

Mangrove and Coastal Small-scale Fisheries Production: Contribution on Economic Valuation of Ecosystem Services Provided by Mangrove in French Guiana

Manglares y Produccion de la Pesca Costera Artesanal: Contribución a la Valoración Económica de los Servicios de los Ecosistemas de Manglares en la Guiana francesa

Mangrove et Production de la Pêche Côtière Artisanale : Contribution à L'évaluation Économique des Services Écosystémiques Fournis par la Mangrove en Guyane Française

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EXTENDED ABSTRACT

Introduction

Mangrove provide services such as fisheries resources, coastal protection, water purification, carbon storage, construction wood, inspiration source (literature), beliefs, that contribute to human well-being. However, mangrove has declined worldwide of about 20% between 1980 and 2005. To contribute to poverty alleviation and food security, public policies have to be implemented to conserve mangrove. Stakeholders need knowledge on the link between the services and the ecosystem to be able to find trade-offs between services, and on the profits from these services, to introduce compensations measures.

In French Guiana, 90% of the coastline is covered by mangrove. The mangrove surface is highly variable because of a natural dynamic due to Amazon river inputs into the Ocean. The population increases on the coastal zone (population will be multiplied by two during the next 20 years according to the INSEE, French national institute for economy and demography), threatening mangroves and the associated services in the long terms because of anthropisation.

This work aims to identify the main services provided by mangrove in French Guiana, and more specifically, investigates the dependence of the coastal small-scale fisheries on mangrove that are located on the whole coastal area and assess its economic value between 2007 and 2014.

Material and Methods

Coastal fish species are exploited by traditional small-scale fisheries using mainly drifting nets. Data sets of production per species and effort per year and per landing point are available from the fisheries information system of Ifremer (SIH) from 2006 up today. It was considered, knowing the low autonomy of the boats, that the areas exploited remain in the neighborhood of their landing point. Enquiries on fishing costs (investment and functioning) and revenue (production per species and selling price on three main distribution circuit) were carried out in 2009 and 2011, allowing to calculate the production value. Historical records of mangrove surfaces were collected allowing to get a temporal data set from 1950 to 2014 (Walker et al. 2015). It was shown that the mangrove surface does not follow the global decline but varies in time accordingly to the NAO signal. Theoretically, the ecological relationships between mangrove and fisheries yields would emerge from the existence of a nursery function of the mangrove. This means that the exploited species depend on the mangrove habitat during the larvae and juvenile stage of their life cycle. To test this hypothesis, the Spearman coefficient of correlation and Kendall coefficient are calculated between the mangrove surface and the fisheries yield two and three years later, necessary time for the considered species to grow and reach the catchability size, for seven species representing about 80% of the total production of the coastal fisheries: *Cynoscion acoupa*, *C. virescens*, *Centropomus undecimalis*, *Hexanematichthys proops*, *H. parkeri*, *Genyatremus luteus*, and *Mugil incilis*. Finally, if statistically significant relationships are observed between mangrove and fisheries yields, we may consider then that the total value of the coastal fisheries production is a proxy for the mangrove value in terms of fisheries production.

Results

The potential mangrove services identified in French Guiana are production of seafood (fish, shrimps, crabs), honey bee, coastal protection, water purification, carbon storage, inspiration source for literature. Production of seafood was the service investigated and valued here. Statistically significant relationships were observed ($p < 0.05$) between fisheries yields and mangrove densities only in the area where the mangrove density showed variation of 30% (in contrast to 3, 12 and 1% in the other areas), on the western part of the coast of French Guiana for all the species (may be excepted for *H. parkeri*, Figure 1). Given that relationships were observed between mangrove and fisheries yields, we considered the total value of the coastal fisheries production as the mangrove value in terms of fisheries production. This value is 3 575 776 € in

2014. Knowing that the total surface of mangrove was 54 742 ha, the value of mangrove is around 65 €/ha.

Conclusion

This would confirm that mangrove acts as a nursery but with impacts on fishery productivity only for high surface mangrove variations. Studies in the field are required to investigate the nursery function of mangrove. The fisheries production value of mangrove is quite low. Tentative valuation of the coastal protection and carbone storage functions have been proposed (Gobardham 2016) and would be much higher (between 4 000 and 5 000 €/ha respectively).

