

ALTERNATIVE USES OF AQUATIC HABITATS: AN ECONOMIC PERSPECTIVE

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Abstract

Alternative uses of aquatic habitats are classified according to human participation and resource depletion. The classification assists to clarify the impact of human activity on the resource. Each use places a demand on the habitat that may be compatible with other uses or mutually exclusive. The key question from a management viewpoint is how to meet these alternative demands.

Three options are discussed; the market approach, the regulatory approach and the value-added approach. It is demonstrated that the value-added approach is the preferred option. The capital value of the habitat is explicitly recognised with this approach. It provides a strong basis for developing strategic, forward-looking, consultative management programs that will effectively meet the alternative demands placed on the habitat.

Aquatic habitat management in Australia is moving towards a value-added approach. The rate of progress, however, needs to be accelerated. Actions required to progress this approach are proposed.

Introduction

Aquatic habitats provide a range of alternative uses to society with the potential to improve welfare. However, there are many examples of aquatic habitats where the demands placed on

the resource have led to overexploitation and permanent resource depletion of one or more of the organisms living in the habitat. In order to prevent overexploitation, the various uses of the habitat must be managed to ensure that the associated impacts are sustainable.

In this paper, I provide an economic perspective to the alternative uses of aquatic habitats. The term habitat is interpreted in its broadest sense to be a region of space where living organisms interact. Alternative uses of habitats are categorised into three groups and alternative management approaches are contrasted.

Alternative uses of aquatic habitats

Aquatic habitats are used for a variety of purposes, ranging from providing leisure activities for society, to being used as a means to generate economic wealth (e.g. fishing). In this paper, I categorise alternative use of habitats into three groups (Table 1).

Category 1 is defined as actions that are both participative and depletive. Participation refers to activities in which there is direct interaction of human activity with the habitat. The level of depletion is defined as the extent to which human activity reduces the quality of the asset. Depletion may be temporary or permanent. Category 1 includes commercial and recreational fishing. It also includes activities such as waste disposal and the use of aquatic habitats for commercial and industrial processes.

Category 2 is defined as participative non-depletive uses. In these, humans interact directly with the habitat but do not deplete the asset. Activities include commercial shipping, recreational boating, surfing, swimming, snorkelling, diving etc. and the use of habitat for aesthetic purposes.

Category 3 is defined as non-participative non-depletive uses. Even if individuals never visit or deplete a habitat, the fact that the resource exists may in itself be beneficial (Kratilla and Fisher 1975). Mitchell and Carson (1989) classify existence (or non-use) benefits into two types - vicarious consumption and stewardship. Vicarious consumption refers to benefits gained from knowing that others are using the resource. In the case of an aquatic habitat, an individual may derive benefit from knowing that members of his family, friends and the general public are able to use the habitat to pursue activities, such as those listed in Categories 1 and 2, that will improve their utility. Stewardship values involve the desire to see a public resource used in a responsible manner and conserved for future generations. For example, individuals may derive benefit from knowing they can pass on a specific aquatic habitat to the next generation even if they do not personally visit the site (bequest value). Also individuals may consider that some habitats are intrinsically valuable to society and should be preserved regardless of whether they will ever be used by anyone (inherent value).

Each alternative use identified in Table 1 places a demand on the habitat. The nature of the demands arising from each use is also indicated in the Table. Category 1 produces a demand for depletion (a reduction in the quality of the asset) and space (to enable human interaction with the habitat). Because Category 2 is non-depletive, the demand created is only for space. Category 3 creates a demand for sustainability; provided the resource is sustained, the demand for Category 3 uses can be met.

Some of these demands are compatible with other uses, while others are incompatible. The key objective of management is to ensure that the aquatic habitat is used efficiently, to meet where possible society's demands for the use of the habitat, taking into account the finite nature of the resource. If alternative demands cannot be met on a sustained basis, management should ensure that the alternative uses are rationed to maximise the contribution of the resource to the welfare of society.

Management options

Alternative management options available to allocate the services derived from an aquatic habitat to competing demands can be classified into three categories.

1. *The unregulated market approach*

Economic theory demonstrates that the benefits (social welfare) from using a resource will be maximised when potential alternative uses are allocated according to the equilibrium of a competitive market system (e.g. Gravelle and Rees 1981). In recent years, governments throughout the world have been increasingly using market mechanisms to achieve efficient use of natural resources in the economy.

Markets exist for some of the products that originate from aquatic habitats (e.g. fish, tourism) and for some of the inputs required to enable people to derive benefit from the resource (e.g. recreational fishing and boat supplies). One management option is to allow alternative uses of the resource to be determined according to the market outcome.

