sustainability

MDPI

Article

Availability of Non-Market Values to Inform Decision-Making in Australian Fisheries and Aquaculture: An Audit and Gap Analysis

Louisa Coglan [1,*], Sean Pascoe [2] and Gabriela Scheufele [2]

[1] QUT School of Economics and Finance, Brisbane, QLD 4001, Australia
[2] CSIRO Oceans and Atmosphere, St Lucia, QLD 4067, Australia; sean.pascoe@csiro.au (S.P.); gabriela.scheufele@csiro.au (G.S.)
* Correspondence: l.coglan@qut.edu.au

Abstract: Fisheries and aquaculture management can have impacts on economic, social and environmental outcomes. Assessing alternative management options requires an understanding of the different trade-offs between these outcomes. Cost–benefit analysis provides a framework in which these trade-offs can be assessed, but requires all costs and benefits to be enumerated in monetary terms. However, some impacts associated with fisheries and aquaculture, particularly environmental, have no explicit monetary value, so they require non-market values to be derived. In this study, we identify and prioritize, through a stakeholder workshop, non-market values that are of the most relevance to Australian fisheries and aquaculture managers. We assess the potential of existing studies to provide appropriate values for use by managers through a detailed review of available studies. We found a deficiency in the number of recent studies across all priority areas. Non-market valuation of recreational fishing has attracted the most attention previously in Australia, but studies in the last five years were found in only half of the states. Other priority non-market values have been estimated in only one or two states, and most have no estimates within the last five years. The results of the study highlight the need for further research in this area.

Keywords: non-market values; fisheries management; aquaculture management

Citation: Coglan, L.; Pascoe, S.; Scheufele, G. Availability of Non-Market Values to Inform Decision-Making in Australian Fisheries and Aquaculture: An Audit and Gap Analysis. *Sustainability* **2021**, *13*, 920. https://doi.org/10.3390/su13020920

Received: 27 October 2020
Accepted: 6 January 2021
Published: 18 January 2021

1. Introduction

The marine environment produces a wide range of ecosystem services, many of which may be affected by fisheries management, but not necessarily considered in fisheries management decision-making. These may include cultural services, such as recreational fishing, as well as support services for a range of marine species that are exploited commercially, either through wild caught fisheries or aquaculture, or that are not exploited, but are of conservation value to society (e.g., seals, seabirds and dolphins) [1].

The fundamental principle underlying fisheries management and policy in Australia—at both the commonwealth (federal) and state level—is to ensure that marine resources are allocated sustainably across competing uses and users, such that the net benefits to current and future generations of society are sustainable and maximized [2]. Most Australian fisheries jurisdictions require the consideration of recreational and indigenous fishers in management decision-making affecting commercial fisheries and aquaculture, while some have additional social consideration requirements [3,4]. This principle requires all benefits and costs associated with the use of marine resources to be accounted for, with the term use being defined broadly to include both use values (e.g., commercially and recreationally harvested fish) and non-use values (e.g., continued existence of an endangered species). Effective management of marine resources therefore needs to be cognizant of the cost associated with the potential negative impacts of fishing and aquaculture activities on the wider ecosystem and community, including (1) environmental and ecosystem impacts

(for example, water and habitat quality, carbon footprint and visual amenity) and (2) recreational, cultural and social impacts [2,5].

The triple bottom line (TBL) approach [6] is the general framework currently used to assess policy outcomes against the economic, social and environmental dimensions. The TBL approach requires articulation of the impacts in each of these dimensions, but these may be qualitatively assessed. Significant progress has been made in incorporating some aspects into fisheries and aquaculture management decisions, particularly prioritizing different objectives of fishery management [7,8]. In some cases, semi-quantitative approaches have been used to assist in decision-making across multiple dimensions [9] including, in some cases, indigenous value [10]. Recent research has also extended this focus to develop a robust articulation of indigenous customary fishing values and enable their inclusion when developing fisheries management policies [11].

However, many decisions require a trade-off between different costs and benefits to be considered. TBL approaches do not explicitly consider this trade-off, resulting in challenges in identifying the options that generate the greatest net benefits. A number of different approaches have been developed to assess trade-offs between different components of the triple bottom line approach. For example, multi-criteria analysis (MCA) has been widely used in fisheries and other natural resource sectors to integrate social, environmental and economic outcomes [12–14]. Other approaches, such as social metabolism analysis [15–17] and the related biophysical economics approach [18,19], provide an alternative (non-capitalist-based) approach that provides information on the impacts on a sector though tracking material or energy flows (input usage and resource extractions and outputs, including adverse environmental impacts) through the production process. In contrast, cost–benefit analysis (CBA) enables an economic assessment of the trade-offs associated with alternative management options in measures that are more familiar and meaningful to managers (i.e., money) and facilitates the identification of those management options that produce the highest net benefits (benefits less costs) to society [20].

CBA is increasingly being applied to natural resource management. For example, forest management in the USA requires consideration of the market and non-market benefits of any management change [21]. In Australia, the New South Wales (NSW) Coastal Management Act 2016 requires local councils to undertake CBA as part of their coastal management activities [22].

CBA requires monetary value estimates for each of the benefits and costs. However, in fisheries and aquaculture (as in many environmental management areas), many costs and benefits do not have an explicit monetary value. Many ecosystem services provided by marine resources and used by fisheries and aquaculture are not bought and sold in markets, but nevertheless generate utility to the broader community. The values associated with these ecosystem services may include use values (e.g., recreational fishing) or non-use values, such as benefits associated with preserving a species for future generations [23,24].

Using CBA to inform decisions about the use and management of environmental resources requires objective information on the non-market value of benefits (and costs) associated with this use [25]. Some attention has been focused on the estimation of non-market values in recreational fishing [26,27], although only limited attempts to date have been made to use these values in supporting management decision-making [28]. Including these values in a cost–benefit framework may change what is considered an optimal outcome. For example, Pascoe et al. [29] found that including a non-market cost associated with bycatch changes the level of harvest in a fishery that maximizes total net economic returns. Many other relevant non-market values have not been quantified, and their use in fisheries and aquaculture management has not been fully explored.

The estimation and use of values associated with non-market benefits and costs is a well-established process in environmental and resource management [25,30] and, as such, the inclusion of the non-market costs and benefits of managing marine resources is not controversial in itself. Such values are commonly used in US marine and coastal management [31]. However, the empirical estimation of critical non-market values requires

resources, including time. This presents managers with a pragmatic constraint that often results in non-market values being excluded in decision-making.

Fisheries and aquaculture managers are in the best positions to identify the non-market values required to support their decision-making. To date, an appropriate research program to provide non-market values relevant for fisheries decision-making in Australia has not evolved, in part due to a lack of information as to management needs.

The aim of this paper is to report the results of an assessment of (1) the current needs for non-market values to support evidence-based decision-making and reporting, (2) the extent to which these values have been estimated within Australia, and (3) the key research gaps and priorities for further empirical non-market valuation studies to support fisheries and aquaculture management in Australia. These results will support the development of a future research strategy to develop and use the estimates of non-market values to support fisheries and aquaculture management in Australia.

2. Materials and Methods

The study was undertaken in three stages. A workshop involving managers from each jurisdiction aimed at identifying key non-market values that would support their decision-making and assess their relative priority (based on the level of potential use). Second, the availability of appropriate non-market values based on Australian analyses through use in management through benefit transfer was assessed through a detailed review of the literature. Benefit transfer involves the use of results from a non-market valuation study in a different but related context [32], and it is a pragmatic approach to the incorporation of non-market values into marine resource management (provided appropriate primary studies exist). Finally, priorities for future research needs were assessed by comparing managers' needs with availability.

2.1. Workshop

A workshop of key management and policy analysts, decision-makers and researchers was conducted in Brisbane, Queensland. In total, 13 managers and policy makers attended the workshop, representing all state and commonwealth fisheries jurisdictions and including representatives of commercial and recreational fisheries, as well as aquaculture management and policy.

The workshop had two roles: (1) better inform managers and policymakers about the potential ways in which these values can be used, and (2) identify which non-market values were considered of most importance for future decision-making.

The first half of the workshop involved a series of presentations around the use of non-market values in fisheries and aquaculture, the conditions necessary for the use of benefit transfer, and the availability of information in existing databases. The second half of the workshop involved group discussions about the types of non-market values that managers and policy makers would find most useful and would most likely use. Prioritization of these values was subsequently undertaken using a simple 1–10 scale as to their likelihood of use of these values, if available.

