ECONOMIC DEVELOPMENT OPTIONS FOR ISLAND STATES: THE CASE OF WHALE-WATCHING

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Abstract

This paper explores the consequences of whale-watching tourism with reference to the Kingdom of Tonga. Whale-watching tourism has been proposed as a viable development option for small island states. This proposal is frequently linked to permanent cessation of what is, in many cases, traditional whale hunting. This article critiques some earlier work on the economic impact of whale-watching and explores the consequences of whale-watching using biometric models in an attempt to inform policy and debate concerning the economic benefits of switching from whale hunting to watching. Ecotourism generally, and whale-watching specifically, have some development risks and these risks are elaborated.

For small island states on the periphery of the whale-watching industry, the profitability of an exclusive whale-watching strategy is threatened by increased competition elsewhere. We contend that economic returns from whale resources can be maximised by retaining a whale hunting option for cases where resource populations rise above that necessary for ecological sustainability and tourism activities. By eliminating the prospects of a diversified use of whale stocks for the somewhat more uncertain gains from whale-watching, small island states expose themselves to potential shocks. Such states have a lesser ability to absorb such shocks; hence the elimination of hunting options is an ill-advised development route for humans.

Keywords

Development, ecotourism, noncommunicable disease, Tonga, whale-watching, whaling

I. Introduction

The whale-watching industry has been in a period of rapid growth over the last two to three decades (Hoyt, 2000). This supports the argument that whale-watching is an important development option, hence worth investment by small island states. Many

small island states are experiencing growth in nearby whale populations, while suffering a lack of other development opportunities. Allied to this growth have been several studies that attempt to quantify the economic value of whale-watching. The values that have been generated are significant and indicate that whale-watching could be an important development activity for some developing countries. It is this final point that motivates this particular paper. Economic and anthropological methodologies are combined in this research.

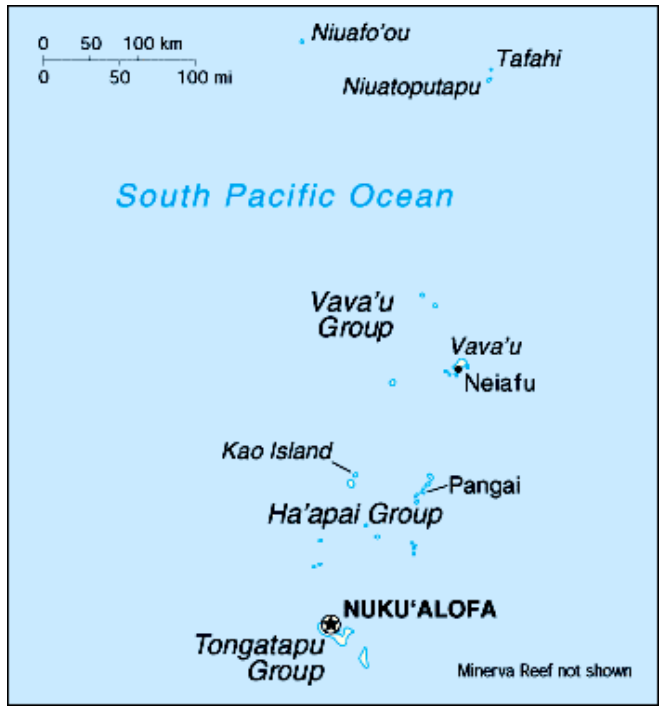

Figure 1 – Map of Tonga (20°S, 175° W)
(reproduced from http://www.weatherhub.com/images/maps/tn.gif)

Estimates of the value of whale-watching have shown that the activity can have significant positive impact on small island economies. This has supported calls to forgo (often small scale) indigenous whale hunting[1] entirely in favour of whale-watching (eg Greenpeace, 2004). The rationale here is that the development benefits of whale-watching are considerable and this option, (via an ecotourism mechanism) would be threatened by simultaneous lethal harvest. This argument has been made by anti-whaling governments and non-governmental organisations. It also forms part of the rationale for the South Pacific whale sanctuary advocated by the Australian and New Zealand governments. These claims, in the case of Tongan whale-watching, received support from a study by Orams (1999; 2002).

It is important to assess these arguments objectively. Island microstates in the developing world often have few natural resources to utilise. Many of the resources that are available are in fact marine-based. Hence, decisions on how to employ these resources have significant development implications. If whale-watching is an activity that

achieves development objectives, then it is an activity that merits support. Nonetheless, if the benefits are exaggerated, the cost of whale-watching is under-estimated and can lead to premature abandonment of whale hunting options, hindering development outcomes. In this case, there would be an over-investment in whale-watching activity based on an inadequate economic justification. In this context, it must be noted that some organisations and governments are actively trying to suppress whale harvest. This goal is manifested in two ways. First, it is asserted that the economically rational policy is to cease all harvests in favour of whale-watching only. This argument is based on claims of superior economic returns from whale-watching. Second, punitive actions, such as the threat of a consumer boycott, are signalled should whale harvest be pursued. These threats were evidenced with Iceland, who recently resumed whale harvests. (For a clear example of these arguments, see the Greenpeace (2004) press release, 'Conservation not Exploitation: Whale-watching').