KEYWORDS: Ecosystem services, economic valuation, mangrove, coastal small-scale fisheries, French Guiana

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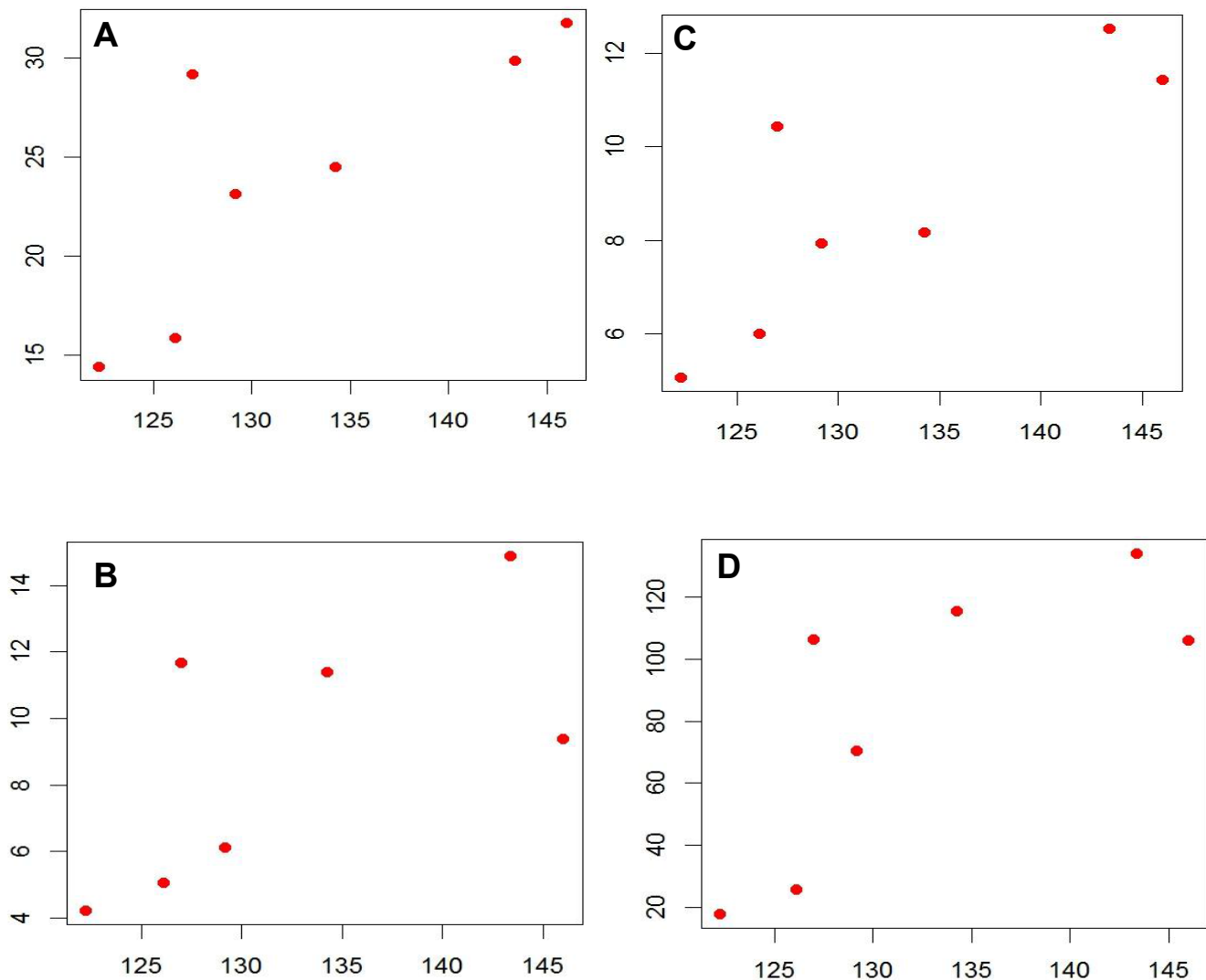


Figure 1. Fisheries yields variations (Kg/day) vs mangrove density (ha/km) 2 years earlier in the western area for a- *Cynoscion acoupa*, b- *C. virescens*, c- *Centropomus undecimalis*, d- *Hexanematichthys proops*, e- *H. parkeri*, f- *Genyatremus luteus*, g- *Mugil incilis*.