2.2. Review of Available Australian Non-Market Values

A literature review was undertaken to gauge the availability of Australian studies providing empirical estimates of the non-market values identified as useful for management decision-making in the workshop. We considered Australia-based studies only, as analyses of the potential for international benefit transfers suggest that these may involve a high number of errors [33]. The literature review included searches within several environmental economic valuation databases (e.g., the Environmental Valuation Reference Inventory (EVRI); the National Ocean Economics Program (NOEP) Non-Market Valuation Database; the Marine Ecosystem Services Partnership (MESP) Mapper & Valuation Library; and the Recreation Use Values Database (RUVD)), as well as additional searches through Google Scholar.

2.3. Gap Analysis

Hoehn [34] identified four key factors that influence the priority given to primary research on a resource: society's awareness of the resource, the importance of the resource to stakeholders, the magnitude of the policy decisions to be made in response to conflicts over the resource, and the availability of funding to support the research. In this study, we assumed both that society (as represented by the fisheries and aquaculture managers) was aware of the resource and that sufficient funds may have been available to undertake appropriate research. Hence, we focused on prioritizing the importance of the resource to the key stakeholders and the likelihood that policy decisions would be made based on the research to resolve potential conflicts over its use.

Gap analysis was conducted to identify key research gaps and prioritize the need for further empirical non-market valuation studies. The analysis, based on the likelihood of use established in the workshop, and the assessment of available studies from the literature review, used a modified version of the importance–performance analysis (IPA) approach [35,36]. The approach has been applied widely in areas such as healthcare [37] and education [38] and has particularly gained widespread acceptance in hospitality and tourism research [39,40], including marine-based tourism [41].

The approach is conceptually simple: a matrix is constructed consisting of four quadrants, the axes being importance and performance. The importance of each of the different types of non-market values was determined in the workshop, as noted above. In the above cited studies, performance is generally measured in terms of customer or visitor satisfaction. For this study, we replaced performance with a measure representing the relative quantity of available studies, adjusted for their recency and relevance (Figure 1).

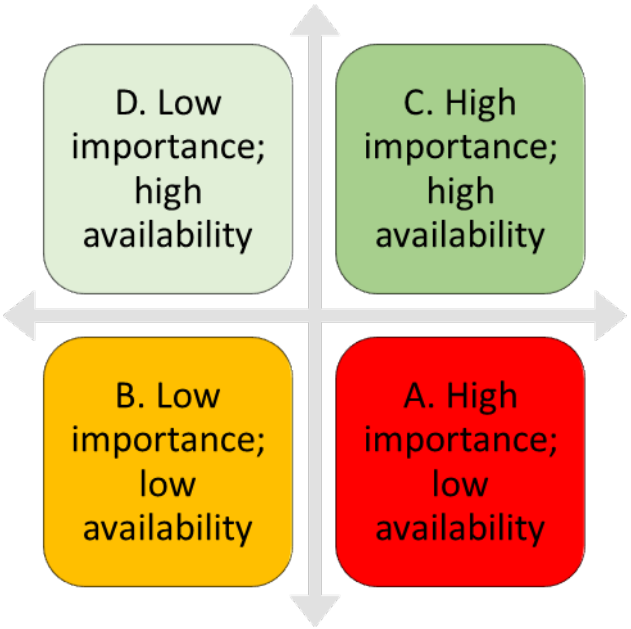

Figure 1. Importance–availability matrix.

For the measure of relevance, we considered only Australia-based studies since 2010. To include a recency consideration, we discounted studies based on their age. While updating estimates of the nominal values of non-market values produced by previous valuation studies through use of the consumer price index (CPI) is a common approach, changes in preferences (e.g., development of alternative opportunities in the case of recreation) and underlying economic conditions over time (e.g., incomes) may increase the distortion in the inflated values [42,43]. Changes in non-market values of ecosystem services over time can be driven by changes in the markets for related ecosystem services, changing preferences for landscapes or biodiversity, increased understanding of the level of scarcity of the ecosys-

tem service, or changes in the level of resources available to manage an ecosystem [43–46]. Skourtos et al. [47] found that non-market values were relatively robust over 1–5 years (i.e., they could be adjusted based on changes in income), but beyond this, preferences changed substantially, decreasing their relevance with time such that simple adjustment was less appropriate. Since valuation methods have improved over time and preferences have changed, dependence on older valuation data can affect the accuracy and relevancy of values derived through benefit transfer [46,48]. Likewise, there is considerable uncertainty as to future preferences and how they will change, so older estimates of values are likely to be less relevant to future values. Even basing decisions on the most recent information may still be flawed if preferences change in the future, but may be reasonably appropriate for the short term, with these decisions needing reassessment over time through adaptive management [49].

Given this, the availability measure was developed on the basis that (1) older studies were potentially less relevant than more recent studies, and (2) several studies provided more information than a single study. As there was no agreed method to discount studies based on their recency, studies conducted in the last five years were considered current (i.e., not discounted following Skourtos et al. [47]), and the five-year period from 2015 to 2020 was incomplete at the time of the analysis. Studies identified in 2020, however, were also included in the analysis, while studies older than 2015 were subjected to a straight line depreciation rate of 20% per year. This effectively removed papers that were over 10 years old from the analysis.

The final availability score was based on the discounted age of the most recent published study in each state or territory contiguous to the coast (i.e., excluding the Australian Capital Territory (ACT)). A state-based analysis was considered as the most relevant for potential benefit transfer. This remains a crude indicator, as noted with the most recent study, although relevant to the state, it may be less relevant to different fisheries or aquaculture industries within the state. The final availability score was calculated as the sum of the discounted ages of the most recent study in each state or territory divided by the total number of states or territories contiguous to the coast (i.e., 7). This gave a value between 0 (no relevant or recent studies) and 1 (a current (i.e., 2020) study in every state and territory). In this case, a value of 0.5 represented a current study (i.e., within the last 5 years) in at least four of the seven states, or a number of less recent papers over more states.

The combination of importance and availability helped identify which values were potentially in the most need of further research. Values that fell into the top left quadrant of Figure 1 (low importance, high availability) required little additional attention. In contrast, values that fell into the bottom right quadrant (high importance, low availability) required additional attention.

3. Results

3.1. Usefulness of Non-Market Values to Managers

At the workshop, managers and policy makers were asked to identify what non-market values they saw as important to aid in management decision-making.

Thirteen different types of values were identified and agreed upon by workshop participants (Figure 2). These covered both use values (e.g., direct use values such as commercial fisher satisfaction, the value of an individual recreational fish, (loss of) access to areas of water and water quality, non-extractive uses of marine resources such as scuba diving or swimming; cultural values such as recreational fishing and fish to Indigenous communities; amenity values affected by aquaculture development or fishing activities; and indirect use values such as ensuring the continued existence of a commercial fishing fleet in a town (i.e., heritage values)) and non-use values (e.g., existence values such as minimizing bycatch and discarding, protecting habitats, threatened, endangered and protected species, and other ecosystem services affected by fishing).

Workshop participants were also individually (and anonymously) asked to assess the likelihood of them using these non-market values, if they were available, on a 10 point scale, from not likely (a score of 1) to extremely likely (a score of 10).

The key values and the likelihood of their use, as identified by the workshop participants, are shown in Figure 2, sorted in order of average use. The diamond in Figure 2 represents the geometric mean score given by the respondents, while the vertical line represents the range of responses. As there was considerable variability in some of the scores, a geometric mean was used rather than an arithmetic mean to reduce the influence of extreme values.

A score of 8 or higher in Figure 2 indicated that managers were fairly to extremely likely to use the values for decision-making. In contrast, a value of 5 or less indicated that managers were unlikely to use the values even if available. Most respondents suggested that they were most likely to use non-market values related to the use of the resource by commercial, recreational, and indigenous fishers, but the likelihood of use was highly variable for values around ecosystem services affected by fishing and aquaculture. The three values mostly associated with the non-market impacts of aquaculture—amenity values, access to water, and changes in water quality—were rated low by most respondents, but high by a few. The likelihood of use was collected anonymously, but it was likely that these values were of greater use to aquaculture managers, but of little use to fisheries managers who made up the majority of workshop participants (70%), hence the scores being low on average across all respondents but useful to some individuals.