This paper is divided into the following sections. In Section II, a formal economic model describing the optimal path of resource-use is presented for whales. This is to provide a benchmark from a development perspective. This model of utilisation incorporates both harvested and non-harvested values. In Section III, a number of prominent whale-watching studies are reviewed. This reveals that the benefits of whale-watching are typically exaggerated. In Section IV, the costs of whale-watching are explored in the context of a developing country. Special mention will be given to Tonga, as an instance of a leading whale-watching destination in the Pacific. The paper concludes by agreeing that whale-watching is a valuable ecotourism option but will argue that the elimination of harvest options for developing countries is an imprudent and a risky development route.

II. A Simple Bioeconomic Model of Whale Utilisation

The argument in favour of a sole whale-watching development option has been couched in economic terms, and motivates the use of an economic methodology in this section. This typically involves generating a model, or generalised description of the problem (Lazear, 2000). Such models are intended to clarify, by logical methods, the most important aspects of the issue. Expressing the problem in a mathematical form supports the use of logical methods. Bioeconomic models combine biological and economic parameters, and are often used in renewable resource management such as fisheries (Clark, 1990).

The bioeconomic model generated here shares these characteristics. It is based on a simple extraction model of a renewable resource (whales) but is elaborated with non-harvest benefits (eg whale-watching). This creates a simple trade-off as an increase in harvest will reduce the population size, and reduce the non-harvest benefits. If whaling reduces the wild population then whale-watching opportunities will be reduced. Note that the generalised structure of the model does not limit these benefits above to monetary benefits. It is intended to capture both monetary and non-monetary benefits that accrue from wildlife. The key elements of this model are as follows. First, there is a biological function that describes how animal-population grows and the effect of harvest. There is a socio-economic function to describe how the wildlife is harvested. There is also a third socio-economic function that describes how the wildlife is utilised by means other than harvest. These three functions all interact. It is also a dynamic model that anticipates changes over time. The result of this is a model that describes how the wildlife is most effectively used if the intention is to maximise economic benefits to humans. It is thus a prescriptive model and not a predictive model.

At a more formal level, we begin with a population of wildlife denoted as n, which in this instance will be whales. The species has a growth function $g(n)$ that is density dependent. Thus the population growth rate increases more slowly as the population gets larger. This conforms to the Cooke model adopted by the IWC for whale populations (Boyce, 2000). There is one choice variable facing the policy-maker. This is the level of harvest q. There are two types of benefits that can be realised from the whales. The first is the *net* consumptive benefits possible from harvest, denoted as $\pi(q)$. This net benefit incorporates the harvest costs as well as the actual returns from harvest.

The second benefit is the non-consumptive benefits, denoted as the expression $B(n,q)$. This states that these benefits are a function of both the population density n and the level of harvest q. These benefits increase if the population gets larger and decreases if any of the population is harvested. Whale-watching is the principle non-consumptive benefit in this paper. Nonetheless, other non-consumptive benefits such as cultural values attributed to whales by indigenous peoples are also relevant (see below). As with the consumptive benefits, the non-consumptive benefits are expressed in net terms. That is, they take into account the costs of acquiring the non-consumptive benefits also. It is reasonable to assume that $B'(q) < 0$ and $B'(n) > 0$. This implies that the second benefit will tend to be decreasing with respect to q and increasing with respect to n. This assumption rules out the possibility that whales would be considered a pest species.

The utilisation path that maximises the economic gain from harvest generates the greatest return to the developing country. Identifying this utilisation path requires specialised mathematical techniques. For non-specialised readers, a less formal explanation follows. The mathematical problem is incorporating an equation of motion (how the population changes over time) with the objective equation (how socio-economic benefits are created). This can be done by using *dynamic optimisation* methods, such as the Hamiltonian approach. This identifies when the equation of motion is consistent with the objective. The optimal solution to the equation of motion is the co-state condition. The optimal solution to the objective is the first-order maximum. Solving these two simultaneously yields the sustainable point that maximises socio-economic benefits over time. The utilisation problem can thus be presented as the following current-value Hamiltonian:

$$H = \pi(q) + B(n,q) + \mu(g(n) - q)) \tag{1}$$

The first-order condition for a maximum is:

$$H_q = \pi'(q) + B'(q) - \mu = 0 \tag{2}$$

The costate condition is:

$$H_n = B'(n) + \mu g'(n) = r\mu - \dot{\mu} \tag{3}$$

The solution, assuming that the conditions for stability are met, is:

$$r = g'(n) + \frac{\dot{\pi}'(q) + \dot{B}'(q) + B'(n)}{\pi'(q) + B'(q)} \tag{4}$$

