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厦门大学

硕士学位论文

海洋生态系统海水养殖服务价值评估：福建省案例研究

Measuring the Value of Marine Ecosystem Services for Mariculture in Fujian Province

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摘 要

海水养殖业对促进经济发展、增加就业、解决食品安全问题等有着重要的作用，并且海水养殖可以通过缓解水产品供给短缺而减少对海洋捕捞渔业资源的压力，从而保护海洋生态系统。近年来随着海岸带地区经济的发展、人口增加以及城市化程度的提高，人类对海洋与海岸带地区资源与环境利用的竞争性不断增加，海水养殖受到其它产业的排挤已经成为一种普遍现象。很多海水养殖的区域被港口、码头、地铁等项目所替代。人类对海洋生态系统的破坏性利用，在开发利用中倾向于消灭海水养殖业的现象，其中一个重要原因是没有给予海洋生态系统服务适宜的价值。本论文在对海洋生态系统养殖服务理论研究的基础上，建立海水养殖服务价值评估方法，并对福建省海水养殖服务价值进行系统评估。论文取得了如下研究成果：

1) 论文对海洋生态系统海水养殖服务理论进行了系统分析，在此基础上，提出了海水养殖服务是海洋生态系统对人类从海水养殖中获得的收益的贡献的理论。人类从海水养殖中获得的收益是海洋生态系统和人类共同贡献的结果，只有海洋生态系统贡献部分才是海洋生态系统海水养殖服务。

2) 论文建立了海水养殖服务价值评估方法。论文基于对海水养殖服务价值理论的研究，根据自然资源经济学的基本原理，提出海水养殖服务的价值是海水养殖产品的价值扣除人类活动贡献后的剩余部分，由此建立了海水养殖服务价值的评估模型。同时，论文还建立了行政区域尺度、养殖环境尺度的海水养殖服务总价值和平均价值评估方法。

3) 论文对样本尺度的海水养殖服务价值评估。通过实地调研收集了 90 个样本的收益成本数据，利用建立的海水养殖服务价值评估方法，对不同地市，不同养殖环境、不同养殖品种的海水养殖服务价值进行估算。研究显示，在全省尺度海水养殖服务的边际价值在 0.68-8.83 元/(m^2·yr)之间，平均值为 3.24 元/(m^2·yr)；不同养殖环境海水养殖服务的价值不同，浅海区域海水养殖服务边际价值最高，达到 3.82 元/(m^2·yr)；池塘养殖和滩涂养殖服务的边际价值分别为 2.84 元/(m^2·yr)和 2.73 元/(m^2·yr)；研究还显示，不同养殖品种海水养殖服务边际价值存在很大差异，边际价值最高的是鲍鱼，达到 8.41 元/(m^2·yr)，最低的是藻类养殖，为 1.31 元/(m^2·yr)。不同养殖品种海水养殖服务边际价值排序为鲍鱼>鱼>海参>混养>虾>

贝>藻，说明海水养殖服务的价值主要受到各养殖品种的价值的影响。

4) 论文系统评估了福建省海水养殖服务价值。研究显示，福建省海水养殖服务的总价值为 38.64 亿元/年，单位面积海水养殖服务价值为 2.56 元/(m^2·yr)。养殖服务总价值和单位面积价值最高的是漳州市，分别为 13.25 亿元/年和 3.48 元/(m^2·yr)。厦门由于海水养殖面积小，其海水养殖服务的总价值最低，为 0.87 亿元/年；从养殖环境看，浅海养殖服务价值最高，达到 16.7 亿元/年，最低的是滩涂养殖，为 7.97 亿元/年；各养殖环境单位面积养殖服务价值分别为 3.82 元/(m^2·yr)、2.84 元/(m^2·yr)、2.73 元/(m^2·yr)；从养殖品种看，由于全省贝类养殖面积最大，尽管其单位面积养殖服务价值不是最高，但是其养殖服务的总价值最高，为 14.5 亿元/年，占全部生态系统服务价值比例为 37.57%；最低的是虾蟹类，为 0.237 亿元/年，占全部生态系统服务价值的比例还不足 1%，这与福建省传统的以养殖贝藻为主的养殖结构有关。