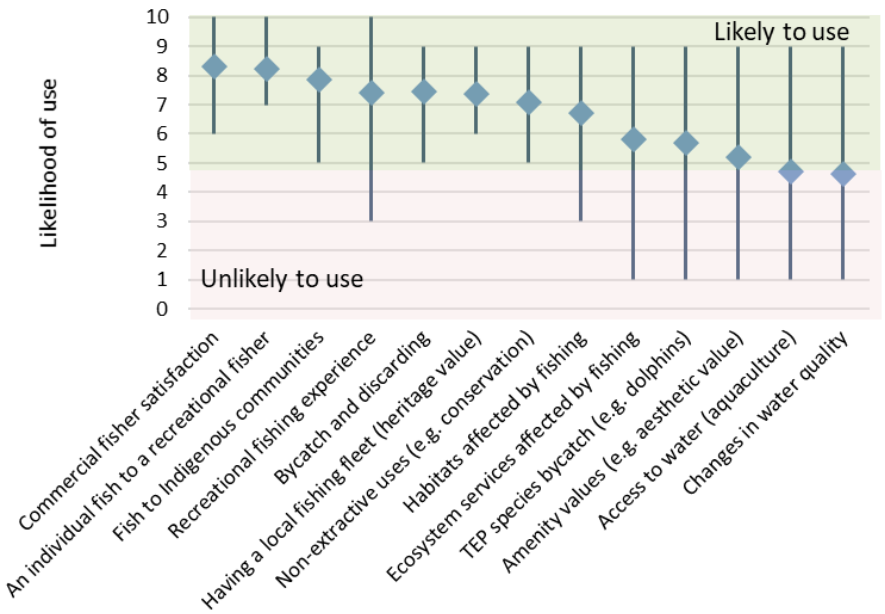

Figure 2. Relative likelihood of use of non-market values identified by workshop participants (n = 13).

3.2. Availability of Australian Non-Market Values Relevant to Fisheries and Aquaculture Management

We found 24 non-market valuation studies since 2010 relating to the above values identified by managers (Figure 3). Some earlier studies were also identified, but these were not included in our subsequent analyses as they were thought to be too old to be useful for managers. Some studies identified several values. For example, Farr et al. [50] estimated values for five different Threatened, Endangered, or Protected (TEP) species groups, while Pascoe et al. [51] identified values associated with several types of coastal and marine habitats. Further details on these studies are provided in the Supporting Information section.

No studies were found regarding non-market values associated with commercial fisher satisfaction, bycatch, and discards (excluding TEP species) and the loss of access to

water (as a result of an aquaculture farm). Values associated with fishers' satisfaction are contentious, as will be elaborated in the discussion section. While bycatch and discards have been linked to social license to operate [52–54], the focus of most international non-market valuation studies regarding bycatch have been in relation to TEP species [55].

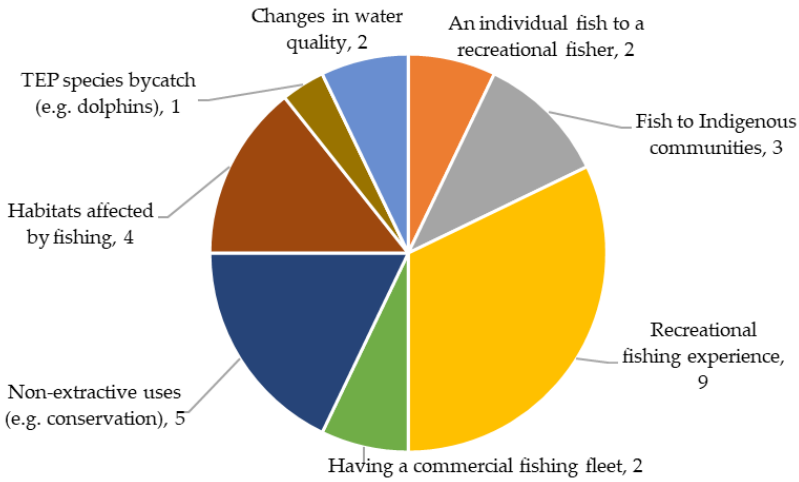

Figure 3. Non-market studies identified from the review, 2010–2020 (n = 24).

The studies identified were not evenly distributed across the different Australian states. Most studies were undertaken in Queensland, which accounted for nearly half of all Australian non-market valuation studies concerning the priorities identified by workshop participants (Figure 4). At least one recreational experience-related study had been undertaken in all states except for the Northern Territory. Studies relating to the value of fish to Indigenous communities were only undertaken in the northern states (Queensland, Northern Territory, and Western Australia, with one study involving all three states), where most Indigenous communities are located.

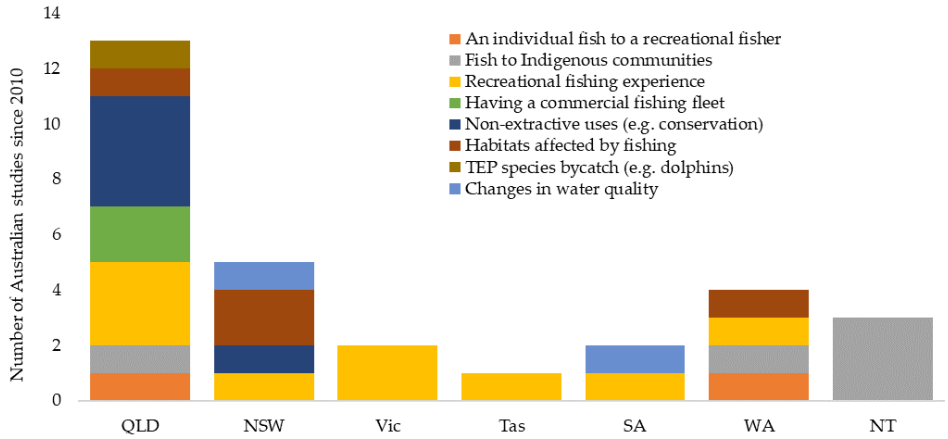

Figure 4. Non-market studies by state, 2010–2020 (n = 24).

The studies employed a variety of estimation approaches, with most using the travel cost method (Figure 5). This also reflected the types of estimates being derived, with travel cost models generally widely used for recreational fishing and non-extractive usage (e.g., other coastal recreation), the two values that dominated the total number of studies (Figure 3). For non-use values, such as TEP species and potentially the bycatch values (for which no studies were found over the last decade in the literature review), stated preference approaches (contingent valuation and choice experiments) were more appropriate [56], with the one observed study using contingent valuation [50].

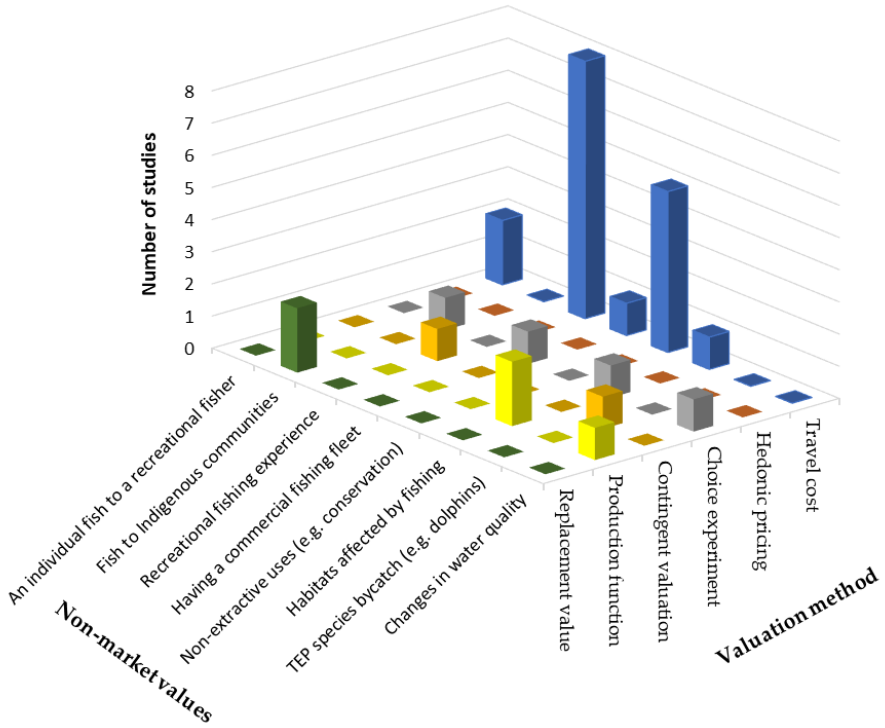

Figure 5. Number of non-market studies by valuation method, 2010–2020 (n = 24).