This demonstrates that maximising the economic gain obtainable to the developing country does not exclude harvest of whales. The right hand side of equation 4 includes both harvest and non-harvest options. Equation 2 states that the marginal net benefits from harvest should equal the sum of the marginal net loss to the non-harvest benefits and the shadow-price of the remaining stock. In other words, there will be a whale population-size that can be sustained to generate the greatest total value to a country. Attaining this greatest value to the stock depends on a combined strategy of harvest and non-harvest use. The ideal development path is to conserve a stock of whales sufficient to maximise the benefits of both activities. This cannot be achieved by restricting use to one of the potential activities. Note that countries that do combine whale-watching with whaling will have a lower harvest level and a higher whale-stock, than countries that only harvest whales. A higher harvest level should only occur if there are no alternative values (cultural or tourism) attached to the whales. This does not appear to be the case for small Pacific Island states. Nonetheless, the significance here is that the economic model does not support a development strategy based solely on whale-watching. Exclusion of whaling activities compromises development paths, while whale stocks can be managed at a level where harvest neither threatens the viability of the whale-watching sector, nor endangers the whale populations themselves. The economic argument in favour of a development path exclusively based on whale-watching is thus limited.

III. The Benefits of Whale-Watching

Estimating robust economic values for wildlife, such as whales, ultimately depends on being able to estimate a demand function for the resource. Demand functions describe a relationship between prices and quantities and are typically represented in Cartesian space as a negatively sloped curve. Other parameters also affect the position of this function in Cartesian space. From this demand function it is possible to infer a surplus measure of value, expressed either in terms of consumer surplus, or a variation measure. Such surplus or variation measures calculate the integral under a demand function over a relevant portion of the curve. For goods with non-market characteristics, the demand function cannot be directly observed. Such goods are often classed as 'environmental goods'. These are goods in the sense they provide something of value to subjects. That these benefits are not revealed by market behaviour does not discount them as having economic values.

There are two widely used techniques that can be used to derive the demand function. The first is by using travel distance as a proxy for the price a subject is willing to pay. This method is known as the Travel Cost Method (TCM). The second technique is the Contingent Valuation Method (CVM). This places the environmental good in a hypothetical market where consumer bids are observed. These bids are then used to derive the demand function. This approach is used in the United States to assess environmental damages; a well-known recent example was assessing the environmental cost of the Exxon Valdez oil-spill in Alaska. The TCM was used by Loomis et al (2000) to calculate the consumer surplus associated with whale-watching. This returned values of between US$43 and US$50 per person per day. The CVM has been used to estimate similar surplus measures (Samples et al, 1986). The problem however with the CVM is that it calculates total non-use value, whereas whale-watching is concerned with a specific non-consumptive use-value. It is suggested that for threatened wildlife, non-use values are likely to exceed use-values (Boyle and Bishop, 1987).

Total non-use values include a range of attributions that do not depend on the direct use of the wildlife. For instance, a subject may believe that wildlife has intrinsic or existence value, which generates a right to exist independent of any direct utility to humans. Other non-use categories are bequest values and option values. Should a subject value the wildlife because s/he wishes to make a bequest of it to other people, then this demonstrates a bequest value. In the case of option values, the wildlife is conserved so that the valuer retains the option of using it at a later date. The practice of hunters voluntarily reducing their hunting, even if it imposes short-term hardship, is a manifestation of such option values.

These different sources of value contribute to the demand for wildlife, even if there is no market for them. In practice it is the manifestations of the values in some budget-allocation exercise that leads to the attributing of value to a resource. The actual motivations for this attribution of value are often not analysed when calculating surplus measure of benefit by CVM or TCM. Hence while surplus measures embody many different sources of value, the challenge is to isolate the influence of whale-watching on such estimates.

Such a challenge has not been met in many studies estimating the benefits of whale-watching (eg Duffus, 1988; Orams, 1999; Hoyt, 2000). These attempts to estimate the value of whale-watching have neither estimated demand functions nor calculated surplus measures of value. Rather, total-expenditure attributed to the whale-watching industry is used as a naïve proxy for value – that is, these authors take no account of costs to island economies incurred in the supply of whale-watching opportunities. This failure to adopt an appropriate methodology generates numerous valuation problems. It also happens to generate much higher values for whale-watching than studies employing appropriate economic techniques.

