Modeling the Economic Benefits of Applying New Spatial Management and Traceability Tools to a Low Governance Fishery

Desarrollo de Modelos para Captar Beneficios Económicos en una Pesquería con Baja Gobernabilidad, a través del Uso de Nuevas Herramientas de Manejo Espacial y Trazabilidadles

Avantages Économiques de L'application de Nouveaux Outils pour la Gestion de L'espace et de la Traçabilité dans une Pêcherie de Gouvernance Faible

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EXTENDED ABSTRACT

Ensuring the sustainable use of wild caught fisheries is a global priority in the 21st century. Effective marine management however comes with an associated cost that many developing nations cannot afford directly. Development banks and non-governmental organizations have frequently picked up the bill for helping to improve fisheries management. These interventions are often framed in the context of biodiversity conservation, such as protecting critical habitats in areas where fishing is a principal threat. This approach, however, is vulnerable to cycles in conservation vogue and ultimately limited by the availability of philanthropic and development funding.

Here we use the spiny lobster (*Panulirus argus*) fishery in Honduras as an example of how some newly developed management tools, including real time analysis of vessel monitoring systems and the implementation of traceability schemes, can have economic, social, and ecological benefits for the fishery. There are two parallel fisheries for *P. argus*, in Honduras: a trap fishery that uses baited wooden traps and a SCUBA dive fishery where lobster are collected from the seafloor by divers using gaff sticks. Dive and trap boats have been spatially separated by depth on the off shore fishing banks. Divers target lobsters in the shallower areas down to around 40 m (120 ft) whilst trappers set their traps between 40 m and 200 m (120 ft - 600 ft) to ensure they are not touched by divers.

A regional agreement signed in 2009 among the countries of Central American aimed to harmonize fisheries regulations for spiny lobster by July 2013. Part of these regulations was to prohibit the use of SCUBA diving to fish lobster. The closure of this fishing practice, however, was postponed by the Nicaraguan and Honduran governments (the only two countries in the region that still have dive caught lobster fisheries) following indecision on how to transition their existing fleet and fishers out from the dive industry. With the deadline missed, no firm date has been set for phasing out dive fishing from these two countries.

The indigenous Miskitu people, employed by the dive boats, and most affected by the social costs of dive accidents, developed a proposal to transition out of SCUBA fishing into a skin diving fishery. Their aim is to use lobster shades as an aggregation device similar to lobster fishing methods of other Caribbean countries. Under the plan they proposed an exclusive use area for artisanal fishing that would prohibit industrial exploitation (including SCUBA fishing) and give access rights to artisanal fishers under a local management plan. The proposed exclusive use area encompasses the marine area around an archipelago of 49 cays (The Honduran Miskitu cays) and includes waters down to 60 ft and a buffer of 3 nautical miles from these shallow areas. In addition to the Miskitu plans, a crucial additional step towards the closure of the dive fishery is what to do with the current fleet of 37 dive vessels.

To help inform potential solutions to this problem we built a simple economic model to compare two scenarios of a dive fishery closure: a “conversion scenario” and a “reform scenario”. In the conversion scenario we assumed that all dive boats would leave the dive fishery and convert to trap boats but with no other controls put on the fishery. The fleet was allowed to grow from the current 86 trap boats back up to its maximum historic level of 123 vessels over three years. No area was granted to the Miskitu people and the production of the trap fishery increased to include the additional 30% estimated to come from the dive fishery. The market price remained stable. No management reforms or attempts to combat IUU fishing were implemented.

A second scenario was a “reform scenario” where the trap fleet was allowed to grow modestly to a cap of 100 boats, the exclusive use area for artisanal fishing was established and measures to improve responsible fishing including combatting IUU and trans-boundary fishing and implementing track and trace systems were implemented. Further a loan of $7.5 million was taken to buy out the dive boats and their associated debts. This loan figure was estimated from average vessel price of dive boats and from discussions with dive boat owners relating to their current debt holdings. Production of the trap

fishery was kept unadjusted to reflect the assumption that the areas gained by the closure of the dive fishery (+15%) would be offset by the reduction in fishing area by ensuring all fishing was within the EEZ (-12%), and due to exclusion from the artisanal area (-3%). These estimates were based on analysis of satellite position data filtered to quantify spatially explicit fishing effort from 2011 to 2013 for the lobster trap and dive fleet.

The economic models were parameterized with historic data on export derived revenue and fishing costs collated from the existing fishery and using projections for changes in costs, including those of implementing these management improvements. Under the conversion scenario we found that per boat profits declined year on year exacerbated by rising fuel costs and lower per boat revenue because of overcapacity in the fleet. This scenario did not prove viable for the industry and the solution was to continue to reduce the number of vessels to fish at economic equilibrium based on projected fuel costs versus dock side value costs. Conversely, restructuring the fishery under the reform scenario, capping the fleet and decommissioning the dive boats, whilst improving compliance, not only provided better returns for the members of the trap fishery, but also provided returns to external investors who pay for the reform.

The reform scenario suggests that the lobster trap fishery would benefit from the closure of the dive fishery, even if they had to "give up" some of the spatial area of the fishing banks to an exclusive use area for artisanal fishers providing that the dive boats would not transition into the trap fleet. This reform model found that although boats had a small dip in projected profits in the first two years due to taking on the loan repayments, per boat profits quickly rose because of the benefits of reduced capacity in the fleet increasing per boat revenues. The fishery as a whole could repay the loan over seven years with a 7% coupon without significantly impacting per boat profits compared to their starting position.

These models assume that export revenues derived from this resource remain at least within the levels of the past 15 years, which means that lobster stocks or market prices cannot crash dramatically. Despite this limitation, this tool can prove useful to explain to decision makers and the fishing industry the projected trajectory of the fishery resulting from either of these two distinct policy choices.