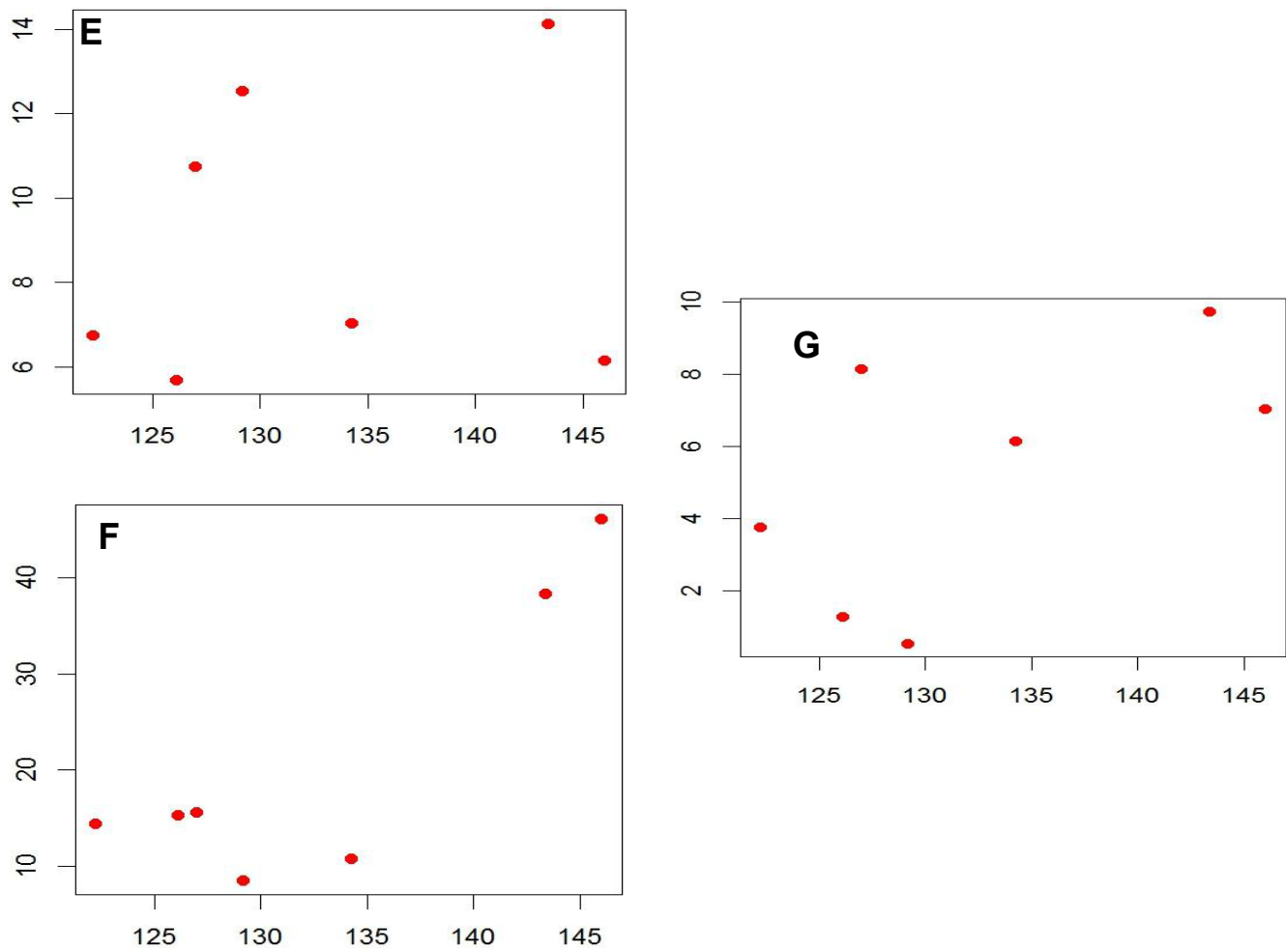


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