Benefits estimated using this total-expenditure technique provide estimates often one order of magnitude greater than the previously cited economic studies. Thus Hoyt (2000) generates a figure of about US$100 per whale watcher visit, Duffus (1988) generates estimates of US$ 262 per whale watcher, and Orams (1999) estimates US$ 212-223 per person. In light of such numbers, it is not surprising that whale-watching is being touted as a development option for countries with whale resources.

The main problem here is simply an inability to distinguish gross from net benefits. This results from using total expenditure (or industry turnover) as a proxy for economic value. This proxy measure is inappropriate for two reasons. First, it treats all expenditures in the industry as a 'good'; there are no 'bads' (or more accurately costs) taken into account. Thus ranges of expenditures within the industry are actually counted as benefits when in reality they are costs. Much of the indirect benefits associated with this expenditure approach are for items such as food and accommodation. This is typified in Orams (1999), where the estimate of value would drop to roughly one third of his assessment if food and accommodations 'costs' were not counted as benefits.

Items such as food, accommodation, souvenirs, boat operations and fuel are inputs that can only be provided at a cost to the whale-watching enterprise and the wider community. For island microstates, much of these inputs have to be imported. Parenthetically Orams (1999) initially states that gross (as opposed to net) benefits are estimated in his report, but this point receives little subsequent acknowledgment. Neither is it identified in reports (eg Hoyt, 2000) that cite Orams' work. Inputs require the allocation of societal-resources to their provision. It is a basic requirement for the

profitability of the industry that the revenue from customers exceeds the cost of providing these inputs. Thus the treatment of all expenditures as benefits can only be done if all inputs are provided at zero cost. This is plainly nonsensical. The practice of not removing input-costs from these estimates of the value of whale-watching contributes to the exaggerated benefits derived from this activity.

The second challenge to employing expenditures to estimate the value of whale-watching is causality. At some level, it is assumed that tourism expenditures are induced by the presence of the whale-watching industry. The validity of this assumption is inherently difficult to prove, and the studies on whale-watching above make little attempt to do so. The validity of this assumption is relevant, however, for developing countries considering whale-watching as a development option.

It may be that it is other investments that induce expenditures on whale-watching. In this sense, the direction of causality is opposite to that claimed by whale-watching advocates. For instance, providing tourism-industry infrastructure, such as hotel construction or the provision of air-links, may cause a rise in visitors. Such a rise would be accompanied by a rise in participation in whale-watching activities. This appeared to be the case in Tonga, where tourist numbers did not increase until the first half of 1999. Despite the history of Tonga as a whale-watching destination, this increase coincided with improvements in airline services. Global trends of rises in whale-watching activity largely bypassed Tonga in the 1990s until this point.

This can be shown with the following time-series model. An auto-regressive (AR) model was generated to test the hypothesis that Tonga has shared the global increase in tourist numbers. The data consists of monthly visitors to Vava'u. A time-trend was tested using the data from Orams (1999). The Pagan technique was used to correct for the order 5 autocorrelation. The variable *V* was the actual visitor numbers that month.

V=	728.01	-0.140$Vt1$	-0.453$Vt2$	-78.949C	-371.19S	-1.038T
	(4.37***)	(-0.66)	(-2.11**)	(-1.96*)	(-4.64***)	(-0.38)
ΣVt=	-0.59276					
	(-1.93)*					
R^2 = 0.765		Adj. R^2=0.740		n=56		

t-ratios in brackets *- significant at 10%, **- significant at 5%, ***- significant at 1%

The variables V_{t-1} and V_{t-2} are first and second lags of V, while ΣVt is the sum of the effects of these lags. The lag length was determined by the use of the Lagrange Multiplier technique. The variables C and S are *cosine* and *sine* harmonics to map the highly seasonal nature of tourists, and T is a time-trend variable. T has a negative coefficient that is not statistically significant. There thus appears to be no discernible evidence that Tonga is a participant of the global trend of growth in whale-watching. The assumption that whales, rather than improved tourism infrastructure, are attracting visitors to the area remains speculative. Vava'u is a popular tourist destination where a variety of alternative marine attractions to whale-watching exist (op cit).

This problem with causality is found in other studies on whale-watching. An appraisal of ecotourism in New Zealand (Pearce and Wilson, 1995) found that whale-watching was one of many activities that drew tourists. Indeed, in this study it was found to be one of

the lower ranked activities. This is supported by Orams (1999) that found that only a minority of visitors to Tonga were actually attracted by the presence of whales. In spite of these questionable economic analyses, this has not deterred governments and NGOs such as the International Fund for Animal Welfare (IFAW) from advocating an exclusive whale-watching development path (see IFAW, 2003). Numerous South Pacific countries are being encouraged to develop whale-watching industries by the South Pacific Regional Environmental Programme (SPREP) and the Australian and New Zealand governments. As this encouragement is allied to attempts to establish a whale-sanctuary in the South Pacific, it is clear that advocates of these proposals see that whale-harvest and whale-watching are mutually exclusive activities.

