EDITORIAL

Biodiversity and the Social Sciences

It has been reported by the World Resources Institute (1994) that "the world is on the verge of an episode of major species extinction. Unlike previous extinction episodes on earth caused by natural phenomena such as climactic and geologic events, this episode is caused by human activities: the rapid conversion and degradation of habitat for human use; the accidental and deliberate introduction of exotic species; overharvesting of animals, fish and plants; pollution; human-caused global climate change; industrial agriculture and forestry; and other activities that destroy or impair natural ecosystems and the species within them. If the warnings prove true, the effect of human activities on biodiversity - the variation of genes within a species and the overall diversity of species, communities and ecosystems, if continued unchecked, will be - within the time frame of subsequent generations, and perhaps within the lifetime of the human race itself."

Management approaches to biodiversity conservation must be able to accommodate human needs and safeguard biodiversity. They must offer local people economic opportunity through the sustainable management of resources. Management strategies must provide for extensive participation in the development and implementation of management policies by the people most concerned - the resource users.

Biodiversity conservation is not just the realm of biologists. The underlying causes of species and habitat loss are primarily of social, economic, institutional and/or political origins. The social sciences must play an integral role in helping to develop approaches to biodiversity conservation. ***R.S. Pomeroy***

Estimating Input Demand and Output Supply Elasticities in Gillnet and Seine Fishing in Guimaras Strait and Adjacent Waters

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Editor's note: The following is a summary of the results of AFSSRN-funded study of the same title conducted by the University of the Philippines in the Visayas team from November 1990 to June 1991.

Gillnets and seines are among the most commonly used fishing gears in the Philippines. Gillnets are mostly small-scale or municipal which includes all fishing vessels of less than 3 gross tons capacity, while seines are either municipal and commercial (more than 3 gross tons). In terms of production, in 1987, gillnets contributed some 227,103 t or 10.26% of total fish production while seines accounted for 489,270 t (22.11%). In this study, the types of gillnet considered were bottom, drift and encircling gillnets while seines include beach seine, purse seine, baby purse seine, modified baby purse seine and the modified danish seine. All gillnets surveyed in Guimaras Strait, the research area, were municipal while all seines were commercial.

Guimaras Strait is known as one of the most productive fishing grounds in the country. In 1987, fish catch from the area totalled 260,120 t which accounted for 11.74% of the country's fish production. Of the total contribution of Guimaras Strait to fish production, 45.53% or 118,438 t were contributed by gillnets, 30.80% from seines and the rest were accounted for other fishing gears in the area like trawls and jiggers. The 1987 production data in the area, however, represents a 3.22% decline from 1983 catch data.

The purpose of this research is to estimate input demand and output supply elasticities in gillnet and seine fishing. The estimated elasticities will be useful not only to policymakers concerned in fisheries price policies but also to researchers building models for the fishery sector. The elasticity coefficients describe the magnitude and direction of change in any input demand given a change in the price of any factor input or what will likely happen to output supply given a change in the output price. Moreover, with the use of the translog profit approach, the efficiency of resource use in gillnet and seine fishing were likewise determined. This was determined by testing the profit maximizing hypotheses for both gear groups and rejection of these indicate that the gillnetters and seiners are not profit maximizers which implies inefficiency in their use of the fishery resource.

The profit function model was chosen for this study because unlike the production function, profit function allows derivation of the firm's output supply and input demand equations. Moreover, profit functions make use of prices as explanatory variables which are independent, hence, would less likely lead to the problem of multicollinearity.

Results, Conclusions and Policy Implications

The results for the hypotheses-testing on the Translog Profit Function Model for all seines and gillnets are presented in Table 1.

