Chapter 13

"You Don't Know What You've Got 'Til it's Gone"

The Case for Spiritual Values in Marine Ecosystem Management

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Abstract

Belief in the spiritual value of nature is most often associated with Aboriginal people, but is common to major religions and many people with no religious affiliation. This chapter traces the origin of whole ecosystem evaluation from the 1950s to the development of the "total economic value" and "ecosystem services" frameworks. I argue that debates over which categories are valid, summation methods, and concerns about "double counting" miss the larger question of whether the whole is greater than the sum of its parts. I review the case for and against inclusion of spiritual value and conclude that it has significant potential to express the intrinsic value of species and landscape and the totality to which they belong.

Keywords: Ecosystem intrinsic value, instrumental value, spiritual value, Pacific Northwest, Aboriginal, eco-theology

Introduction

…you don't know what you've got 'til it's gone
They paved paradise and put up a parking lot… (Mitchell, 1970).

When Aboriginal leaders speak of spiritual values, politicians listen, but the memory fades fast in face of competing claims of constituents. When conservation organizations speak of intrinsic value, many eyes glaze over. Joni Mitchell's lament for lost spaces and threatened species (Mitchell, 1970) speaks to a growing public unease that can be stated neutrally as concern about the rate of human encroachment on nature, but equally as grief at the loss of sacred spaces. I argue that spiritual value resides in those species, places, and qualities that shape our identity, community and, in a wider sense, our place and purpose in the universe. How it is expressed varies dramatically with social, religious, and ecological context. Apparent

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inconsistency and association with minorities or fundamentalists makes it easy to reject spiritual values as inappropriate to the decision-making process in a pluralistic society (Brunk, 2004), but this can lead to over-reliance on methods designed to convert such values to monetary equivalents (Sagoff, 1998, 2007; Ludwig, 2000). Some reject the entire economic valuation project when it comes to nature (McCauley, 2006), as in Michael Toman's famous dismissal of a US $33 trillion estimate of the Earth's ecosystem services (Costanza *et al*., 1997) as "a serious underestimate of infinity" (Toman, 1998). The danger of ascribing infinite value is that economists may well reject such values as "irrational" (Sagoff, 1998; Ludwig, 2000), or exclude them because no mechanism exists to take infinite values into account.

Belief in the spiritual value of nature is not inconsistent with use, but does encourage ethics of respect, gratitude, and reciprocity that constrain excessive or destructive use. I ask: Do concepts such as "total economic value" (NRC, 2005: 44–47) and "ecosystem services" (Costanza *et al*., 1997; Daily, 1997) provide adequate recognition of the spiritual value of nature? If not, can a cogent case be made to overcome the problems that intolerance, persecution, and the forced imposition of outdated models of "reality" (e.g., "creationism" and the crusade to equate the "market economy" with the "free world") pose for the incorporation of spiritual values into public policy?

Aboriginal people, species, and landscape in the Pacific Northwest reshaped each other in the thousands of years before European contact (Anderson, 2005; Mann, 2005; Turner, 2005), creating multiple ways of understanding the world that can be collectively described as the "Ethnosphere" (Davis, 2001). I would go further: over long periods of time, people, species, and landscape transform each other, so that after hundreds to thousands of years, none of them are what they were at the beginning (Fig. 13.1). The extent to which marine

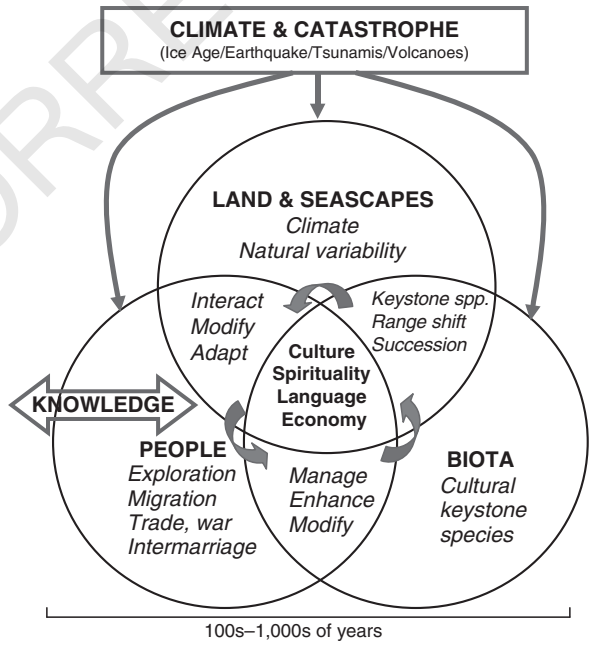

Fig. 13.1 Interaction between people, territory, biota and 'surprise' (sensu Holling 1986).

species were modified is only beginning to be understood (Harper *et al*., 1995; Haggan *et al*., 2006; Williams, 2006; Erlandson and Rick, 2008).

The spiritual value of nature might be described as a relationship that we perceive between ourselves, other living creatures, and the physical environment. "Nature" as a realm governed by immutable laws and understood only by natural scientists whose business is to discover facts, which they believe must forever change the way politics and business is done, is a dysfunctional modern concept. This is attested by the equal frustration of scientists, politicians, and business (Latour, 2004). In contrast, the pre-modern world was made up of different relationships between people, environment, and biota. Humans like to see themselves as in charge but, as Michael Pollan (2001) mischievously suggests, corn and wheat have hoodwinked us into transforming much of a planet for their benefit. It might amuse the Aztec corn god that North Americans eat more corn than his ancient adherents (Pollan, 2006); he would be less amused that transforming corn into biofuel was raising the price of tacos for their descendants. Corn or potatoes in Latin America, yams for the people of the South Pacific, and salmon in the Pacific Northwest, are not facts reducible to genus and species. They were and are spiritual beings who could be persuaded to cooperate, and which changed in abundance, form, time of appearance, taste, and texture from year to year.