The whale-watching valuation reports that are being utilised are very optimistic about the benefits of whale-watching. For developing countries there is, however, scant attention paid to the risks of such ventures. That there has been a global trend upwards in whale-watching activity does not imply that every region also experienced this trend. Further, it is not at all clear that all whale-watching enterprises will generate positive returns.

Whale-watching has economic risks. It is an industry that is relatively easy to enter, given the widespread distribution of whales. As more countries or business operators enter the industry, the economic viability of the earlier-established businesses will be subject to increased threat from competition (as Graburn, 1990, commented on similar proposals advocated elsewhere). This threat to the economic viability of the whale-watching industry, generated by new entrants, is illustrated by the situation at Ogata in Japan (Murakami, 1996). In 1989 there were eight tour boats operating at this location. This number had grown to 61 boats by 1996. This trend was allied with an increase in whale-watching sites (to 20) throughout Japan. The impact of this increased competition was a significant reduction in revenues to individual tour operators at Ogata. By the end of this period, annual profits by operators are in the regions of US$ 10-12,000. This was simply inadequate to replace the income from foregone harvesting opportunities.

Similar lack of profitability occurred at Andenes in northern Norway. Whale-watching operations were subsidised by an international environmental organisation to demonstrate that whale-harvest was economically inferior to whale-watching (Ris, 1999). The problem was that even with the subsidy these enterprises were not viable. As a demonstration of the superior returns from whale-watching the effort was unsuccessful.

Such risks are likely to be exacerbated for South Pacific Island states. As Hoyt (2000) notes, many Pacific tourist destinations (including Australia, Canada, New Zealand, Japan and the US) have their own well-developed whale-watching industries. These happen to be the countries South Pacific Island states are likely to draw tourists from. Nonetheless, it is likely that consumers prefer to go to the closest site available to them to view whales. There is little reason to bear the high costs of flying to a remote location to view whales when this can be done at a significantly lower cost much closer to home. Pearce and Wilson (1995) suggest that just such conditions apply in New Zealand. The lack of participants from Australia and North America in New Zealand whale-watching sites indicate a preference for viewing whales at sites closer to the tourist's country of origin.

The impact of travel distance on whale-watching demand is ignored in many whale-watching reports. This also frustrates claims that whale-watching attracts tourists, as the demand function is not correctly specified to take into account one of the most significant variables. Claims that whale-watching sites attract tourists to sites peripheral

to global tourism trends are at best speculative. It may even be implausible for remote locations. Such sites are likely to have a variety of alternatives to whale-watching (eg Vava'u has several other marine attractions) and such 'bundling' of activities makes it difficult to isolate the impact of whale-watching. The assumption that whale-watching is attracting tourists is not yet based on robust empirical data, nor is it based on coherent economic reasoning.

Overall, for countries at the periphery of the whale-watching industry, demand is likely to remain weak or turbulent. Maintaining a high visitation rate based on whale resources will present these peripheral industries with a major challenge together with significant risks. Even during the 1990s when global demand for whale-watching was increasing, Vava'u in Tonga did not participate in this rise in demand. It is worth noting that Vava'u, one of the few known breeding areas for South Pacific humpback whales, is a particularly favourable whale-watching location, arguably unmatched among South Pacific island nations. Unlike other island locations, Vava'u offers a high probability of sighting one of the most spectacular large whale species (the Humpback whale, *Megaptera novaeangliae*), favoured by whale watchers, in sheltered inshore waters.

For peripheral nations in the South Pacific, all of which suffer from a geographic disadvantage *vis à vis* the more developed countries from which many (potential whale-watching) tourists are drawn, the ease of entry by firms into the industry globally generates a palpable threat to their own domestic enterprises. Evidence that whale-watching represents a significant and positive development option for such countries is rather lacking. In what might be indicative of the increasingly competitive market facing Tongan whale-watching enterprises, 'swim with whales' programs have been introduced to attract tourist interest. Whether such initiatives are sufficient to maintain a market niche, or are ecologically sound, remains questionable.

Nonetheless, in an apparent effort to gain support for the South Pacific whale sanctuary proposal, the Australian and New Zealand governments claim that economic benefits will result from establishing whale-watching enterprises throughout the South Pacific region (eg Hill, 1996; Lee 2001a, 2001b; New Zealand 2001). The poor ability of Pacific Island states to attract ecotourists interested in whale-watching suggests that expanding whale-watching throughout the region may harm rather than benefit its economies. Eco-tourists may end up being spread too thinly across the region to sustain the profitability of any particular island-state's investment. The Australasian sponsors of this proposal appear indifferent to the fate of the existing whale-watching interests.

