 . Introduction

The metaphor of the “race to fish” is powerful, conveying the over investments in fixed and variable harvesting inputs when seasonal harvesting rights are insecure. We contribute an additional insight to the linkage between management institutions and harvester behavior by developing and testing a simple theory of the use of space and time in resource systems under insecure harvest rights that enriches the usual “race to fish” metaphor. We propose that fishers in a spatially distributed common-pool fishery may be less mobile than in a system with secure catch rights and demonstrate the validity of our predictions using exceptionally detailed spatiotemporal data on vessel-level effort in a trawl fishery before and after the implementation of a catch share system.

2 . The model

Our stylized model has three key features. First, we focus on fishers' within-season time allocation between harvest and non-harvest (i.e. time spent in moving between grounds) activities. We assume the variable inputs used for both activities per unit time is optimized out in a previous stage of decision making, so that fishers focus on how long to employ these fixed inputs at and between fishing grounds. Second, a fisher's harvest from a fishing ground depends only on his/her own harvest time; and it does not depend on other fishers' efforts directly (congestion externality) or indirectly through fish stocks (stock externality). Thus, the only interaction among fishers operates through a depletable common-pool quota. These assumptions allow us to focus on the exact nature of how a common-pool quota setting affects fishers' time allocation. Finally, we assume a decreasing marginal harvest in individual fishing time at each fishing ground due to localized depletion or dispersal of the harvestable resource.

A key result from our model is that a common-pool quota increases the opportunity cost of time for individual fishers relative to under an individualized quota system. Under a common-pool quota system, other fishers continually harvest fish from the common pool, and the value of these foregone fish serves as the added opportunity cost of time for each fisher.

^{**} 東京大学大学院農学生命科学研究科 Graduate School of Agricultural and Life Sciences, The University of Tokyo、〒113-8657 東京都文京区弥生 1-1-1、Email: ytr.sakai@gmail.com

^{††} School of Sustainability, Arizona State University

^{‡‡} NOAA Alaska Fisheries Science Center

This wedge distorts fishers' time allocation by skewing the relative prices of harvest and non-harvest time. If the undistorted marginal cost of time spent in harvest activities is greater than that of non-harvest activities, then insecure property rights to catch induces fishers to delay the decision to move to new grounds. Paradoxically, the "race" to fish manifests itself in an intense, yet relatively stationary, fishery.

3 . Empirics

We demonstrate the empirical relevance of this effect by analyzing fishing behavior before and after a transition to a catch share in the Eastern Bering Sea and the Aleutian Islands (BSAI) mixed species groundfish trawl fishery. Prior to 2008, the fishery operated as a limited license program with fleet-wide total allowable catches (TACs) allocated to each target species. In 2008, Amendment 80 (A80) to the BSAI Fishery Management Plan was implemented. A80 effectively granted each vessel a defined share of the total A80 TAC for the six target species.

The primary data for our analysis are unusually detailed confidential observer data on the location and catch of each vessel from the North Pacific Groundfish Observer Program (NPGOP). Onboard observers record the deployment and retrieval location and times for every trawl. Observers are also tasked with randomly sampling, without pre-announcement, particular hauls for species composition sampling. Once these hauls are selected the contents are randomly sampled to provide assessments of the weight or numbers of target and prohibited species catch (PSC). We have access to this unusually thorough record of fishing activities and catch composition for vessels both before and after Amendment 80.

Using this exceptionally high-resolution data and a variety of rules to classify when subsequent trawls are "mining" a ground vs. moving to a previously unfished area, we use linear probability models to demonstrate that the propensity to move to new fishing grounds increased in statistically and economically significant ways after the institution of catch shares. We also use quantile regression techniques to demonstrate that the entire distribution of distance of movement (as measured by the distance between subsequent trawls) experienced an upward shift, validating the predictions of our theoretical model.

4 . Conclusion

Our findings not only shed additional light on the role of space and time in the dissipation of resource rents under insecure access but also raise interesting questions about the potential impacts of how access institutions alter both the magnitude and the concentration of fishing activities across the marine environment – potentially concentrating impacts on particular habitat substrates in ways that are not adequately understood.