Golden Rule #1: Love your neighbor as yourself

The Pacific Northwest coast had three periods of "transformation", which we may characterize by different "Golden Rules". A close relationship manifests in Aboriginal themes of transformation (Plate 9 in the color plate section) between humans, environment, and other species as spiritual beings (Jones and Williams-Davidson, 2000; Trosper, 2003), respect for the "personhood" of non-human life forms, and in sentient landscapes (Povinelli, 1995; Basso, 1996; Cruikshank, 2005).

In Aboriginal cultures, salmon and other species were regarded as spiritual beings with power to punish greed, waste, or disrespect (Jones and Williams-Davidson, 2000; Trosper, 2003). Appropriate expressions of respect and thanks accompanied all uses of the natural world (Boas, 1921). Salmon were also a major contributor to food and social security, wealth, and status (Trosper, 2003; Haggan *et al*., 2006; Trosper, 2009). This reciprocal relationship corresponds to the Golden Rule: "Love your neighbor as yourself" common to Judaism, Christianity, Islam, and almost if not all major religions (Beversluis, 2000; Swidler, 2006), often with the direction that "neighbor" is to extend beyond family and friends to encompass even enemies and particularly the poor.

Major differences between pre- and post European contact societies reside in the locus, use, and flow of wealth and the options available. Traditional coastal societies were organized along the lines of house territories (Marsden and Galois, 1995; Sterritt *et al*., 1998; McMillan, 1999). While leadership was hereditary, leaders who failed to maintain or increase and distribute wealth could be replaced, a critical distinction from the western concept of ownership (Trosper, 2009). Extended kinship and intermarriage contributed to food and territorial security (Trosper, 2003). This system of distribution is characteristic of many tribal societies (Ommer and Turner, 2004).

Golden Rule #2: The one with the gold makes the rules

The near annihilation of Aboriginal populations by old world diseases (Boyd, 1999) and European settlement ushered in a "biotic-commodification" period based on high rates of exploitation of seals, sea otters, whales, fish, and forests. The commercial fishery "transformed" salmon and other species from spiritual beings to commodities. Wealth flowed off tribal lands into a global economy. Golden rule #2: "The one with the gold makes the rules" drove the politics that alienated Aboriginal people from the wealth of their lands and waters. By 1992, Aboriginal people had been reduced to a 5% share of the salmon fishery (Pearse and Larkin, 1992). Loss of management control to settler government and inability to distribute wealth were profoundly destructive of traditional management and government systems (Harris, 2001). Aboriginal people have been marginalized in most fisheries by limited entry licensing schemes and being bought out by corporations in hard times. They are effectively excluded from quota fisheries by extremely high prices (Haggan and Neis, 2007).

Golden Rule #3: The gold goes where the gold grows

The late 20th and early 21st century economy of coastal BC is one of "multiple uses of ocean space", where other economic sectors dwarf fisheries (Haggan *et al*., 2009) and geopolitical considerations such as climate change and the opening of the Northwest Passage take centre stage (Ommer *et al*., 2007: 438). Figure 13.2 shows that commercial fisheries now constitute less than 0.1% of GDP, less than the contribution of farmed salmon.

The growth of other economic sectors presented investment options that did not exist prior to European contact. Fisheries economist Colin Clark (1973a,b) describes the "economics of overexploitation" and extinction that drive industrial fishing:

> … the principal shortcoming of the existing theories is their disregard of the time variable, both biologically and economically… It denies the fundamental principles of economics itself to overlook the latter effect, and that is just what the rule of maximizing rent does (Clark, 1973b).

Clark's theorem states that extinction is likely whenever people are only prepared to wait half as long for their money as it takes the whales or fish to grow. Almost 20 years later, Munro (1992) remarked with asperity that although Clark's work was widely cited: "The static economic model of the fishery appeared to go on seemingly unscathed." Thirty-four years later Grafton *et al*. (2007) claimed that Clark's theorem was of only academic interest, and that property rights would protect even slow-growing species from extinction. In response, Clark and colleagues (2010) modeled the growth rate of over 1,000 species. They concluded that private ownership might be justified for just one extremely rapidly growing species, but would be "supreme folly" for slow-growing fish such as orange roughy (*Hoplostethus atlanticus*) and sablefish (*Anopoploma fimbria*):

> Aesthetic or moral questions aside, the decision to exterminate a species is an irreversible decision that can only be justified in economic terms if we are certain that present conditions will persist into the distant future (Clark, 1990: 41).

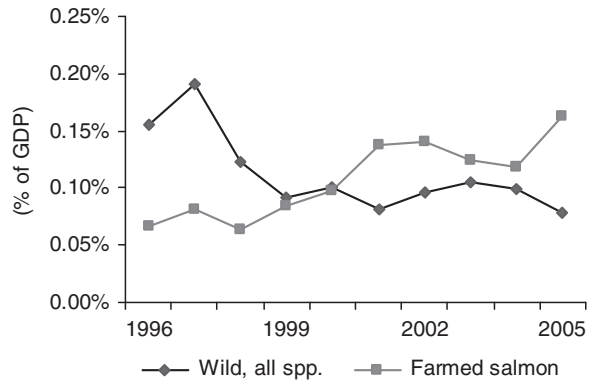

Fig. 13.2 Percentage of British Columbia's GDP contributed by wild fisheries compared with farmed salmon, 1996–2005. Data source BC Statistics and Stats Canada.