This might be merited if the economic returns were as large as claimed. Nonetheless, the promised returns to the region's island states from investing in whale-watching have been exaggerated. Further, the assertion that whale-watching and whale hunting are incompatible activities deliberately limits the potential diversification, and hence enhanced security, of marine resource-based development opportunities in the region.

The argument that whale-watching is incompatible with whale hunting is a key element in anti-whaling proposals. The case that ecotourism via whale-watching will lead to superior development outcomes requires careful scrutiny. One assumption is that because whale-watching appears to be a rapidly growing industry, South Pacific countries ought to actively enter this industry. The limited available evidence however, does not support this assumption. Visitation rates at Vava'u have not reflected the potential for significant expansions in the whale-watching industry.

Further, there is evidence that whale-watching and whale-hunting can occur simultaneously. Many countries still harvest whales for traditional, scientific and commercial reasons, such as Canada, some eastern Caribbean nations, Japan, Norway, the Philippines and the United States (bowheads). These countries allow both whale hunting and whale-watching. In some cases (eg Canada and Norway), whale-watching opportunities are provided in active whaling communities. While there is clearly the potential for negative attitudes towards whaling to affect the flows of tourists upon which whale-watching relies, it has not yet been established that this is necessarily the case. The conditions under which a dual use of the resource might be managed with concerns for the sensibilities (or overall economic impact) on major tourist spending areas are yet to be determined (Hoyt and Hvenegaard, 2002).

The bioeconomic model above also does not provide a justification for forgoing hunting options. Equation 4 showed that to maximise the return on whale populations both consumptive and non-consumptive use occurs at a steady-state equilibrium. This does not imply that whale harvests need occur in disequilibrium. For instance, a temporary cessation of whale hunting might be good management in both economic and ecological terms, when whales are at low densities.

Low whale populations are likely to impact on hunting decisions. The influence on non-consumptive benefits from harvest $B(q)$ is likely to be high. The intuition for this is that the odds of observing whales is a function of their numbers and, by driving small numbers even lower, the demand for whale-watching is likely to decline. Whale-watchers are simply unable to find whales to view. The second is that at low densities, the value of $B'(n)$ is high (as numbers fall the marginal value of each whale rises). Hunting effort should thus be low or zero until populations reach higher densities. Nonetheless, there is an important difference between a temporary reduction in hunting effort while numbers are low, and a permanent end to hunting at any and all whale densities.

In theory, if the function $B(n)$ was continuously increasing through time (ie if whale–watching activity was locked into a permanent growth path) it may be that the gains from whale-watching always outweigh the gains from hunting. This peculiar result, though, is solely dependent on whale-watching being stuck in a permanent growth trend. While reports like Hoyt (2000) are optimistic about such growth paths, evidence from a number of whale-watching sites (such as Ogata above) indicates that saturation points are inevitable. With no guarantees of a permanent growth in whale-watchers, it is untenable to adopt permanent hunting bans in anticipation of such growth.

In order to establish the superior returns from whale-watching over whale hunting, such reports often make reference to whale hunting. Such comparisons are hard to justify in the absence of quality data on whale hunting. In practice this comparison is undertaken by stacking the 'balance sheet' in favour of whale-watching. Reporting and estimating as many 'values' as possible inflate the net benefits of whale-watching. This is reinforced by ignoring environmental, social or economic costs that may occur alongside ecotourism. As noted above, many industry expenditures are actually counted as benefits. In the case of whaling, however, no such inclusion of both market and non-market benefits are used. One would imagine that if whalers were also allowed to class industry expenditures on fuel and wages as benefits, this too would greatly exaggerate the returns from whaling.

IV. Whale Utilisation for Small Island States with special reference to Tonga

The discussion above emphasised the economic risks associated with whale-watching. Nonetheless, from a development perspective ecotourism may be associated with other social costs. These costs have not been properly acknowledged in the whale-watching studies above. Indigenous or traditional whaling may still generate social benefits to island-based communities. We motivate these points by referring to Tonga.

In small peripheral communities such as Tonga, whale-watching occurs almost exclusively in the monetised sector of the economy. In this situation its engagement with traditional sharing and gift-exchange practices is minimal. Consequently, most economic relationships involved with whale-watching activities are mediated by and understood as commodity exchanges. This is different to the small-scale marine production that occurs in many small island nations, both in the South Pacific and other regions. Such marine production is embedded in both the monetised and non-monetised (or subsistence) sectors of the economy.