3.3. Gap Analysis

The gap analysis was based on the Australian studies identified in the literature review and database audit above over the last 10 years. As noted in the methods section, the gap analysis was based on the importance–availability analysis approach. The importance of each of type of non-market value identified by managers in the workshop was determined through a survey and was represented by a score out of 10. We used the geometric mean value of these importance scores for the purposes of the gap analysis. For the availability measure, we developed a measure based on the availability of studies in each state or territory, as noted previously, with the most recent study in each state or territory (if any) discounted by its age.

The results of the analysis relating to each of the thirteen potential non-market values identified in the workshop can be seen in Figure 6, with further details also presented in Table 1. In Figure 6, an availability score of one would represent a current (i.e., within the last five years) study in each state.

All but three of the priorities fell into the high importance low availability category. For the two priorities that fell into the low importance group based on the mean usage rating, these both related to aquaculture, and it is likely that the low average likelihood of use was an artifact of the small proportion of aquaculture managers compared with fisheries managers in the survey. For at least some managers—presumably linked to aquaculture—these values were identified as having a high likelihood of use. In contrast, the value of the recreational fishing experience was well represented, with studies undertaken in six of the seven states since 2010 and half of these being undertaken in the last five years.

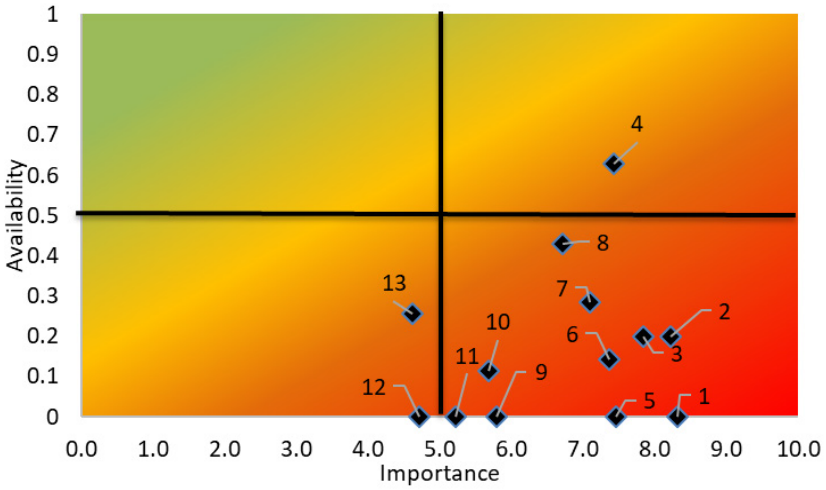

Figure 6. Importance–availability analysis of non-market valuation studies in Australia by priority (numbered; see also Table 1).

Table 1. Importance and availability of recent non-market valuation (NMV) studies in Australia.

Value	Importance	Discounted Age of Most Recent NMV Study by State							Av. Score
		Qld	NSW	Vic	Tas	SA	WA	NT	
1. Commercial fisher satisfaction	8.32								0
2. An individual fish to a recreational fisher	8.22	0.8					0.6		0.200
3. Fish to Indigenous communities	7.85	0.2					0.2	1	0.200
4. Recreational fishing experience	7.43	1	1	1	0.6	0.2	0.6		0.629
5. Bycatch and discarding of commercial species	7.46								0
6. Having a local commercial fishing fleet (heritage value)	7.37	1							0.143
7. Non-extractive uses	7.10	1	1						0.286
8. Habitats affected by fishing	6.71	1	1	1					0.429
9. Ecosystem services affected by fishing	5.80								0
10. TEP species bycatch	5.68	0.8							0.114
11. Amenity values	5.22								0
12. Access to water (aquaculture)	4.72								0
13. Changes in water quality	4.63		0.8			1			0.257

Note: Average score is across all states and territories, including a zero for states where no studies exist. Qld = Queensland; NSW = New South Wales; Vic = Victoria; Tas = Tasmania; SA = South Australia; WA = Western Australia; and NT = Northern Territory.

4. Discussion

4.1. Are There Enough Non-Market Valuation Studies Already in Australia to Support Fisheries and Aquaculture Management?

Previous studies of managers' attitudes to the use of non-market values in Australia [57,58] suggested that most managers were interested in using non-market values, but their lack of availability and understanding of their use were major barriers. Rogers et al. [58] suggested that increased education of managers and policy makers is the key to increased acceptability of the use of non-market values in decision-making.

Our study confirmed the lack of recent and relevant non-market valuation studies in Australia for most of the potential impacts fisheries and aquaculture managers were interested in, including in their decision-making. Except for recreational fishing experience, and to a lesser extent coastal and marine habitat values, only a limited number of non-market valuation studies were identified, with some priority areas having no identifiable studies in the last decade. While there is a degree of arbitrariness in the approach used to assess availability (e.g., considering only one study each state and assessing availability

on the basis of the age of the study and the number of states covered by such studies), the more complete review of available studies since 2010 (Table S1, Supporting Information) highlight the low availability of studies.

The research effort into non-market values relevant for fisheries and aquaculture management is also disproportionately applied in Australia. For example, 10 of the 24 identified studies were based on Queensland case studies. This most likely reflects the location and interests of the individual researchers involved in the studies. This does not necessarily align with the broader needs of managers at a national scale and suggests the need for a more coordinated research strategy.

Similarly, the distribution of studies did not align with the needs of the managers. One third of the identified studies (eight) related to recreational fishing experiences. In contrast, only one study was identified that estimated the values of non-commercial species [50], although these were values to tourists and would be difficult to include in a fisheries cost–benefit analysis. For five of the priorities, no study could be identified in the last 10 years.

4.2. What Key Alternatives Are Currently in Use to Support Decision-Making in Fisheries and Aquaculture Management?

A potential explanation for the lack of non-market studies in Australia is the perceived high cost of data collection and analysis. This argument is potentially spurious, as compared with other fisheries information inputs (e.g., stock assessments and monitoring programs) that are regularly undertaken, the costs of estimating non-market values are relatively low. New technologies such as online surveys can further reduce these costs [59], while some values can be derived from existing monitoring information (e.g., recreational fishing values) [60].

As noted in the introduction, other approaches are also currently being applied to assess the broader impacts of fisheries and aquaculture. Several studies to date have focused on identifying and measuring the impacts (both direct and indirect) and contributions of the different sectors using marine ecosystem services. These include economic impact studies (e.g., recreational fishing expenditure surveys [61,62] and commercial fishing expenditure studies [61]) as well as well-being studies [63], which aim to extend the analysis beyond direct economic impacts. While these studies provide useful information to managers, they have sometimes been incorrectly used to influence decision-making [64]. Furthermore, they exclude environmental externalities associated with fisheries and aquaculture production. Similarly, triple bottom line assessment, while explicitly considering economic, social, and environmental impacts, are useful for monitoring management performance, but do not provide information on potential management changes. In particular, all of these approaches do not explicitly consider trade-offs, nor can they be used to assess management alternatives in the face of trade-offs. Critically, they do not provide a measure of the total economic value of the use of all ecosystem services, which is necessary to determine the optimal allocation of resources for the whole of society.

Multi-criteria analysis (MCA) provides a relative ranking of different policy outcomes, usually developed through stakeholder involvement in objective prioritization and impact assessment. With MCA, many impacts can be assessed semi-quantitatively through subjective measures that are often not commensurate, including social and ecological impacts that are difficult to otherwise measure. MCA has been successfully applied to support fisheries management decision-making in several Australian fisheries [9,14].

However, in the absence of objectively estimated non-market values, derived policy rankings are not independent of the stakeholders included in the analysis. Different stakeholder groups have different importance weights on the non-market costs and benefits. For example, some groups may advocate strongly for the consideration of some benefits (e.g., reduction in bycatch or improvement in water quality) while ignoring others (e.g., changes in commercial catches or employment), while other groups may have opposite preferences. This approach implicitly places an infinite value on some non-market benefits and zero on others by some groups, with potential conflicts between groups with different

priorities. Again, this can potentially distort decision-making and reduce transparency in decision-making.

While MCA can be used to rank different management options, it is unable to help identify the degree to which benefits exceed costs, or indeed if benefits do exceed costs. It can also only rank the options as presented. Economic values derived through non-market valuation allow these variables to be included in formal modeling of the sector and enable targets to be developed based on the management objectives, taking into account the non-market impacts as well as the market related outcomes.