Clark's theorem is a modification of the "golden rule equation" (Munro, 1992; Clark *et al*. 2010), which tells an investor when it is time to liquidate one asset and diversify into others. I restate the "modified golden rule" as: "The gold goes where the gold grows". Maintaining fish populations into the far future makes sense for indigenous people who depend on fish for their "cultural and physical survival" (Canada, 1990) or for permanent communities that depend on fishing. Extinction may well be "economically rational" for the owners of corporate fleets that are the marine face of "footloose capital" (Ommer, 2000). Not all depletion is caused by corporate fleets, but the depletion of fish populations by large vessels is a major cause of the poverty that drives indigenous, artisanal, and subsistence fishers to overexploit populations which they have used sustainably over long periods of time (Kaczynski and Fluharty, 2002; Alder and Sumaila, 2004), with a "knock-on effect" on terrestrial species or "bushmeat" (Robinson and Bennett, 2000; Brashares *et al*., 2004).

Concepts of value

Intrinsic value is the value of something in and of itself, without reference to any real or perceived use to humans (NRC, 2005: 35). Intrinsic value includes non-anthropocentric values (NRC, 2005), i.e., more than just the values ecosystems provide to humans (Pimentel, 1998). *Instrumental value* lies in the usefulness of things as a means to an end. Intrinsic and instrumental values are thus in tension. Intrinsic value is often associated with Immanuel Kant, who restricted it to "rational" humans (NRC, 2005: 36). Wood (1998) argues persuasively that Kant's reasoning would extend intrinsic value to all humans, species, and ecosystems. Marilyn Cash (2002) makes the specific argument for women. What has intrinsic value is not mere existence or mere life, or therefore continued existence or continued life, but quality of life, not only of present, but also of future flourishing lives of individual members of the species and ecosystems (Attfield, 1998). "Flourishing" as opposed to "mere existence" is a criterion of spiritual value (McFague, 1993; Callicott, 1994: 121–122; Lucas, 2008). *Existence value* as used in whole ecosystem evaluation is defined as the amount that people are willing to pay to ensure that a species or landscape continues to exist.

While *spiritual value* is found in individual species, the idea that spirit flows through and enlivens all things finds expression in and outside of indigenous spirituality and formal religion. The concept of an enlivening spirit is common to many cultures – "Chi" or "Qi" in Taoism, "Prana" or "Shakti" in India, the Great Spirit in certain North American Aboriginal cultures (Callicott, 1994: 121), "Mana" in Hawai'i (O'Connell, 2008), and "Mauri" in New Zealand (Durie and Hermansson, 1990). Belief in the spiritual value of nature is widespread among people who deny any religious affiliation (Shibley, 2004). Reverence for life and the universe, outside of the "supernatural" defined as events that defy the laws of science, is expressed by scientists from Einstein's "cosmic religious feeling" (Einstein, 1954) to Dawkins "reverence for life" (Gledhill, 2007) and in poets (Oliver, 1992), writers (Butala, 1994: 21–22), and other forms of art. Those who find belief in spirit permeating the cosmos hard to swallow may consider how their credit cards are manifestations of a global financial system based on faith in the economy.

The roots of whole ecosystem evaluation

The development of whole ecosystem evaluation is rooted in the 1950s debate about population growth and how best to use and protect the natural environment. By the 1960s and early 1970s, attention focused on the impact of population growth on the coastal zone (Spinner, 1969; Sweet, 1971; Gosselink *et al*., 1974). It was driven by the general unawareness of politicians and developers of environmental impacts and the need to integrate and identify sensitive and critical habitat as part of an integral planning process (Spinner, 1969). A "Marine Resources Committee", set up in the 1960s to develop "A Plan for the Marine Resources of the Atlantic Coastal Zone", identified a need for:

> … a method that accounts for all habitats and all uses, present and proposed and which evaluates a proposal for change by its effect on the entire [US Atlantic] coastal system as well as on the state or local situation … (Spinner, 1969).

The spatial, temporal, and human scope is significant. It recognizes that ecosystem effects transcend the immediate interest of coastal state governments and particular development projects. The Committee's work extended beyond the general prescriptions so easy for a government panel to make and so hard to implement. Collecting "…biological and sociological information as well as economic data…" is a huge task, but a good start can be made using existing "studies on the salt marshes, estuarine zones and shoal waters" (Spinner, 1969). Salt marshes, generally regarded as "unproductive" habitats suitable to conversion to harbors or farmland, figure largely in early calculations of total economic value. Gosselink *et al*. (1974) calculate net present salt marsh values ranging from $US1974 50–80,000 per acre ($US 550–880,000/hectare in 2008 dollars) for contributions to commercial and recreational fisheries and tertiary waste treatment. The concept of ecosystem services is anticipated in the term "free work of nature that is grossly undervalued simply because it has always been taken for granted, or assumed to be unlimited in capacity." (Gosselink *et al*., 1974).

Formal frameworks, 1987–1991

Bishop *et al*. (1987) set out to extend valuation of Great Lakes fishery resources beyond commercial and sport exploitation by including "intrinsic" and "indirect use" values. They define intrinsic values as a "catch-all category for all non-use values", which is different from the Kantian concept, but the study is notable as it explicitly considers option, bequest and existence values. However, indirect use has the narrow sense of experiencing species and landscape through books and media. Randall (1991) identified "option", "bequest", "existence", and "quasi-option" as values not included in standard cost benefit analysis.