In Tonga, as elsewhere in the Pacific, fisheries production goes into both the market and traditional exchange circuits (Evans, 1999a; 1999b, 2001). The socio-economic value of production that goes into markets is readily incorporated into economic models. The significance of gift-exchange is not. Such gift-exchanges have an insurance role in society. They widen the distribution of fisheries harvests, thus ensuring that many households and individuals enjoy nutritional benefits (Bender et al, 2002). A perhaps unintended consequence of this gift exchange is that it moderates harvest effort and yields a more ecologically sustainable use pattern (Bender, 2007) Such exchanges are also fundamental in maintaining family and community relationships and practices. The continuance of these various institutions is important for the long-term maintenance and vitality of Tonga's society and culture (Evans, 2001). These non-market benefits are typically ignored in whale-watching studies that argue against whale hunting options (eg Orams, 1999). Precluding marine primary production as a development option is imprudent. It may be associated with significant, and unanticipated, social costs.

It is also erroneous to presume that whale hunters only maximise commercial profits. Whaling is carried out by a variety of businesses, ranging from smallholders through to some larger enterprises. Such harvests are typically well below the maximum sustainable yield. While it is possible that in certain cases, economic factors (small markets, high marginal costs) could prevent harvest occurring at the maximum sustainable yield, current effort does not seem to be explained by such factors (Conrad, 1989; Bloch and Hanusadottir, 1993, Bjorndal et al, 1997; Freeman et al, 1998). It appears that cultural limits on harvest operate to sustain the use of these valued resources to ensure long-term community and cultural persistence.

From the model above (equations 2, 4), non-consumptive benefits such as those that attribute cultural or spiritual values to wildlife operate to limit harvest. Conrad (1989) for instance demonstrates that Alaskan Eskimo [Inupiat] catch-rates of the bowhead whale must also implicitly value an *increase* in bowhead whale populations. The values of those opposed to whaling often clash with the values and aspirations of community-based whalers. Nonetheless, from a development perspective these conflicts are not germane to the argument that whale-watching produces a superior return to community-based whaling.

These non-commercial values can be elaborated. They often include those of a social or cultural nature. Some community-based whalers in various countries are motivated by strong desires to bequeath robust populations to others in their families and communities. There may be value-associated societal norms that limit harvest to satisfy local or wider community needs only (Sanderson, 1991; Kalland and Moeran, 1992; Freeman et al, 1998). Whaling may also be an expression of cultural or community life that maintains traditions and links with ancestors or community predecessors (Manderson and Hardacre, 1989; ISG, 1992). These would all be non-commercial benefits attributed to whaling over and above any 'market' attribution of value. The relative importance of market and non-market values of whales is, however, outside the scope of this paper. Such determinations have been made elsewhere (Bockstoce et al, 1982; Akimichi et al, 1988; Braund et al, 1989, 1990; Moeran et al, 1992; Freeman, 1993; Young et al, 1994).

The point here is that the use of market value as a proxy for the economic significance of whale hunting severely discounts the importance of non-market values attributed to whales by whale hunters. As such, the consequences of exaggerating the benefits from whale-watching and discounting the benefits from whale hunting unfairly favours whale-watching. The social costs of an exclusive whale-watching development path are ignored. This can bias decision-makers into favouring exclusive whale-watching development options under erroneous economic assumptions.

Calls by whale protectionists for the elimination of consumptive whale use occur in the context of increasing challenges to smaller nations in terms of nutrition, health, economic development and security. Taking Tonga as representative of many South Pacific small island nations, a serious health crisis has been precipitated by changing diets and increased consumption of low quality imported foods. Of particular concern are the imports of high-fat content meats like mutton flaps (sheep bellies) and poultry parts (including 'turkey 'tails') that are imported from several of the nations advocating the non-use of whale meat (Australia, New Zealand, and the United States).

In Tonga, import levels of these fatty imported foods (eg mutton flaps, poultry parts, sausages and corned beef) have increased from 3.39 million kg in 1989, to 5.56 million kg in 1999 (Evans et al, 2001). The consequent increases in consumption of such food represent almost a doubling of import expenditures to the Tongan economy. During this time the population size has scarcely changed. The increase in per capita consumption of these low-nutrition foods has been more than 60%. The health consequences of this changing diet are severe. A WHO epidemiological study of diabetes and cardiovascular diseases on Tonga concludes:

> *Noncommunicable diseases (NCDs) are common and increasing in Tonga. In the last ten years, cardiovascular mortality has increased by 43 percent… Diabetes patients have high complication rates from kidney, eye and foot diseases. The main reason for the rising NCD rates are increased imports of meats… leading to high levels of fat consumption.* (Scragg, 1997: 11)

NCDs are of concern in many parts of the developing world today (World Health Organisation, 1998). Given the known association between diet-related noncommunicable diseases and the consumption of fatty foods (Campbell, 2000; Hermansen, 2000), concern is clearly warranted.