As with non-market valuation, undertaking MCA, particularly through stakeholder engagement, is potentially costly in terms of both time and financial resources. With MCA, however, some of this cost is potentially imposed on the stakeholders who agree to participate, unless they are compensated for their time.

MCA has one key advantage in that a broad range of impacts can be considered (subjectively) simultaneously, whereas non-market valuation requires a series of individual assessments to derive the objective values (i.e., each component needs a separate valuation study). However, MCA results are not readily transferable to other fisheries or other situations beyond those for which they were developed. In contrast, provided non-market values are available, they can be applied to a wide range of fisheries or aquaculture management decisions as they are less case specific. Therefore, investing in non-market valuation studies that can be used in a range of alternative management situations has more long-term benefits.

4.3. Does Satisfaction Need a Non-Market Value?

Of the non-market values identified by managers as potentially useful, all but commercial fisher satisfaction has been estimated in some form for some industry (not necessarily fisheries or aquaculture) either in Australia or elsewhere. Fisher satisfaction is often interpreted as an indicator of the social performance of fisheries management [65–69]. Such measures are routinely collected as part of the economic and social monitoring of key commercial fisheries [67] and are also a common feature of many recreational fishery surveys [70]. These have largely been assessed on a qualitative basis. While a number of qualitative measures of fisher satisfaction have been undertaken [67,71], these have not been developed to represent economic values that could potentially be used in a benefit–cost analysis.

The level of satisfaction with fishing and with being part of the commercial fishing industry has been associated with a willingness to remain in the fishery in periods of lower incomes [72], as well as the desire to exit the industry [71]. Holland et al. [72] found that 80% of commercial fisher satisfaction was attributable to lifestyle factors such as being outdoors, working on the water, maintaining family history in the industry, and the identity of being a commercial fisher. In contrast, livelihood-related factors, such as income, accounted for only 15% of job satisfaction in fishing [72].

Satisfaction levels have also been linked to achieving the planned outcomes of management (as well as being affected by management). For example, dissatisfied fishers were less likely to comply with management regulations [73]. Similar links between compliance and satisfaction have been noted for recreational fisheries [74,75].

Intuitively, incorporating changes in satisfaction into a cost–benefit analysis framework has its appeal. A management option that improves economic and sustainability outcomes but reduces the social benefits associated with fishing is not as desirable as another that achieves the same economic and sustainability outcomes without the loss of social benefits to fishers. Choice experiments could be designed to derive estimates of the value of satisfaction for this purpose. A non-market valuation approach has been developed using satisfaction measures as a means of deriving non-market values of environmental and public goods (the Life Satisfaction Approach (LSA) [76]). This does not value satisfaction directly, but rather estimates the marginal value of satisfaction as part of the environmental valuation.

In a broader (non-fisheries) study, Spagnoli et al. [77] found that during periods of management and structural change, satisfaction with work can (negatively) change, but returns to similar (or higher) levels once changes have been fully implemented and are the new norm. This suggests a dynamic process, where declines in satisfaction due to management changes are relatively short-term.

This is not to say that changes in satisfaction should be ignored. Spagnoli et al. [77] suggested that gaining an understanding of the determinants of satisfaction is important to try and minimize any short-term impacts from management change. Other studies have suggested that improved communication and increased stakeholder participation in the change process can minimize reductions in job satisfaction during the change process [78,79].

In this regard, a better understanding of the factors affecting satisfaction with fishing would be of benefit to managers as a separate area of research. While it may be feasible to develop non-market values of satisfaction change, minimizing short run impacts during any management change is likely to be a better option.

4.4. Estimate or Borrow?

When done poorly, the inclusion of non-market values can undermine the scientific rigor of decisions and reporting, weakening trust in practitioners and users of non-market values, as well as in decision-making [57,80]. Conversely, excluding non-market values implicitly assumes that these impacts have no value and can lead to decisions that do not maximize the net economic returns to the broader community.

Deriving non-market values to support decision-making is a potentially costly and time-consuming activity. The cost of data collection for the non-market valuation studies can vary depending on the attribute being examined. In some cases, where the potential beneficiaries are limited (e.g., visitation to a particular site), on-site surveys may be required. These are both expensive and time-consuming. In contrast, for more general values (e.g., cost of bycatch), surveys may be distributed more broadly online, which may lower the cost of the data collection and also reduce the time required to collect an appropriate sample. However, compared with the collection of other data and analyses (e.g., fishery independence surveys and stock assessments), the costs of collecting non-market values may not be excessive, particularly if values can be applied to several fisheries or aquaculture industries. For example, estimates of the value of TEP species or other bycatch could potentially be applied to all fisheries that interact with these species.

Benefit transfer provides a cost-effective means of including non-market values in decision-making. However, benefit transfer is not without problems, and in some cases may lead to wrong decisions being made if the values are not valid or robust for the situations being considered [32]. However, from the gap analysis, there are only limited Australian estimates of values that could potentially be applied in benefit transfer. Furthermore, these values may vary substantially between studies, reflecting not only differences in the underlying demographics of the different populations (e.g., Queensland versus Tasmanian fishers), but also in the estimation approach used and the assumptions involved. For example, some travel cost analyses assumed that travel time had an explicit cost [81], whereas in other cases, travel time was assumed to have zero cost [82]. In some cases, accommodation and food costs were included for overnight trips [81], while in other cases, accommodation costs were excluded [83]. These different assumptions affect the measure of travel cost and the resultant estimate of consumer surplus.

Meta-analysis is an approach that has been widely adopted for benefit transfer to allow for adjustments in different sample characteristics, as well as methodological assumptions [84–86]. Meta-analysis involves the development of regression models that model the willingness to pay, estimated as a function of the different sample and survey characteristics. A key feature of meta-analysis is that the transfer error can be estimated using the model, so the reliability of the estimates can be better evaluated. While examples in fisheries and aquaculture are limited, such an approach has been used in the marine

environment to develop estimates of coral reef values for benefit transfer [87] and (some) marine TEP species [88].

While there exists a sparsity of Australian values, there exists a broader range of international studies. Views on the potential usefulness of international studies in benefit transfer are mixed. Ready and Navrud [89] and Shrestha and Loomis [90] suggested that the errors encountered through international benefit transfer were no larger than those from transfer study sites within the same country as the policy site. More important are the similarities in the sites—not the geographical location—that may affect their usefulness for benefit transfer [89]. Similarly, Czajkowski et al. [91] found that, provided appropriate adjustments are made for differences in income levels and other demographic characteristics, international benefit transfer can provide appropriate values. Other studies, based on meta-analysis, have suggested that errors introduced through international benefit transfer may be substantial, and recommend that international benefit transfer be avoided [33,92].

5. Conclusions

CBA is an economic evaluation framework that, through the inclusion of non-market values, quantitatively captures the broader costs and benefits of using ecosystem services (in addition to costs and benefits that are captured by market prices). As CBA uses a standardized measure or numeraire (relevant market and non-market values as costs and benefits expressed in dollar value), the net benefits of a policy management decision can be quantified (in dollar value terms) and comparisons made between different policy management options. The valuation principle that underpins CBA is grounded in neoclassical economics theory, and it leverages the assumption that prices, in a competitive market, maximize economic surplus. Hence, from a neoclassical perspective, CBA provides an absolute measure of the dollar value of the total economic and social impact of a policy outcome and the optimal allocation of resources for the whole of society. It should be noted that the neoclassical underpinnings of value are not without their critiques. Ontological approaches, such as social metabolism, view prices and markets as part of the problem of environmental degradation as a result of exploiting ecosystem services, such as in [17]. However, CBA and the use of non-market valuation as a methodology aligns to a broader social perspective reflecting the principles of ecologically sustainable development. Its application is therefore not unique to fisheries and aquaculture management decision-making and is well embedded to inform decision-making across a range of policy areas in natural resource management, including water resources, forestry, national park management, and coastal management.

The key aim of this study was to assess the key priorities for non-market valuation in Australia that could be used in CBA to support fisheries and aquaculture management. This involved determining which types of values would be most useful for their decision-making and identifying the availability of these data.

The study identified thirteen types of non-market values that fisheries and aquaculture managers considered as potentially important for decision-making. Of these, the top four involved values related to users of the fisheries resources, including fisher satisfaction, values to indigenous fishers and the value of the fish and the experience to recreational fishers. The next four involved the impacts of fishing on other aspects, including habitats, species, local communities, and other users of the marine environment.