The most fundamental division is between *use values* comprising *consumptive, non-consumptive* and *indirect use*, and *non-use values* (MEA, 2003; NRC, 2005). *Consumptive use* covers the extraction of fish, forest, and other products at all scales from local use and sale to the world market. *Non-consumptive use* refers to everything that depends on the quality of the coastal environment from contemplation of nature to jet-skis. *Indirect use* in the total economic value framework equates to the ecosystem functions that make human life and the economy possible, excluding consumptive and non-consumptive uses, which are already in the market. The corresponding neoclassical economics concept is "externalities", which are positive when business benefits and negative when business impacts environment and biota. Neither appears in profit and loss statements.

Ecosystem services have grown from one component of total economic value to a framework that now includes all categories of use and non-use value. Figure 13.3 shows the increasing use of "ecosystem services" vs. "total economic value" between 1990 and 2007. This is likely due to a combination of factors, starting from Costanza and colleagues' (1997) estimate of $US 33 trillion for global ecosystem services and natural capital vs. global GDP of $US 16 trillion, growing business community interest in the contribution of nature to the economy (Heal, 2000; Daily and Ellison, 2002; MEA, 2005), and a sharp rise in awareness of the impact of climate change on ecosystem services. The popularity and attention is attested by the TV series *Nature Inc*. scheduled to run from 2008–2010 (BBC World Service, 2008).

Non-use values in both frameworks include *option value* defined as maintaining the opportunity to use something in the future which we do not use now, or of which we may not

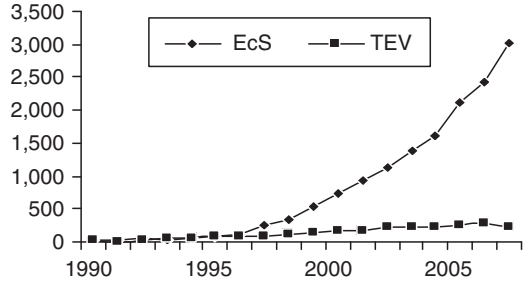

Fig. 13.3 Instances of "ecosystem services" (EcS) compared with "total economic value" (TEV) in Google Scholar from 1990–2007.

be aware; *quasi-option value* being the value of information gained under policies, which defer developments that risk irreversible harm; *bequest value* is the amount we are prepared to leave to future generations; while *existence value* is measured by the amount people are willing to pay for the continued existence of species and or places those people may never personally experience. These categories are discussed more fully in Appendix 1.

Approaches differ on how non-use values are treated. The US National Research Council (2005: 100) specifically excludes option value as, "…the difference between valuation under conditions of certainty and uncertainty … a numerical calculation, not a value held by people". Others differ; Chapin *et al*. (2000) identify significant financial costs of biodiversity loss and corresponding benefits of conservation. This would appear to be more in tune with growing public awareness of new pharmaceuticals and the desire to insure against calamity. The Millennium Ecosystem Assessment considers bequest as a subset of option value.

Measuring ecosystem value

Significant attention has been devoted to methods of summing across categories. Randall (1991) noted that the literature has been "contentious from the beginning… Economists debate the validity of important categories… [and the] relevance of others." There is also an "eclectic variation" in summing strategies, i.e., that the value of a "bundle" of non-use values is not the same as the sum total of all possible use values.

Contingent valuation measured by surveys of *willingness to pay* to conserve species and ecosystems is the economist's method of choice for non-use values. Properly done, contingent valuation is consistent with total economic value as it permits valuation of wide range of plausibly-constructed scenarios (Randall, 1991). Bishop *et al*. (1987) showed that residents in the US state of Wisconsin were willing to pay $US 28 million to protect bald eagles (*Haliaeetus leucocephalus*) from possible extinction. This is no surprise as the eagle is the national emblem and has use value from birdwatching to T-shirts and coinage. It is surprising that the same residents were prepared to pay $US 12 million to protect the striped shiner (*Notropis chrysocephalus*), a small endangered fish of no use value whatever. The $12 million indicates that people will pay for "existence value", but provides little information as to how much (Bishop *et al*., 1987), but as the authors note, the striped shiner is likely a surrogate for all endangered species. Surveys are bedeviled by significant "ordering" effects (Clark and Friesen, 2008). The amount people were willing to pay to preserve visibility in the Grand Canyon was five times higher when the "visibility" question was asked first than when it came third (Tolley and Randall, 1986). Ordering effects are not necessarily tractable to randomization. A marine mammal study valued seals more highly when the seal question came before the "whale question" – the value of whales did not vary (Samples and Hollyer, 1990). Other effects include "embedding" where respondents will put the same value on losing one lake out of five as on losing them all (Kahneman and Knetsch, 1992) and a "warm glow" of support for a good cause (Diamond and Hausman, 1994; Nunes and Schokkaert, 2003).