Recent research in Tonga has shown that these consumption patterns are not a product of either dietary preference or an erroneous perception of nutritional value (Evans et al, 2002). The contributing factors are low household budgets combined with the low price and ease of availability of these imports. In effect, households are making optimal decisions that resemble 'corner solutions'. The resulting health problems are a consequence of limited access to better quality affordable meats. Ironically, there is a direct relationship between the level of engagement in the monetised economy and a diet compromised in this way (Evans et al, 2002). In effect, pursuing an expansion of ecotourism at a time when NCDs are rising may exacerbate current health problems. We emphasise that whale-watching is embedded in the monetised sector, while community-based whaling engages the non-monetised sector as well[2].

Diet related disease, such as diabetes or stroke creates profound impacts on communities by debilitating or removing key community actors and cultural brokers in the prime of their social lives. Not only does the cost of caring for afflicted individuals devolve upon families and communities, but also the untimely loss of key community members can, in aggregate, impair the productive capacity, and the vitality and maintenance of important cultural institutions. In the case of small nations, these losses can negatively impact the collective wellbeing to a degree not experienced in larger countries.

The costs of deferring whaling, therefore, are not entirely economic in their nature. They have the potential to involve serious human health issues, with concomitant rises in demands on public finances. Health professionals in Tonga estimate that slightly more than half of all health-related spending results from diagnosing and treating various diet-related NCDs (Evans et al, 2000). Increased production and consumption of fish, whale, and other marine protein offers non-market benefits. The nutritional and health benefits of consuming marine fats and protein are well established (Dyerberg et al, 1975; Bang et al, 1980; O'Keefe and Harris, 2000). When considered in relation to the increased consumption of imported foods, the net health effect on the general Tongan population of suppressing whale consumption (in the belief that this is necessary in order to encourage whale-watching) is detrimental. These costs have not been acknowledged or accounted for in the various reports proclaiming the benefits of whale-watching at the cost of whale hunting. It may, of course, be the case that whale populations are not yet high enough to sustain a regular, community based harvest. Nonetheless, pulling more people away from traditional fisheries production towards the ecotourism industry is likely to perpetuate the replacement of marine protein with imported foods.

The negative health impacts caused by the substitution of imported high-fat foods for indigenous food resources are a serious issue throughout the South Pacific region (Collins et al, 1990; Hodge et al, 1996; South Pacific Consumer Protection Programme, 2000*).* It is also an issue that is of concern throughout the developing world (World Health Organisation, 1998). In regard to these health problems, a return to greater consumption of traditional foods, including whale on occasion in the case of Tonga, is locally recognised as offering protection against some of the negative health consequences associated with high consumption levels of imported fatty foods.

V. Conclusion

Whale-watching is a new and potentially valuable industry but proponents have employed faulty economic techniques, over-estimating benefits often by an order of magnitude. Because whale-watching is often linked to a ban on alternative uses of the resource, realisation of the full value of whales for developing nations is inhibited. Economic diversity is generally socially beneficial, and can offer increased development benefits and community sustainability. It is only reasonable to objectively assess a variety of whale-use options. Increasing resource-use options can offer benefits, which contribute to strengthening the economy, food security, human health, and the maintenance of social and cultural values, institutions, and practices.

Seeking to preclude resource-use options increases the vulnerability of small Island microstates to shocks. These shocks include increased competition from tourism sites that are situated closer to the 'core' consumer areas, unanticipated changes in future demand for whale-watching and rises in NCDs. An open-minded consideration of the optimal use of whale resources suggests that opportunities exist to derive a wide range of economic and non-economic benefits. These ought to be by developed in a locally appropriate fashion, considering both consumptive and non-consumptive use of the renewable resource. That such uses must fit within an ecologically sustainable management regime is transparent and assumed by all.

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Endnotes:

[1] The International Whaling Commission, the body charged with managing the harvest of baleen whales, distinguishes between three types of whaling, aboriginal subsistence whaling, the harvest of whales for scientific reasons, and all other forms of whaling. There are significant conceptual problems with the categorisation scheme (see for example Takahashi, 1998). The 'aboriginal subsistence' category actually included factory style whaling in the USSR because at least some of the whale meat was used to provision Siberian Aboriginal peoples. Here we use the term 'indigenous whale hunting' to refer to locally controlled small scale practices, but this criterion has no standing at the IWC (see Evans, nd and Reeves, 2002 for a fuller discussions of these issues).

[2] In fact, indigenous Tongan whaling practice, which occurred from approximately 1890 to 1970, engaged first an international market for oil, and then an exclusively domestic market for meat (Reeves, 2002, Ruhen, 1966). After use became exclusively domesticated in the 1910s, it is unclear how much of the whale products entered market based versus non-market based exchanges. Nonetheless, both anecdotal evidence collected in the Ha'apai region of Tonga by Evans in the early 1990s and contemporary fisheries practice suggest that significant quantities of whale meat would have entered either the gift exchange sphere, or the moral economy (in which social ties and values decrease the price of a good). Of course, the mix of market and non-market based circulation varies elsewhere as well.

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