Valuing satisfaction in monetary terms has not been undertaken in fisheries in Australia or elsewhere. While such a valuation could theoretically be undertaken (for example, through a choice experiment), the dynamic nature of satisfaction changes in response to management changes will make the use of any derived values difficult. Deriving a standardized method for assessing satisfaction, and understanding what drives these measures, rather than an equivalent monetary value may be of greater benefit to fisheries and aquaculture managers.

The identification of key non-market values and their prioritization was limited to current fisheries and aquaculture managers and policymakers. Other potential values may

be of importance to other decision-makers and society as a whole. In principle, fisheries and aquaculture managers aim to implement government policy, which in turn is, in principle, based on the values of society as a whole. The perceived high importance of commercial fisher satisfaction may reflect the more regular contact with the commercial sector than other interest groups in society and the perceived needs of this group. Nevertheless, the managers are those responsible for making decisions, and the values identified were those that they thought would be most useful in making these decisions.

The review of the available Australian studies indicated that current empirical estimates for most of the identified priorities did not exist. The value of recreational fishing experience was the best represented, with several recent studies available, although for five of the priorities, no studies have been undertaken in the last decade. At the state and territory level, Queensland was the best represented in terms of available non-market data, although not all values were available, nor were all of them recent. For some of these priorities, there is the opportunity to use existing data to develop estimates of non-market values. For example, recreational fishing values (experience and value per fish) could potentially be estimated from existing boat ramp or expenditure surveys, which are routinely collected by the states and territories. Ideally, more primary studies would be undertaken for other key values identified in the study. Nearly all priorities identified by the managers fell into the high importance, low availability category in the gap analysis.

The results of this study, while focused on Australian fisheries and aquaculture management, are potentially relevant to other countries who are also aiming to better integrate environmental impacts into management decision-making. The priorities identified are relatively generic and undoubtedly would be of relevance to other jurisdictions internationally. While the availability of relevant studies is likely to vary from country to country, the approach applied in this study to identify research gaps is also equally applicable elsewhere.

Supplementary Materials: Additional materials identified in the manuscript are available online at https://www.mdpi.com/2071-1050/13/2/920/s1. Table S1: Australian non-market valuation studies identified in the literature, 2010–2020.

Author Contributions: Conceptualization, L.C. and S.P.; methodology, L.C. and S.P.; formal analysis, S.P., L.C. and G.S.; investigation, S.P., L.C. and G.S.; writing—original draft preparation, G.S. and S.P.; writing—review and editing, L.C., S.P. and G.S.; visualization, S.P.; funding acquisition, L.C. and S.P. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by the Fisheries Research and Development Corporation (FRDC), grant number 2018-068.

Institutional Review Board Statement: The study was conducted according to the guidelines of the Declaration of Helsinki, and approved by the QUT University Human Research Ethics Committee (UHREC) (QUT Ethics Approval Number 1900000690)

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data presented in this study are available on request from the corresponding author. The data are not publicly available due to ethical considerations.

Acknowledgments: The authors would like to thank the survey and workshop participants who provided information for the study; Aimee Pickens and Samantha Paredes for assistance with part of the literature search; and John Rolfe for presenting on benefit transfer at the workshop. The authors would also like to thank the four anonymous reviewers for their useful comments.

Conflicts of Interest: The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, or in the decision to publish the results.

References

1. Barbier, E.B. Marine ecosystem services. *Curr. Biol.* **2017**, *27*, R507–R510. [CrossRef]
2. Farmery, A.K.; Ogier, E.; Gardner, C.; Jabour, J. Incorporating ecologically sustainable development policy goals within fisheries management: An assessment of integration and coherence in an Australian context. *J. Environ. Manag.* **2019**, *249*, 109230. [CrossRef] [PubMed]
3. Department of Agriculture and Fisheries. *Queensland Sustainable Fisheries Strategy, 2017–2027*; Queensland Government: Brisbane, Australia, 2017.
4. Department of Agriculture and Water Resources Commonwealth Fisheries Harvest Strategy Policy. *Framework for Applying an Evidence-Based Approach to Setting Harvest Levels in Commonwealth Fisheries*; Department of Agriculture and Water Resources: Canberra, Australia, 2018.
5. Sumaila, U.R.; Bellmann, C.; Tipping, A. Fishing for the future: An overview of challenges and opportunities. *Mar. Policy* **2016**, *69*, 173–180. [CrossRef]
6. Elkington, J. *Cannibals with Forks-Triple Bottom Line of 21st Century Business*; New Society Publishers: Stoney Creek, CT, USA, 1997.
7. Pascoe, S.; Dichmont, C.M.; Brooks, K.; Pears, R.; Jebreen, E. Management objectives of Queensland fisheries: Putting the horse before the cart. *Mar. Policy* **2013**, *37*, 115–122. [CrossRef]
8. Jennings, S.; Pascoe, S.; Hall-Aspland, S.; Le Bouhellec, B.; Norman-Lopez, A.; Sullivan, A.; Pecl, G. Setting objectives for evaluating management adaptation actions to address climate change impacts in south-eastern Australian fisheries. *Fish. Oceanogr.* **2016**, *25* (Suppl. 1), 29–44. [CrossRef]
9. Dichmont, C.M.; Pascoe, S.; Jebreen, E.; Pears, R.; Brooks, K.; Perez, P. Choosing a fishery's governance structure using data poor methods. *Mar. Policy* **2013**, *37*, 123–131. [CrossRef]
10. Plagányi, É.E.; van Putten, I.; Hutton, T.; Deng, R.A.; Dennis, D.; Pascoe, S.; Skewes, T.; Campbell, R.A. Integrating indigenous livelihood and lifestyle objectives in managing a natural resource. *Proc. Natl. Acad. Sci. USA* **2013**, *110*, 3639–3644. [CrossRef] [PubMed]
11. Australian Institute of Aboriginal and Torres Strait Islander Studies (AIATSIS). *Aboriginal Fishing Values of the South Coast of NSW: Community Report for the Livelihood Values of Indigenous Cultural Fishing Project*; FRDC: Canberra, Australia, 2018.
12. Elvarsson, B.Þ.; Agnarsson, S.; Guðmundsdóttir, S.; Viðarsson, J. Using multi-criteria analysis the assess impacts of change in ecosystem-based fisheries management: The case of the Icelandic cod. *Mar. Policy* **2020**, *116*, 103825. [CrossRef]
13. Estévez, R.A.; Gelcich, S. Participative multi-criteria decision analysis in marine management and conservation: Research progress and the challenge of integrating value judgments and uncertainty. *Mar. Policy* **2015**, *61*, 1–7. [CrossRef]
14. Pascoe, S.; Cannard, T.; Dowling, N.A.; Dichmont, C.M.; Breen, S.; Roberts, T.; Pears, R.J.; Leigh, G.M. Developing harvest strategies to achieve ecological, economic and social sustainability in multi-sector fisheries. *Sustainability* **2019**, *11*, 644. [CrossRef]
15. Fischer-Kowalski, M.; Haberl, H. Social metabolism: A metric for biophysical growth and degrowth. In *Handbook of Ecological Economics*; Edward Elgar Publishing: Cheltenham, UK, 2015.
16. Martinez-Alier, J. Social Metabolism, Ecological Distribution Conflicts, and Languages of Valuation. *Capital. Nat. Soc.* **2009**, *20*, 58–87. [CrossRef]
17. Barkin, D. Social Metabolism: A Construct for Teaching and Research in Ecological Economics. In *Ecological Economics and Social-Ecological Movements. Science, Policy and Challenges to Global Processes in a Troubled World*; Barkin, D., Carrillo, G., Eds.; Universidad Autónoma Metropolitana, Xochimilco: Mexico City, Mexico, 2019; pp. 47–56.
18. Dale, M.; Krumdieck, S.; Bodger, P. Global energy modelling-A biophysical approach (GEMBA) part 1: An overview of biophysical economics. *Ecol. Econ.* **2012**, *73*, 152–157. [CrossRef]
19. Patel, P.; Patel, B.; Vekaria, E.; Shah, M. Biophysical economics and management of biodiesel, a harbinger of clean and sustainable energy. *Int. J. Energy Water Resour.* **2020**, *4*, 411–423. [CrossRef]
20. Boardman, A.E.; Greenberg, D.H.; Vining, A.R.; Weimer, D.L. *Cost-Benefit Analysis: Concepts and Practice*; Cambridge University Press: Cambridge, UK, 2017.
21. Venn, T.J.; Calkin, D.E. Accommodating non-market values in evaluation of wildfire management in the United States: Challenges and opportunities. *Int. J. Wildland Fire* **2011**, *20*, 327–339. [CrossRef]
22. Office of Environment and Heritage. *Guidelines for Using Cost-Benefit Analysis to Assess Coastal Management Options*; Office of Environment and Heritage: Sydney, Australia, 2018.
23. Millennium Ecosystem Assessment. *Ecosystems and Human Well-being: Synthesis*; Island Press: Washington, DC, USA, 2005.
24. Baker, R.; Ruting, B. *Environmental Policy Analysis: A Guide to Non-Market Valuation*; Productivity Commission: Canberra, Australia, 2014.
25. Pearce, D.; Atkinson, G.; Mourato, S. *Cost-Benefit Analysis and the Environment: Recent Developments*; Organisation for Economic Co-operation and Development: Paris, France, 2006.
26. Pascoe, S.; Doshi, A.; Dell, Q.; Tonks, M.; Kenyon, R. Economic value of recreational fishing in Moreton Bay and the potential impact of the marine park rezoning. *Tour. Manag.* **2014**, *41*, 53–63. [CrossRef]
27. Prayaga, P.; Rolfe, J.; Stoeckl, N. The value of recreational fishing in the Great Barrier Reef, Australia: A pooled revealed preference and contingent behaviour model. *Mar. Policy* **2010**, *34*, 244–251. [CrossRef]
28. Lindner, R.; McLeod, P.; Nicholls, J. *Dynamic Modelling of the Socially Optimal Allocation of Fish Resources between Commercial and Recreational Use*; Fisheries Research and Development Corporation: Canberra, ACT, Australia, 2006.