However, there is a large body of evidence available demonstrating that the operation of an unregulated market in this context will not produce a socially efficient outcome. Aquatic habitats have common property (Gordon 1954) and public good characteristics (Cornes and Sandler 1986) that ensure that the market outcome will

not be optimal. The failure of the market to produce an optimal outcome is referred to as market failure (Tietenberg 1988).

2. *The regulatory approach*

Intervention by the government is often advocated to correct situations of market failure (provided the cost of intervention does not exceed the benefit). Intervention is usually achieved through implementation of a regulatory approach. With a regulatory approach, governments recognise that the demands placed on habitats from alternative uses sometimes exceed the capacity at which they can be supplied on a sustainable basis. They therefore intervene to introduce controls on either participation (e.g. limited entry) or depletion (e.g. bag limits or quotas) to prevent overexploitation.

Using the terminology of this session, the key value implicit in application of the regulatory approach is preservation of the habitat and interacting organisms. Regulations are developed and implemented and the effectiveness of the regulations is assessed according to the degree of success in maintaining the habitat.

The regulatory management approach can be extremely effective at preventing overexploitation of individual species by restricting the level of exploitation of the habitat. However, it is characterised by two major deficiencies: it is inflexible and inefficient. Once regulations are enacted, they are often difficult to alter quickly should circumstances change. If a regulatory approach is to be used, effort should be directed to ensuring that the regulations enacted are as flexible as possible to enable managers to respond to unforeseen perturbations of the aquatic habitat.

Even if regulations are flexible, a regulatory approach will encourage users of the habitat to pursue strategies that minimise the adverse impact of the regulations on their activities. This effect is clearly demonstrated through analyses of the impact of regulations on fishing effort in commercial fisheries e.g. Anderson (1985).

Fishers respond to the regulations by substituting non-regulated inputs for those that are regulated. This action reduces the effectiveness with which the regulations protect the stock, implying that the severity of the regulations will eventually have to be increased to maintain the resource at the desired level. More importantly, input substitution by fishers increases the cost of harvesting the fish. Potential profits that could be earned from the fishery are thus reduced. The reduction in profits reduces the economic contribution of the fishery to society.

A further characteristic of the regulatory approach is that regulations are typically introduced after a problem becomes apparent. Thus, even if industry is consulted before implementation of the regulations, the urgency of the problem to be solved often produces political actions and conflict amongst participants. The regulations implemented are often a compromise and oriented towards solving the current problem.

3. *The value-added approach*

A value-added approach recognises that aquatic habitat is a natural asset that has a capital value. The value of the asset is the sum of the benefits derived by all current and future users of the resource. A value-added approach to management seeks to maximise the total value of the asset.

In contrast to the regulatory approach, the key value is the asset value, not the need to preserve the resource. Due to the market failures associated with aquatic habitats, a value-added approach will include regulations. This may involve input controls and/or output controls. However, the focus of the regulations will be fundamentally different from the regulatory approach. With the value-added approach, emphasis is redirected from preventing overexploitation or protecting the resource, to looking for ways to improve value.

Asset value could be improved by:

- varying the level of exploitation of the habitat (e.g. reducing fishing effort);

- changing access rules to alter the way in which the resource is allocated between existing participants; and
- encouraging new uses that develop the habitat.

The value-added approach will by definition guarantee protection of the resource. Actions that reduce the quality of the asset will reduce the value. Thus actions that lead to resource depletion that is not sustainable are inconsistent with a value-added approach.

The value-added approach is preferred to the regulatory approach because, not only does it protect the resource, it also facilitates development within biological and economic constraints. Key characteristics of the value-added approach are contrasted with the regulatory approach in Table 2. A key distinction is that the value-added approach is forward looking and anticipative. As a consequence, regulations are flexible and strategic.

Where does Australia fit into this classification?

Aquatic habitat management in Australia is moving towards a value-added approach. For example introduction of individual transferable quotas (ITQ's) in the tuna fishery has assisted to increase the value of the fishery (Geen and Naylor 1989). However, most managers would also agree that there are many deficiencies with the present system. The challenge for the 1990s is to build on the progress to date and to strive for a full value-added approach.

What is required to implement the value-added approach?

1. Habitat managers need to develop a value-added mission. They need to think in terms of values and recognise that in most habitats, the present use pattern will not be maximising the value of the resource. Man-

agers need to search for innovative methods to increase value through changing current use patterns.