Sagoff (1998) suggests that the embedding effect and zero values reflect a belief that government or polluter should pay and high to infinite values are based on principle rather than individual satisfaction. Aesthetic, moral, and spiritual values are better characterized

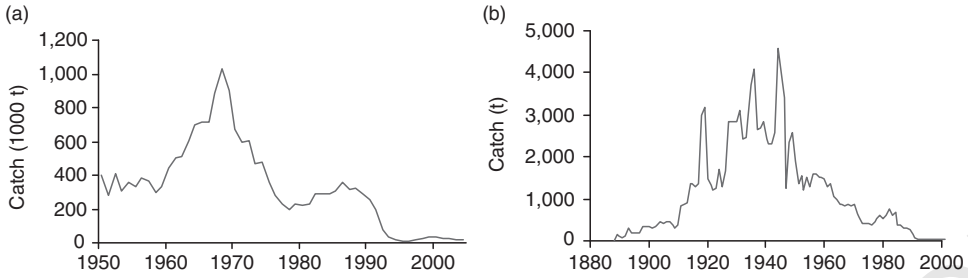

Fig. 13.4 (a) Total Canadian catch of Atlantic cod, *Gadus morhua*, 1950–2004. Data source: *Sea Around Us Project*, www.seaaroundus.org. (b) Total sport and commercial catch of lingcod, *Ophiodon elongatus*, from the Strait of Georgia, British Columbia, 1880–2000. Data Source, Department of Fisheries and Oceans, Canada.

by unwillingness to pay (Sagoff, 2007). This is consistent with Amartya Sen's (1977) point that commitment is at least as potent a motivation as individual preference satisfaction. The likelihood that respondents are considering the general good of society rather than individual satisfaction; and the very large amount of information required to make informed judgments, suggests that "mock referenda" (Kopp and Portney, 1999) or jury-style deliberative approaches would be more reliable (Sagoff, 1998, 2007). The wide differential in ability to pay both within the industrialized world and between the "north" and "south" makes willingness to pay measurements morally problematic (Attfield, 1998).

It is important to distinguish the interest of future generations from "bequest value" determined by willingness to pay. The "bequest motive" (Krutilla, 1967) suggests that future generations should enjoy no less than the present, but fish populations continue to decline (Pitcher *et al*., 2005; McClenachan *et al*., 2006; Saenz-Arroyo *et al*., 2006; Worm *et al*., 2006). We would prefer to have more BC lingcod (*Ophiodon elongatus*) or Atlantic cod (*Gadus morhua*), but the population levels that past generations of fishers were willing or able to "bequeath" to us preclude that option (Fig. 13.4).

Application of total economic value significantly increased the *net present value* of US marine ecosystems (Sumaila *et al*. submitted). "Net present value" or the present *and future* monetary value of catch is calculated by dividing present value by a "discount rate". A discount rate of zero makes future catch infinitely valuable; 100% makes it worth nothing at all. The question of appropriate discount rates for the deep future is hotly debated (Portney and Weyant, 1999) and the furor stirred up by the 0.1% used in the *Stern Report on Climate Change* (2007).

High discount rates impact future generations by accelerating depletion; low rates are deemed to impose unfair hardship on those alive today. Numeric approaches to balance present and future interests include the "Chichilniski Criterion" (1996) of no tyranny of the present or future, "intergenerational discounting" (Sumaila and Walters, 2005) and Gamma Discounting (Weitzman, 2001). I have also interpreted the "7th Generation" principle of the *Hau de no sau nee* Aboriginal people of Canada (Clarkson *et al*., 1992) as a zero discount rate over 140 years. This is for illustration only, as the directive to consider the 7th generation includes the full range of social, cultural, spiritual, and economic interests. I have no reason to suppose that the *Hau de no sau nee* would revert to some form of conventional discounting at the end of that time. Table 13.1 summarizes

Table 13.1 Net present value (NPV) of US marine ecosystems under total economic valuation (Sumaila *et al*., submitted); with increases by intergenerational discounting (Sumaila and Walters, 2005) gamma discounting (Weitzman, 2001) and the aboriginal "7th generation" principle (Clarkson *et al*., 1992).

Source of Value	Management	Discount Rate (%)	NPV ($US billion)	Source [Approach]
Commercial and sport fisheries	Current (Poor)	7	32	(Sumaila *et al*., submitted)[b]
Add non-use values[a]	Current (Poor)	7	106	(Sumaila *et al*., submitted)[b]
Restoration	Excellent	7	224	(Sumaila *et al*., submitted)[b]
Future generations	Excellent	7	411	(Sumaila and Walters, 2005)[b]
Future generations	Excellent	3	522	(Sumaila *et al*., submitted)[b]
Future generations	Excellent	Variable	958	(Weitzman, 2001)[c]
Future generations	Excellent	3	1,437	(Sumaila and Walters, 2005)[c]
Future generations	Excellent	0 (140 years)	2,198	(Clarkson *et al*., 1992)[d]

[a] Option, ecosystem services, existence and bequest.
[b] Conventional discounting at 3%, summed to infinity.
[c] Summed over 1,000 years.
[d] Summed over 140 years based on 7 × 20-year generations.

increase in net present value of US marine ecosystems from Sumaila's total economic value analysis (Sumaila *et al*. submitted) and under the Chichilniski criterion, gamma, and 7th generational discounting.

Total economic value and inter-generational discounting increase the value of US marine ecosystems by many orders of magnitude (Table 13.1), but require a dramatic improvement in fisheries management and compliance. These theoretical gains must be set against the reality that despite the bequest motivation; past generations of fishers have depleted fish populations (Fig. 13.4, Pitcher *et al*., 2005; McClenachan *et al*., 2006; Saenz-Arroyo *et al*., 2006; Worm *et al*., 2006). A discount rate below Canada's official rate of 7% might well have averted the collapse of Atlantic cod (Ainsworth and Sumaila, 2005), but fishers often operate with significantly higher discount rates – between 20% for fishers in the Irish Sea (Curtis, 2002) and ~130% for Ghanaian fishers living in "abject poverty" (Akpalu, 2008).