29. Pascoe, S.; Hutton, T.; Hoshino, E. Offsetting Externalities in Estimating MEY in Multispecies Fisheries. *Ecol. Econ.* **2018**, *146*, 304–311. [CrossRef]
30. Hanley, N.; Barbier, E.B. *Pricing Nature-Cost-Benefit Analysis and Envrionmental Policy*; Edward Elgar: Cheltenham, UK, 2009.
31. Lipton, D.; Lew, D.K.; Wallmo, K.; Wiley, P.; Dvarskas, A. The evolution of non-market valuation of US coastal and marine resources. *J. Ocean Coast. Econ.* **2014**, *2014*, 6.
32. Johnston, R.J.; Rolfe, J.; Rosenberger, R.S.; Brouwer, R. *Benefit Transfer of Environmental and Resource Values. A Guide for Researchers and Practitioners*; The Economics of Non-Market Goods and Resources; Springer: Dordrecht, The Netherlands, 2015; Volume 14.
33. Lindhjem, H.; Navrud, S. How reliable are meta-analyses for international benefit transfers? *Ecol. Econ.* **2008**, *66*, 425–435. [CrossRef]
34. Hoehn, J.P. Methods to address selection effects in the meta regression and transfer of ecosystem values. *Ecol. Econ.* **2006**, *60*, 389–398. [CrossRef]
35. Bacon, D.R. A comparison of approaches to importance-performance analysis. *Int. J. Mark. Res.* **2003**, *45*, 1–15. [CrossRef]
36. Martilla, J.A.; James, J.C. Importance-Performance Analysis. *J. Mark.* **1977**, *41*, 77–79. [CrossRef]
37. Yavas, U.; Shemwell, D.J. Modified importance-performance analysis: An application to hospitals. *Int. J. Health Care Qual. Assur.* **2001**, *14*, 104–110. [CrossRef] [PubMed]
38. O'Neill, M.A.; Palmer, A. Importance-performance analysis: A useful tool for directing continuous quality improvement in higher education. *Qual. Assur. Educ.* **2004**, *12*, 39–52. [CrossRef]
39. Azzopardi, E.; Nash, R. A critical evaluation of importance-performance analysis. *Tour. Manag.* **2013**, *35*, 222–233. [CrossRef]
40. Lai, I.K.W.; Hitchcock, M. Importance-performance analysis in tourism: A framework for researchers. *Tour. Manag.* **2015**, *48*, 242–267. [CrossRef]
41. Tonge, J.; Moore, S.A. Importance-satisfaction analysis for marine-park hinterlands: A Western Australian case study. *Tour. Manag.* **2007**, *28*, 768–776. [CrossRef]
42. Eiswerth, M.E.; Shaw, W.D. Adjusting benefits transfer values for inflation. *Water Resour. Res.* **1997**, *33*, 2381–2385. [CrossRef]
43. Rosenberger, R.S.; Johnston, R.J. Selection Effects in Meta-Analysis and Benefit Transfer: Avoiding Unintended Consequences. *Land Econ.* **2009**, *85*, 410–428. [CrossRef]
44. Hein, L.; van Koppen, C.S.A.; van Ierland, E.C.; Leidekker, J. Temporal scales, ecosystem dynamics, stakeholders and the valuation of ecosystems services. *Ecosyst. Serv.* **2016**, *21*, 109–119. [CrossRef]
45. Bryan, B.A.; Ye, Y.; Zhang, J.; Connor, J.D. Land-use change impacts on ecosystem services value: Incorporating the scarcity effects of supply and demand dynamics. *Ecosyst. Serv.* **2018**, *32*, 144–157. [CrossRef]
46. Scheufele, G. *Environmental Values and Valuation over Time*; Australian National University: Canberra, Australia, 2012.
47. Skourtos, M.; Kontogianni, A.; Harrison, P.A. Reviewing the dynamics of economic values and preferences for ecosystem goods and services. *Biodivers. Conserv.* **2010**, *19*, 2855–2872. [CrossRef]
48. Pendleton, L.; Atiyah, P.; Moorthy, A. Is the non-market literature adequate to support coastal and marine management? *Ocean Coast. Manag.* **2007**, *50*, 363–378. [CrossRef]
49. Johnston, R.J.; Rosenberger, R.S. Methods, trends and controversies in contemporary benefit transfer. *J. Econ. Surv.* **2010**, *24*, 479–510. [CrossRef]
50. Farr, M.; Stoeckl, N.; Alam Beg, R. The non-consumptive (tourism) 'value' of marine species in the Northern section of the Great Barrier Reef. *Mar. Policy* **2014**, *43*, 89–103. [CrossRef]
51. Pascoe, S.; Doshi, A.; Kovac, M.; Austin, A. Estimating coastal and marine habitat values by combining multi-criteria methods with choice experiments. *Ecosyst. Serv.* **2019**, *38*, 100951. [CrossRef]
52. Gislason, G. Bycatch Management in Fisheries: Impacts and Challenges. In *Fisheries Bycatch: Global Issues and Creative Solutions*; Kruse, G.S., An, H.-C., DiCosimo, J., Eishens, C.A., Gisalason, G.S., McBride, D.N., Rose, C.S., Siddon, C.E., Eds.; University of Alaska Fairbanks Alaska Sea Grant: Anchorage, AK, USA, 2015; pp. 25–39.
53. Condie, H.; Grant, A.; Catchpole, T. Incentivising selective fishing under a policy to ban discards; lessons from European and global fisheries. *Mar. Policy* **2014**, *45*, 287–292. [CrossRef]
54. Hobday, A.J.; Fleming, A.; Ogier, E.M.; Thomas, L.; Hartog, J.R.; Hornborg, S.; Stephenson, R.L. Perceptions regarding the need for broad sustainability assessments of Australian fisheries. *Fish. Res.* **2018**, *208*, 247–257. [CrossRef]
55. Lew, D.K. Willingness to pay for threatened and endangered marine species: A review of the literature and prospects for policy use. *Front. Mar. Sci.* **2015**, *2*, 96. [CrossRef]
56. Wallmo, K.; Lew, D.K. Public Willingness to Pay for Recovering and Downlisting Threatened and Endangered Marine Species. *Conserv. Biol.* **2012**, *26*, 830–839. [CrossRef]
57. Marre, J.-B.; Thebaud, O.; Pascoe, S.; Jennings, S.; Boncoeur, J.; Coglan, L. The use of ecosystem services valuation in Australian coastal zone management. *Mar. Policy* **2015**, *56*, 117–124. [CrossRef]
58. Rogers, A.A.; Kragt, M.E.; Gibson, F.L.; Burton, M.P.; Petersen, E.H.; Pannell, D.J. Non-market valuation: Usage and impacts in environmental policy and management in Australia. *Aust. J. Agric. Resour. Econ.* **2015**, *59*, 1–15. [CrossRef]
59. Evans Joel, R.; Mathur, A. The value of online surveys. *Internet Res.* **2005**, *15*, 195–219. [CrossRef]
60. Raguragavan, J.; Hailu, A.; Burton, M. Economic valuation of recreational fishing in Western Australia: Statewide random utility modelling of fishing site choice behaviour. *Aust. J. Agric. Resour. Econ.* **2013**, *57*, 539–558. [CrossRef]