关键词：海洋生态系统；海水养殖服务；价值评估；养殖环境；福建省

Abstract

Mariculture plays an important role in promoting economic national development, increasing employment and ensuring the food safety. Moreover,mariculture can protect marine ecosystems through reducing the pressure on marine capture fisheries by alleviating the shortage of aquatic products. However, the competitive and conflicts use of sea area are increasing with the fast economic development, population growth and urbanization in coastal zones. It has become a common phenomenon that seawater farmingwas squeezed by other industries in many coastal communities. Many areas tradational for mariculture are replaced by ports, docks, subways and other projects. One of the important reasons that mankind's destructive use of marine ecosystems and tending to removing aquaculture is that we did not place adequate value to marine ecosystem services. Based on the study of marine ecosystem service theory, this paper establishes a method of assessing the value of mariculture service and systematically evaluates the value of mariculture service in Fujian Province. The main achievements of the dissertation were as follows:

1) The study systematically analyzed the theory of marine ecosystems services for mariculture , and proposed that marine ecosystems services for mariculture is the contribution of marine ecosystem to the benefits of human derived from mariculture. The benefits derived from marine aquaculture are the result of the joint contribution of marine ecosystems and human activities, and only the contribution of marine ecosystems is the marine ecosystem service for mariculture.

2) The study established the method to assessing the value of mariculture service. Based on the above theory of marine aquaculture services this paper found that the value of mariculture services is the remaining part of the value of marine aquaculture products after deducting the contribution of human activities. And themethod for valuingthe mariculture service is established according to the rent principles of natural resource economics. The paper also established the total value and average value evaluation method of mariculture service at administrative scale and breeding environment scale.

3) The study evaluates of the value of mariculture in sample scale. The benefits and costs data of 90 samples were collected by field investigation, and the value of mariculture service at different cities, breeding environment and breeding species were estimated employing the established evaluation method. The results showed that the marginal value of marine aquaculture services at the province scale is between 0.68-8.83 yuan/(m^2·yr), with an average value of 3.24 yuan/(m^2·yr). The marginal value of different breeding environments are different. The value of mariculture services in shallow sea area is highest, reaching 3.82 yuan/(m^2·yr), the value of pond farming and beach farming were 2.84 yuan/(m^2·yr) and 2.73 yuan/(m^2·yr) respectively. The results also indicated that the maginal value of marine aquaculture services varied significantly by breeding species.The highest value of aquaculture services is abalone, reaching 8.41 yuan/(m^2·yr), the lowest is algal aquaculture, 1.31 yuan/(m^2·yr). The marginal value of marine aquaculture services for breeding species ranked as abalone> fish> sea cucumber> polyculture> shrimp> shellfish> algae, which indicating that the value of mariculture services is largely influenced by the value of each breeding species.

4) The study assessed the value of mariculture services in Fujian Province. The total value of marine aquaculture services in Fujian Province is RMB 3.86 billion per year which the contributed more than 10% to the total value of mariculture products. The average value is 2.56 yuan/(m^2·yr). Among the coastal cities ,the total value and the average value in Zhangzhou, which is the highest, reach 1.325 billion per yerar and 3.48 yuan/(m^2·yr) respectively; The lowest is Xiamen due to its smallest mariculture area. The values of maricultyure services were different by breeding environments.The highest value is shallow aquaculture services, reaching 1.67 billion per year, the lowest is the beach farming, reaching 0.797 billion per year; the aquaculture environment per unit area of the value of services were 3.82 yuan/(m^2·yr), 2.84 yuan/(m^2·yr), 2.73yuan/(m^2·yr).

From the breeding species, although the value of unit area of shellfish farming is not the highest, the shellfish farming area is the largest, its total value of farming services is the highest, reaching 14.5 billion per year, accounting for the proportion of all ecosystem services value of 37.57%; the lowest is shrimp and crabs, 0.237×10^7

billion per year, accounting for the proportion of the value of all ecosystem services is less than 1%, which is also closely related to the traditional algae-based aquaculture structure in Fujian Province.

Key Words: Marine ecosystem; Mariculture services; Measurement of value; Breeding environment; Fujian Province.