Based on the test on profit maximization, both gillnet and seine fishers do not maximize profits from their fishing activities. This implies that these fishers are not using the fishery resource efficiently or both gears are not operating at the maximum economic yield, the level of catch that gives greatest profit for the fishers. This suggests that Guimaras Strait is economically overfished. Moreover, the decline in the fish production data of Guimaras Strait from 1983 to 1987, while the number of fishing gears operating on the area did not significantly decrease, suggests that these gears operate not only beyond the maximum economic yield but even beyond the maximum sustainable yield. This further implies that Guimaras Strait is likewise biologically overfished.

The input demand and output supply elasticities for gillnet and seine fishing are presented in Table 2.

The same conclusion can be drawn from most of the estimated elasticies. For instance, the estimated coefficients of own-price elasticity of supply, which measure the responsiveness of catch to changes in the price of fish, were negative for both gears. Normally, the own-price elasticity coefficient of supply is positive because as the price of fish increases, all things the same, this serves as incentive for the fisher to increase fishing effort. Intensified fishing then results normally to increase in catch, and consequently increase in revenue and profits. The negative output elasticities however, indicate that, as the price of fish increases, the increase in fishing effort may instead lead to lower catch. This situation may likely happen when the fishing effort applied on the fishery resource already exceeds the maximum sustainable yield, which suggests biological overfishing in the area. In basic fisheries economic model, the maximum economic yield comes ahead of the maximum sustainable yield (except when fishing cost is zero where both yields coincide). Therefore, if the resource is biologically overfished, then it can be said that it is likewise economically overfished. Since the negative own-price output elasticity indicates biological overfishing in Guimaras Strait, this also suggests that the area is likewise economically overfished.

In addition, the output elasticity coefficients with respect to variable inputs (labor, fuel and crew provisions) were unexpectedly positive. These elasticity coefficients measure the responsiveness of catch to changes in the price of a variable fishing input like labor, fuel or crew provisions. In general, these coefficients are expected to be negative because as the price of a fishing input increases, fishers get discouraged to fish, thereby decreasing fishing effort and consequently decreasing catch. However, the positive coefficients indicate otherwise. The decrease in fishing intensity, as fishing input becomes more expensive, may instead result to higher catch. Again, this situation may likely occur when the fish stock is already exploited beyond its maximum sustainable yield.

Moreover, the input demand elasticities with respect to the price of fish were

Table 1. Hypotheses testing on the translog profit function model for all gillnets and seines.

Hypotheses	Computed F-ratio	Degrees of Freedom	Critical F-value 10%	5%	1%	Remarks
Cobb-Douglas						
Gillnets	5.85	v1=15 v2-435	1.49	1.67	2.07	Reject Ho
Seines	7.86	v1=15 v2=21	1.82	2.18	3.03	Reject Ho
Profit Maximization						
Gillnets	5.29	v1=18 v2-435	1.45	1.61	1.94	Reject Ho
Seines	4.42	v1=18 v2=141	1.45	1.61	1.94	Reject Ho
Equal Relative Economic Efficiency						
Gillnets	80.29	v1=2 v2=435	2.30	3.00	4.61	Reject Ho
Seines	5.96	v1=4 v2=21	2.24	2.84	4.37	Reject Ho
Homogeneity and CRTS						
Gillnets	50.37	v1=6 v2=435	1.77	2.10	2.80	Reject Ho
Seines	11.94	v1=24 v2=141	1.38	1.52	1.79	Reject Ho

Note:

Cobb-Douglas Ho: $a_{ij}=0$, $b_{ij}=0$, $c_{ij}=0$

Profit Maximization Ho: $a_i'=a_i^*$, $a_{ih}'=a_{ih}^*$, $b_{ih}'=b_{ih}^*$

Equal Relative Economic Efficiency Ho: $D_1=0$, $D_2=0$

Homogeneity and CRTS Ho: $a_i=1$, $a_{ih}=0$, $c_{ih}=0$

Table 2. Input demand and output supply elasticities for gillnets and seine fishing.