To put the Table 13.1 figures in perspective, the annual, as distinct from "net present" value of fisheries, is $7.4 billion under poor management and $15.7 billion assuming that restoration can be achieved (Sumaila *et al*. submitted). Contrast the annual US defense budget of close to one trillion dollars (Higgs, 2007) and total US GDP of 13.8 trillion (CIA, 2009). Fifty-one percent of the US population lives close to the coast or Great Lakes, but accounts for 57% of the total US economy, eight times more than the interior (Rappaport and Sachs, 2003). The difference in productivity is increasingly attributable to amenity values (Rappaport and Sachs, 2003), confirming the "temporal asymmetry" that Krutilla (1967) noted between current consumptive use and future demand for unspoiled environments. Berman and Sumaila (2006) suggest that higher future amenity values from restored ecosystems make a case for lower discount rates on consumptive activities such as fishing, so contributing to ecological restoration. They also note that restoration will be more economically-beneficial to growing economies whose citizens have the money and leisure to appreciate amenities, an instance of Attfield's (1998) moral objection to willingness to pay.

A bridge between intrinsic and instrumental value

The goal of the Millennium Ecosystem Assessment (2003: 128) was to help decision-makers "evaluate trade-offs between [policies and actions] that alter the use of ecosystems and the services they provide." Obsession with measurement of marginal change in existing ecosystems leaves little room for ecosystem restoration based on past abundance benchmarks from "baseline shift" studies (Pitcher *et al*., 2005; McClenachan *et al*., 2006; Saenz-Arroyo *et al*., 2006; Worm *et al*., 2006).

While the utilitarian paradigm has "no notion of intrinsic value", the Millennium Ecosystem Assessment authors note that "Many other factors including notions of intrinsic value … will also feed into the decision framework" (MEA, 2003: 128). They also argue that intrinsic value that would be "partially reflected" in the existence value that many people place on ecosystems [intrinsic value] is the hardest, and the most controversial, to estimate." (MEA, 2003: 133). There is considerable confusion or "entanglement" between intrinsic and existence value (Bishop *et al*., 1987). Definitions of existence value based on altruism (Randall, 1991) or "happiness that the ecosystem exists quite apart from any future option to consume it, visit it or otherwise use it.…[which] may arise from aesthetic, ethical, moral or religious considerations…" (Sumaila *et al*. submitted) indicate the presence of values beyond existence value in the strict utilitarian sense.

The "partial reflection" of intrinsic value is roundly rejected by Attfield (1998), Toman (1998), and McCauley (2006). Sagoff (2007) attributes the blurring to inability to separate preference satisfaction as determined by the market from ideas of what constitutes the good of society, which must be determined by public deliberation. Sagoff (2007) sees willingness to pay as an attempt to supplant democratic process with economic calculus in much the same way as scientists seek to short-circuit the public process with incontrovertible facts (Latour, 2004). In their major study of aquatic ecosystem services, the US National Research Council (2005: 33) observe that existence value is an "anthropocentric and utilitarian concept of value" measured in willingness to pay, "for the continued existence of a species or landscape".

The paradox of "willingness to pay" for intrinsic or spiritual value and "unwillingness to pay" for the same reasons (Sagoff, 2007), indicates the need for a bridge between intrinsic and instrumental value. Spiritual value is not inconsistent with use, but is inconsistent with depletion, extinction, waste, and disrespect. Examples include the "dual nature" of salmon as resource and spiritual being and the widespread practice of recognizing food as a gift from God/Allah/The Creator… (Kelly and Kelly, 1997), as well as thanking the host/cook and as a way of connecting with family and the wider community (Tirone *et al*., 2007).

Total economic value and ecosystem services are significant advances on the commercial and recreational values, which first come to mind when decision-makers weigh ecosystem health against the cost of treating industrial, domestic and agricultural waste, and the revenue from offshore oil and gas, gas hydrates, gravel mining, etc. Both frameworks are helpful in avoiding "double counting" and exclusion when multiple methods are used (Bishop *et al*., 1987; Randall, 1991). Yet, neither framework has any concept of intrinsic value. Implicit in both is the idea that the entire creation exists for the benefit of humans.

I suggest that the non-use values used in total economic value and ecosystem services studies are simply *deferred use* values, i.e., all are utilitarian. Major studies identify intrinsic values as "inputs to decision-making", but there is no guidance on how this might be achieved. The Millennium Ecosystem Assessment makes sporadic references to "sacred groves". The only mention of spiritual value in the extensive US National Research Council study of aquatic ecosystems is the caution that, "estimating the existence value and spiritual value of salmon with currently available economic valuation methods is controversial." (NRC, 2005: 176).

Daily (1997), one of the foremost exponents of ecosystem services, notes that spiritual values are "eloquently described elsewhere", but provides no references. I suggest that an exploration in and beyond indigenous spiritual and religious traditions might provide some crude sailing directions to "elsewhere". Mindful that "religion is a room clearer in the academy" (Caputo, 2008), I will briefly address some of the problems.

Belief in spiritual value does not necessarily guarantee conservation. The cleansing power of the Ganges is "spiritual"; it has nothing to do with the state of the actual river (Ruether, 2005). Devils' Tower is sacred to Native Americans, but rock climbers also claim that it connects them to the spiritual power of nature, creating ongoing problems for the Parks Board (Harmon and Putney, 2003). The notion of "redemptive violence" as the US civil religion (Wink, 2007), the threat which it poses to world peace (Jewett and Lawrence, 2004), and the way in which North American Christianity, government, and industry unite to bless consumption (McFague, 2008) is indeed problematic.