2. More research effort needs to be directed towards determining current and potential values of habitats. From an economic perspective this will involve gaining competence in measuring the values derived from alternative uses of habitats e.g. recreational and commercial uses. Biological research needs to provide a sound understanding of the dynamics of the resource and also the impact of human activities on the quality of the asset (which is related to value).
3. Use available technology to improve habitat management efficiency. There are unlikely to be new instruments discovered to control human activity in aquatic habitats. However, technological advances may improve the effectiveness of existing methods whether they be input or output controls
4. There is large scope for institutional reform to improve the effectiveness of aquatic management. Institutions need to be flexible, adaptable, depoliticised, strategic, consultative, anticipative and conflict reducing. The Commonwealth has considered this issue and chosen a statutory authority. What should the States do? Options include:
 - a statutory authority like the Commonwealth's;
 - a Fisheries Board consisting of government and industry representatives; and
 - an independent Fisheries Commission conducting periodic audits of fish habitats and reporting to the Government (analogous to the role performed by the Industry Commission in economic development).

Buchanan (1987) argues that it may be more effective to improve economic welfare by changing the institutions and rules governing the use of resources to obtain a

result that more accurately reflects the preferences of stakeholders than to develop strategies (techniques) to improve efficiency within the current rules. In some aquatic habitats, there may be scope to develop common property management regimes rather than continue with management programs that seek to strengthen individual participants' property rights.

5. Information and education of industry and the public are essential elements of a value-added approach. Effective debate on alternative options must be based on accurate information. This must be disseminated to all stakeholders.
6. Increased emphasis needs to be given to the process of fisheries management i.e. consulting with industry, developing, planning and recommending policy. A characteristic of the value-added approach is shared ownership of the problem and the solution. The fisheries management development process will to a large extent determine the extent to which problems and solutions are owned by stakeholders.

Summary

Alternative uses of aquatic habitats place demands on the resource that sometimes exceed the capacity of the habitat to meet the demands. This leads to overexploitation, permanent resource depletion and reduced economic welfare.

Management authorities have typically responded to the potential problem of overexploitation by introducing a regulatory management approach that protects the resource. This approach can be extremely effective in maintaining the resource. However, a regulatory approach is often inflexible and inefficient. Moreover, it may restrict the extent to which the resource contributes to economic welfare. Reduced welfare is expressed through a reduced value of the habitat relative to what it could be under an alternative management arrangement.

A preferred option is to introduce a value-added approach. Rather than just protecting the resource, a value-added approach seeks to develop the resource and maximise the value of the asset through varying exploitation levels, and utilisation of the resource by competing participants. Development opportunities are exploited so that management becomes forward looking and strategic. Implementation of a value-added approach will increase the contribution of the habitat to the welfare of society.

References

- Anderson, L.G. (1985). Potential economic benefits from gear restrictions and licence limitation in fisheries regulation. *Land Economics* 61(4), 409–418.
- Buchanan, J.M. (1987). The constitution of economic policy. *The American Economic Review* 77(3), 243–250.
- Comes, R. and T. Sandler (1984). Easy riders, joint production and public goods. *Economic Journal* 94, 580–598.
- Geen, G. and M. Naylor (1989). Individual Transferable Quotas and the Southern Bluefin Tuna Fishery: Economic Impact. Occasional Paper 105, Australian Bureau of Agricultural and Resource Economics, AGPS, Canberra.
- Gordon, H.S. (1954). The economic theory of a common property resource: the fishery. *Journal of Political Economy* 62, 124–142.
- Gravelle, H. and R. Rees (1981). *Microeconomics*. Longman, New York.
- Kratilla, J.V. and A.C. Fisher (1975). *The Economics of Natural Environments: Studies in the valuation of Commodity and Amenity Resources*. James Hopkins University Press for Resources In the Future, Baltimore.
- Mitchell, R.C. and R.T. Carson (1989). *Using Surveys to Value Public Goods: The Contingent Valuation Method*. Resources In the Future, Washington, D.C.
- Tietenberg, T. (1988). *Environmental and Natural Resource Economics*, Scott, Foreman and Company, Illinois.

Table 1. Classification of uses

<i>Category</i>	<i>Description</i>	<i>Nature of demand</i>
1	Participative and depletive	Depletion Space
2	Participative and non-depletive	Space
3	Non-participative and non-depletive	Sustainability

Table 2. Characteristics of the regulatory and value-added approaches

<i>Regulatory approach</i>	<i>Value-added approach</i>
Key value is the stock	Key value is the value of the asset
Protects the stock	Develops the resource
Current problem oriented	Forward looking and anticipative
Inflexible	Flexible and strategic
Consultative	Highly consultative
Political	Depoliticised
Conflict	Reduced conflict