



FISHERIES VALUATION IN THE COASTAL AND MARINE ECOSYSTEMS OF KERALA, INDIA

K .K. Joshi*, R. Narayanakumar, Molly Varghese, K. Vinod, S. Jasmine, Miriam P. Sreeram,
K.R. Sreenath, M. Sethulakshmi, Thobias P. Antony, Aju. K. Raju, K. M. Sreekumar, K.A. Divya, and M.S. Varsha.
Central Marine Fisheries Research Institute, Cochin, P.B. No. 1603, P.O. Ernakulam North, Kerala, India
joshiyuguru@gmail.com

Introduction

Marine and coastal ecosystems of Kerala is one of the most productive and unique ecosystems in the world. Millennium ecosystem assessment defines ecosystem services and classifies into four major categories like provisional services, regulating services, supporting services, and cultural services. The state exports fish products worth Rs. 1200 crores and a domestic sale worth Rs. 600 crores annually, accounting for 3% of the state revenue. Kerala's share in the national marine fish production is about 20%. As against the estimated MSY of about 7.5 lakh metric tons, the present level of fish production in the state is about 5.53 lakh tons. The studies on the ecosystem services and valuation are very few.

Materials and Methods

Valuation of Provisional Services

For the purpose of valuation two methods followed namely the Total Economic Value (TEV) and Value Transfer (VT). The data from the commercial fish landing centers of districts such as Trivandrum, Kollam, Alleppey, Ernakulam, Trichur, Malappuram, Kozhikode, Kannur and Kasargode were collected by the Fisheries Resources Assessment Division. Average price for the species was taken from market price data of Socio Economic Evaluation & Technology Transfer Division collected from all the districts. The total economic impact was estimated from the commercial fishing, fish processing, cleaning and local fishing. The revenue from commercial fishes was estimated using the market price method (WRI, 2007). The ecosystem services were valued using Value transfer Methodology (Troy and Wilson, 2006).



Results

Provisional services

Fisheries

The total estimated value of commercial fisheries was 477656 million \$ provides a net revenue of 344974 million \$. This gives a total direct economic impact of 4911361 million \$ to the state economy (Table 1).



Table 1. Total value of Coastal and Marine Ecosystems of Kerala

Particulars	Million Dollars
1. Commercial Fisheries	
Gross Revenue	530729
Net Revenue	344974
Transfers to the economy (Wages)	132682
Total Commercial Fishing Value	477656
2. Fish Processing and Cleaning	
Gross Revenue from Processing	175035
Net Revenue from Processing Sale	1073
Transfers to the economy (Wages)	17504
Total Revenue from Cleaning Fish	48176172
Total Fish Processing and Cleaning Value	48194749
3. Local Fishing	
Value of Local Fish Sale	39708
Value of Local Fish Consumption	4412
Value of Local Fish Enjoyment	0
Total Local (non-commercial) Fishing Value	44120
4. Total Direct Economic Impacts (including local use)	4911361



Aquaculture

The production per hectare and price per kg shows variation depending on the system of production. The estimated total value was 157.5 million \$ (Brackish water), 26.3 million \$ (Backwater), 31.10 million \$ (Traditional prawn filtration fields), 43.09 million \$ (Shrimp aquaculture), 415.3 million \$ (Fish culture ponds), 0.93 million \$ (Brackish water farms). Total value estimated for aquaculture was 674.36 million \$.



Regulating Services

Water regulation

The value estimated for the water regulation in ponds and freshwater bodies was 10215508 million \$, brackish water was 3309408467 million dollars, Pokkali fields was 65327488 million \$, rivers was 32985992 million \$, rice fields was 1012979515 million \$ and lakes was 234093973 million \$.

Gas Regulation

The gas regulation value was estimated as \$.18151/ton from Mangrove, \$.334661/ton from Pokkali, \$.1581604/ton from Coconut and \$.3749172/ton for other vegetations. Whereas the NO₂ value of \$.39892/ton from Mangroves, \$. 735499/ton from Pokkali, \$. 3475958/ton from Coconut and \$. 8239715/ton for other vegetation.



Supporting services

Nutrient cycling

The habitats selected for this are Mangrove, Coconut, Pokkali fields, Seaweed and Phytoplankton. The total area of these was estimated at 253053 ha and range of values got was 9584 \$ (Mangroves), 673512 (Coconut), 291494 (Pokkali), 22 (Seaweeds) and 31897\$ (Phytoplankton). The total nutrient cycling value/ha/year was estimated to be 0.1–385.1 million \$.



Cultural services

Tourism

During 2010 a total of 8595075 domestic tourists and 659265 foreign tourists visited Kerala. Among these 5454970 domestic tourists and 569735 foreign tourists exclusively visited marine and coastal ecosystems of Kerala.

Value transfer data

The estimated value showed a range of 1 million \$ (beaches) to 14423 million \$ (Open Ocean). The total value estimated was 51895 million \$. The total economic value (TEV) estimated was higher than the value estimated by VT. Difference between the TEV and VT was found to be 205717 million \$. The reason for the higher difference is TEV considers the value of unique ecosystems and their services provided by each ecosystem considering local specialties like upwelling in the sea, mudformation, extensive rice-cum prawn farming, traditional methods of aquaculture, well developed coastal agriculture, extensive coconut plantations, export earnings from the prawn and squid resource, employment generation to 14 lakh people, water supply from 41 rivers and two monsoon rainy seasons make it a highly productive system in the world.

Table 2. Summary of the monetary values for ecosystem services of coastal and marine ecosystems of Kerala estimated using TEV method

Ecosystem services	Area in hectares	Value in Million dollars	\$/hectare /year
1 Provisional services			
Total	26818778	111091	41422
2 Regulating services			
Water regulation	332339000000	161040	623
Gas regulation	783414	24.2	30
Carbon sequestration	783414	3.3	92.67
Total	332340566828	161067.5	248.56
3 Supporting Service			
Nutrient cycling	769831	0.31	4.2
4 Cultural services			
Tourism services		1882	0.196

Conclusion

The present study showed that the value of different ecosystem services of marine and coastal ecosystems have direct effect on the total fish production of Kerala which was already showing a downward trend. This decline directly impact on the state economy and livelihood issues of about 10 lakh fishermen community. The provisional services estimated in the present work were about \$ 41422/ha/year from the sectors such as fisheries and aquaculture being the highest value recorded from any ecosystems around the world. De Groot *et al.*, 2012 estimated the values of the coastal system as 2396\$/ha/year based on the calculation of total 665 sample values. In the context recent decline of fishery resources of Kerala and the steady increase in the human population, necessitates a study on the ecosystem services and their values along the marine and coastal ecosystems of Kerala.



References

- De Groot, R., Brander, L., Van Der Ploeg, S., Costanza, R., Bernard, F., Braat, L., Christie, M., Crossman, N., Ghermandi, A., Hein, L., Hussain, S., 2012. Global estimates of the value of ecosystems and their services in monetary units. *Ecosystem services* 1(1), 50-61.
- Troy, A., Wilson, M. A., 2006. Mapping ecosystem services: practical challenges and opportunities in linking GIS and value transfer. *Ecological economics* 60 (2), 435-449.
- World Resources Institute. 2007. *Economic Valuation of Coral Reefs: Methodology v2.1*. World Resources Institute, Washington DC, USA.