The case against religion in politics and education has been eloquently made by Dawkins (2006). While intolerance, persecution, and forced impositions of outdated models of reality have no place in public life or education, Dawkins demonstrates a weak grasp of theology: the core message of religion is not crusades or jihad, but compassion (Armstrong, 2007) and failure to recognize the potential of the world's spiritual tradition to contribute to ecological restoration (Wolfensen, 2003). Religious organizations have significant wealth, but even more potential to encourage their adherents to divert their personal and business holdings into ethical investments and ecological restoration that will also alleviate poverty (Boff, 1997; Palmer and Finlay, 2003). Dawkins says:

> under the banner of religion you can write about what I call Einsteinian religion, which I subscribe to and so do many scientists as a sort of reverence for the Universe and life, which has nothing to do with anything supernatural (Dawkins, cited in Gledhill, 2007).

Belief in a spiritual dimension of nature is strongly associated with Aboriginal people (Callicott, 1994; Basso, 1996; Cruikshank, 2005; Berkes, 2008), but is common to human cultures from pre-industrial peoples to the present. It is found in many if not all religions, as evidenced by the substantial output of the Harvard Forum on Religion and Ecology on Islam (Foltz *et al*., 2003); Buddhism (Tucker and Williams, 1997); Confucianism (Tucker and Berthrong, 1998); Hinduism (Chapple and Tucker, 2000); Daoism (Girardot *et al*., 2001); Judaism (Tirosh-Samuelson, 2002); Jainism (Chapple, 2002); and Christianity (Hessel and Ruether, 2000).

Christianity has been famously implicated in the destruction of nature (White, 1967). The eco-theology of Sallie McFague (McFague, 1993, 2001, 2008) extends the critique.

Human encroachment has turned nature into the "new poor" (McFague, 1993: 165–168, 188), at the sharp end of fishery depletion (Kaczynski and Fluharty, 2002; Alder and Sumaila, 2004; Brashares *et al*., 2004) and climate change (Stern, 2007). All religions teach a standard of care for the poor and oppressed, not out of condescension or sterile duty, but out of love. Latin American liberation theology interprets this as the *Opción preferencial por los pobres*, or preferential option for the poor. Liberation theology has proliferated into feminist, gay, lesbian, and multi-ethnic networks (Jones and Lakeland, 2005) whose delight in the inclusive message of scripture is a growing challenge to the patriarchal fundamentalisms that draw the ire of Dawkins (2006). If fish are the "literature of the sea" (McLoughlin, 2003), we are burning the library. Scientists of all flavors, natural, social, and humanist, are primarily motivated by love for what they do. Even the most vehemently anti-"religious" fisheries scientist might be seen as a human manifestation of the love of (whatever God or principle you believe in) for the plants, creatures, and coasts of the sea.

McFague cautions that all we can ever have is "models of God" and that fundamentalisms arise when religions seek to impose yesterday's model (McFague, 1993). New liberation theologies are dismantling old models. Constructive theology is extending the "traditional" duty of care for the poor to depleted fish populations, mangroves, and other habitats.

Conclusion

> … the dignity of rational nature is often hard to interpret, inherently controversial, in part culturally variable and in no wise subject to the elegant decision procedures which some other ethical theories (such as utilitarianism) think they can provide (Wood and O'Neil, 1998).

No matter how sophisticated, calculations of whole ecosystem value do not represent the spiritual value of nature, whether as Dawkins' "reverence for life and the universe" (Gledhill, 2007), Einstein's "cosmic religious consciousness" (Einstein, 1954), or Wilson's "Biophilia" (Wilson, 1984). While the discussion of values is evidently a human project, much depends on whether values are "assigned" or "recognized". All classifications require some form of ranking, and so are "invidious and dangerous and we are better off deconstructing them" (Caputo, 2003). Debates about "higher" values are unproductive. It has been suggested that economics should speak to means, not to ends (Ludwig, 2000), but senior economists have concluded that cost benefit analysis is "neither necessary nor sufficient" to guide public policy in environmental health and safety (Arrow *et al*., 1996). Similarly, I conclude that whole ecosystem evaluation frameworks are "necessary, but not sufficient" for full ecosystem evaluation. They do not address Michael Toman's "serious underestimate of infinity" (1998) or the zero or infinite values provided in contingent valuation surveys. Nor do they address the fact that most people are unwilling to set a price on cultural and spiritual values, indeed that such values are best characterized by "unwillingness to pay" (Sagoff, 2007).

Creation theology sees the "Commands" of Genesis as invitations to an "infinite matrix of possibility" (primal chaos or "The Deep") to collaborate (Keller, 2003). This is consistent with chaos and complexity theory. If "In the beginning" refers to all beginning, creation

is ongoing. In the context of marine ecosystem degradation and climate change, our choice is to be partners in creation or destruction (McFague, 1993: 197). This choice has been stated in various ways, "A different world is possible", the "proposed" vs. the "presumed" world (Brueggemann, 1997). When all claims to absolute truth, whether of religion, science, or philosophy are deconstructed, what remains is obligation to justice and the possibility of "something completely different", whether the "tout autre" of Jacques Derrida, or John Caputo's "passion for the impossible" (Dooley, 2003). According to Einstein this is what it takes to sustain great scientists through the long years of isolation, if not scorn and contempt (Einstein, 1954). On our dark days, many of us feel that it is too late for many of the things we love, but real hope is the hope that endures when there is no hope. Ecological justice/Liberation theology for fish and all who depend on them must engage not only the worlds of science and economics but also indigenous spiritual traditions, mainstream religions, the new liberation and creation theologies, artists, poets, and painters.