61. García-de-la-Fuente, L.; García-Flórez, L.; Fernández-Rueda, M.P.; Alcázar-Álvarez, J.; Colina-Vuelta, A.; Fernández-Vázquez, E.; Ramos-Carvajal, C. Comparing the contribution of commercial and recreational marine fishing to regional economies in Europe. An Input-Output approach applied to Asturias (Northwest Spain). *Mar. Policy* **2020**, *118*, 104024. [CrossRef]
62. Hyder, K.; Weltersbach, M.S.; Armstrong, M.; Ferter, K.; Townhill, B.; Ahvonen, A.; Arlinghaus, R.; Baikov, A.; Bellanger, M.; Birzaks, J.; et al. Recreational sea fishing in Europe in a global context—Participation rates, fishing effort, expenditure, and implications for monitoring and assessment. *Fish Fish.* **2018**, *19*, 225–243. [CrossRef]
63. Voyer, M.; Barclay, K.; McIlgorm, A.; Mazur, N. Using a well-being approach to develop a framework for an integrated socio-economic evaluation of professional fishing. *Fish Fish.* **2017**, *18*, 1134–1149. [CrossRef]
64. Crompton, J.L. Economic impact studies: Instruments for political shenanigans? *J. Travel Res.* **2006**, *45*, 67–82. [CrossRef]
65. Brooks, K.; Schirmer, J.; Pascoe, S.; Triantafillos, L.; Jebreen, E.; Cannard, T.; Dichmont, C.M. Selecting and assessing social objectives for Australian fisheries management. *Mar. Policy* **2015**, *53*, 111–122. [CrossRef]
66. Pascoe, S.; Brooks, K.; Cannard, T.; Dichmont, C.M.; Jebreen, E.; Schirmer, J.; Triantafillos, L. Social objectives of fisheries management: What are managers' priorities? *Ocean Coast. Manag.* **2014**, *98*, 1–10. [CrossRef]
67. Carlin, L.; Morison, J. Economic Indicators for the South Australian Marine Scalefish Fishery 2016/17. In *A Report to PIRSA Fisheries and Aquaculture*; The Government of South Australia, The Department of Primary Industries and Regions (PIRSA): Adelaide, Australia, 2018.
68. Pouso, S.; Borja, Á.; Martín, J.; Uyarra, M.C. The capacity of estuary restoration to enhance ecosystem services: System dynamics modelling to simulate recreational fishing benefits. *Estuar. Coast. Shelf Sci.* **2019**, *217*, 226–236. [CrossRef]
69. Heck, N.; Stedman, R.C.; Gaden, M. Indicators to Evaluate the Social Dimensions of the Recreational Fishery in the Great Lakes. *North Am. J. Fish. Manag.* **2016**, *36*, 477–484. [CrossRef]
70. Tate, A.; Ryan, K.; Smallwood, C.; Desfosses, C.; Taylor, S.; Blight, E.L.S. *Review of Recreational Fishing Surveys in Western Australia*; Department of Primary Industries and Regional Development: Perth, Australia, 2020.
71. Pascoe, S.; Cannard, T.; Jebreen, E.; Dichmont, C.; Schirmer, J. Satisfaction with fishing and the desire to leave. *AMBIO* **2015**, *44*, 401–411. [CrossRef] [PubMed]
72. Holland, D.S.; Abbott, J.K.; Norman, K.E. Fishing to live or living to fish: Job satisfaction and identity of west coast fishermen. *AMBIO* **2019**, *49*, 628–639. [CrossRef]
73. Crona, B.; Gelcich, S.; Bodin, Ö. The Importance of Interplay between Leadership and Social Capital in Shaping Outcomes of Rights-Based Fisheries Governance. *World Dev.* **2017**, *91*, 70–83. [CrossRef]
74. Ward, H.G.M.; Allen, M.S.; Camp, E.V.; Cole, N.; Hunt, L.M.; Matthias, B.; Post, J.R.; Wilson, K.; Arlinghaus, R. Understanding and Managing Social–Ecological Feedbacks in Spatially Structured Recreational Fisheries: The Overlooked Behavioral Dimension. *Fisheries* **2016**, *41*, 524–535. [CrossRef]
75. Arlinghaus, R.; Alós, J.; Beardmore, B.; Daedlow, K.; Dorow, M.; Fujitani, M.; Hühn, D.; Haider, W.; Hunt, L.M.; Johnson, B.M.; et al. Understanding and Managing Freshwater Recreational Fisheries as Complex Adaptive Social-Ecological Systems. *Rev. Fish. Sci. Aquac.* **2017**, *25*, 1–41. [CrossRef]
76. Frey, B.S.; Luechinger, S.; Stutzer, A. The Life Satisfaction Approach to Environmental Valuation. *Annu. Rev. Resour. Econ.* **2010**, *2*, 139–160. [CrossRef]
77. Spagnoli, P.; Caetano, A.; Santos, S.C. Satisfaction with job aspects: Do patterns change over time? *J. Bus. Res.* **2012**, *65*, 609–616. [CrossRef]
78. Kim, S. Participative Management and Job Satisfaction: Lessons for Management Leadership. *Public Adm. Rev.* **2002**, *62*, 231–241. [CrossRef]
79. Bull, M.; Brown, T. Change communication: The impact on satisfaction with alternative workplace strategies. *Facilities* **2012**, *30*, 135–151. [CrossRef]
80. Marre, J.-B.; Thébaud, O.; Pascoe, S.; Jennings, S.; Boncoeur, J.; Coglan, L. Is economic valuation of ecosystem services useful to decision-makers? Lessons learned from Australian coastal and marine management. *J. Environ. Manag.* **2016**, *178*, 52–62. [CrossRef] [PubMed]
81. Rolfe, J.; Dyack, B. Valuing Recreation in the Coorong, Australia, with Travel Cost and Contingent Behaviour Models. *Econ. Rec.* **2011**, *87*, 282–293. [CrossRef]
82. Pascoe, S. Recreational beach use values with multiple activities. *Ecol. Econ.* **2019**, *160*, 137–144. [CrossRef]
83. Paredes, S. *The Value of Fisheries for Tourism and the Local Coastal Community*; Queensland University of Technology: Brisbane, QLD, Australia, 2020.
84. Rosenberger, R.S.; Loomis, J.B. Using meta-analysis for benefit transfer: In-sample convergent validity tests of an outdoor recreation database. *Water Resour. Res.* **2000**, *36*, 1097–1107. [CrossRef]
85. Stapler, R.W.; Johnston, R.J. Meta-Analysis, Benefit Transfer, and Methodological Covariates: Implications for Transfer Error. *Environ. Resour. Econ.* **2009**, *42*, 227–246. [CrossRef]
86. Bergstrom, J.C.; Taylor, L.O. Using meta-analysis for benefits transfer: Theory and practice. *Ecol. Econ.* **2006**, *60*, 351–360. [CrossRef]
87. Londoño, L.M.; Johnston, R.J. Enhancing the reliability of benefit transfer over heterogeneous sites: A meta-analysis of international coral reef values. *Ecol. Econ.* **2012**, *78*, 80–89. [CrossRef]

88. Richardson, L.; Loomis, J. The total economic value of threatened, endangered and rare species: An updated meta-analysis. *Ecol. Econ.* **2009**, *68*, 1535–1548. [CrossRef]
89. Ready, R.; Navrud, S. International benefit transfer: Methods and validity tests. *Ecol. Econ.* **2006**, *60*, 429–434. [CrossRef]
90. Shrestha, R.K.; Loomis, J.B. Testing a meta-analysis model for benefit transfer in international outdoor recreation. *Ecol. Econ.* **2001**, *39*, 67–83. [CrossRef]
91. Czajkowski, M.; Ahtiainen, H.; Artell, J.; Meyerhoff, J. Choosing a Functional Form for an International Benefit Transfer: Evidence from a Nine-country Valuation Experiment. *Ecol. Econ.* **2017**, *134*, 104–113. [CrossRef]
92. Muthke, T.; Holm-mueller, K. National and International Benefit Transfer Testing with a Rigorous Test Procedure. *Environ. Resour. Econ.* **2004**, *29*, 323–336. [CrossRef]