Item	Notation	Elasticities	
		Gillnet	Seine
I. Input demand elasticities			
A. Own-price elasticities			
1. Labor	N_{11}	0.786	-0.244
2. Fuel	N_{22}	-0.959	-1.163
3. Crew provision	N_{33}	-1.385	-1.171
B. Cross elasticities			
1. Labor wrt fuel price	N_{12}	0.225	0.58
2. Labor wrt cost of CP	N_{13}	0.106	0.540
3. Fuel wrt labor price	N_{21}	0.292	1.136
4. Fuel wrt cost of CP	N_{23}	0.067	0.189
5. CP wrt labor price	N_{31}	0.539	1.131
6. CP wrt fuel price	N_{32}	0.264	0.236
C. Input demand elasticities wrt fixed inputs			
1. Labor wrt mesh size	N_{11}	-0.202	32.972
2. Labor wrt GT	N_{12}	-0.397	6.237
3. Fuel wrt mesh size	N_{21}	-0.888	23.171
4. Fuel wrt GT	N_{22}	-0.300	-2.283
5. CP wrt mesh size	N_{31}	-0.681	26.172
6. CP wrt Gt	N_{32}	-0.276	0.010
D. Input demand elasticities wrt price of fish (Output price)			
1. Labor	N_{1y}	0.455	-0.880
2. Fuel	N_{2y}	0.600	-0.163
3. Crew provision	N_{3y}	0.582	-0.379
II. Output supply elasticities			
A. Own-price elasticity of supply	E_{yy}	-0.593	-1.130
B. Output wrt labor price	E_{y1}	0.262	0.888
Output wrt fuel price	E_{y2}	0.266	0.084
Output wrt cost of CP	E_{y3}	0.065	0.157
C. Output wrt mesh size	e_{y1}	-1.406	34.856
Output wrt gross tonnage	e_{y2}	-0.347	-0.741

negative for seines. This does not conform with the *apriori* knowledge that these elasticity coefficients should be positive. Factor demand elasticity with respect to the price of fish measures the responsiveness of a fishing input such as labor, fuel or crew provisions to changes in the price of fish. If the price of fish increases (*ceteris paribus*), which serves as incentive for fishers to intensify fishing activities, the demand for a fishing input is expected to likewise increase. While this may be true for gillnetters, seiners did not behave as such.

Evidently, the situation in Guimaras Strait and adjacent waters indicates both economic and biological overfishing. This necessarily calls for reduction in fishing effort or effective fishing regulations, if overfishing is to be controlled the soonest.

Fishing regulations which may be feasible in the area may include closed season or closed area, license limitation and gear restrictions. The areas can be totally closed to fishing during the time of the year when most important species are spawning, which allow the fish stock in the area to regenerate. Biological researchers that will identify the specific spawning grounds in the areas and the months of the year when most commercially viable species spawn, will be useful for this policy. Another way to minimize fishing effort in the area can be done through license limitation. Issuance or renewal licenses must be limited to those currently operating in the area, and no new licenses must be issued to prevent entry of new boats in the area. Lastly, gear restrictions particularly outright ban for nonselective fishing gears may also be implemented. This however is relatively a drastic move because fishing vessels banned from operating in the area may not have alternative uses other than fishing.

In most instances, reducing fishing effort dislocates the fishers considering their limited skills and the lack of alternative sources of livelihood in the fishing village. In the Philippines, a typical fishing village usually has limited land area, hence, farming or even backyard gardening may not be viable. Hence, alternative livelihood that must be promoted in small fishing villages must include nonfarming activities like handicraft making, pottery, weaving and even small-scale aquaculture like mussel and oyster farming. Moreover, the alternative livelihood that must be introduced in the area must not require large capital investments considering the fact that most fishers work only as fishing labor especially in commercial vessels like seines.

For a fishing household, it is very typical that if the household head is a fisher, then the spouse and the children are mostly involved in fishing-related activities like net making, fish vending or selling and others. This limits the working skills of the family members and the household heads to only fishing and fishing-related activities. The government must therefore conduct trainings and workshops that will develop the nonfishing skills of these fishing household, which will make them more versatile workers.

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