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Appendix 1: Categories used in total economic value and ecosystem services frameworks

Consumptive use can be roughly divided between small-scale fisheries meeting mostly local needs, a corporate sector supplying food fish to the industrialized world, and "forage" fish to the livestock and aquaculture industry. The extent of consumptive use is seen in the depletion and extinction of fish populations (Carlton *et al*., 1999; Musick *et al*., 2000; Punt, 2000; Dulvy *et al*., 2003; Sadovy and Cheung, 2003; Hutchings and Reynolds, 2004), but is best understood from "baseline shift" studies that compare past and present abundance (Pitcher *et al*., 2005; McClenachan *et al*., 2006; Saenz-Arroyo *et al*., 2006; Worm *et al*., 2006; Roberts, 2007). As striking as these are, they do not convey the "collateral damage" of serial depletion (Pauly *et al*., 1998). Threats to ecosystem integrity range from replacement of finfish by jellyfish (Boero *et al*., 2008), trophic cascades caused by removal of large sharks (Myers *et al*., 2007), the combination of invasive species and climate change (Carlton, 2000), and the impact of toxic algal blooms on fish (Burkholder *et al*., 1992) and humans (Morris, 1999). Significant marine impacts of consumptive use in other sectors of the economy include growing "dead zones" in the ocean (Diaz and Rosenberg, 2008) and the threat posed by ocean acidification to tropical coral reefs (Hoegh-Guldberg *et al*., 2007), deepwater coral and sponge reefs (Roberts *et al*., 2006; Rogers *et al*., 2007), and creatures that depend on calcium for all or part of their life history – almost all animal life in the sea (Orr *et al*., 2005; Kleypas *et al*., 2006; Stokstad, 2008; Barange and Perry, 2009).

Non-consumptive uses include eco-tourism, diving, birding, boating, and waterside vacations. All these are enjoyed (and priced) on the beauty and quality of the environment, presence of charismatic species and abundance. Overfishing of prey species such as Pacific herring (*Clupea pallasi pallasi*) has a profound effect on marine mammals, "recreational" fish species, and birds (Jones and Williams-Davidson, 2000). Decline in environmental quality, whether through beaches and shorelines polluted with plastic (Ballance *et al*., 2000; Derraik, 2002) or sewage, littered and stinking with dead sea life (Anderson, 1997) as caused by anoxic water in Oregon (Chan *et al*., 2008), or increase in stinging jellyfish (Purcell *et al*., 2007) impact non-consumptive use benefits to present and future generations.

Option value was first articulated by Weisbrod (1964) using the examples of the giant redwood trees (*Sequoia sempervirens*) in California's Sequoia National Park. People might well be prepared to pay to maintain the option to visit at some future date, though many will never do so. Government can factor this option value to all citizens into their rationale for maintaining the park at a cost greater than user fees. The economically-rational choice for a private owner would be "cash out" by selling the timber. Option value extends to the opportunity to use things in future, which we might not even be aware of today. It can be seen as a form of insurance, increasing the likelihood of future discoveries (Gowdy and McDaniel, 1995) and maintaining linkages vital to ecosystem function of which we may never become aware (Attfield, 1998).

Quasi-option value relates to the benefit of delaying a development decision when there is uncertainty about the benefit of alternate choices, at least one of which entails irreversible harm (Arrow and Fisher, 1974) and/or an irreversible commitment of resources (Freeman, 2003: 250–252; Sharp and Kerr, 2005). Quasi-option value thus translates into the value of information that becomes available only with the passage of time. As used by decision-makers, quasi-option value relates to the value of information gained through policies of risk aversion (Coggins and Ramezani, 1998), adaptive management, safe minimum standards, and the precautionary principle (NRC, 2005: 50). Freeman (1993) contends that quasi-option value is "not a component of the value individuals attach to resource changes". Fromm (2000) allows that it "quasi equals the value of efficient environmental policy", but is "no value component of natural assets". Increasing incorporation of the Precautionary Principle in policy and legislation and growing public desire for good management driven by the temporal asymmetry between consumptive use and amenity values (Krutilla, 1967; Rappaport and Sachs, 2003; Berman and Sumaila, 2006), suggest that there is a public "demand" and that quasi-option value might indeed be measurable in terms of the very substantial cost of monitoring and compliance programs.

Bequest value was described by Krutilla (1967), who observed that Weisbrod's (1964) case for public investment in preserving option values would apply equally to the private motivation to leave a balance of public and private assets to one's descendants. The rate of conversion of irreplaceable environment to manufactured goods at any point in time is always higher than it would have been had more advanced future technology been available. Concern expressed by the present generation can be attributed as much to the bequest motivation in private economic behavior as much as to a sense of public responsibility.

Existence value is defined as "a willingness to pay for retaining an option to use an area or facility that would be difficult or impossible to replace…" (Krutilla, 1967). Many people value the knowledge that wilderness continues to exist "even thought they would be appalled by the prospect of being exposed to it" and/or subscribe to conservation organizations to preserve species they may never see. It is the value that people attach to "knowing that a resource exists, even if they never use that resource directly" (MEA, 2003).

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