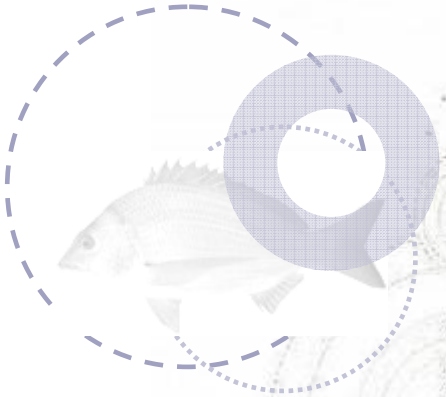
More habitat ... more fish

A strategy for educating recreational fishers about habitat





Title: A Strategy for Educating Recreational Fishes about Habitat

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Disclaimer

The information contained in this publication is based on knowledge and understanding at the time of writing (August 2010). However, because of advances in knowledge, users are reminded of the need to ensure that information on which they rely is up to date and to check the currency of the information with the appropriate officer of Industry & Investment NSW or the user's independent advisor.

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- The 500 recreational fishers who provided information via the telephone survey
- The 40 recreational fishers who spoke with student researchers at two sites
- The eleven recreational fishers who participated in the focus groups

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- Cassie Price
- Stephan Hodgson
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Abbreviations

EBFM	Ecosystem Based Fisheries Management
FMS	Fishery Management Strategy
I&I NSW	Industry and Investment NSW
NRM	Natural resource management
RFE	Recreational Fishers Education Project
SCU	Southern Cross University

Overview

The Recreational Fishers' Education Strategy (RFE) project was an initiative arising from an ongoing partnership between Industry and Investment NSW (I&I NSW) and Southern Cross University (SCU). This project arose out of concern that the message about fish habitat was not being communicated effectively, despite many years' work with local communities on aquatic habitat rehabilitation projects and providing information about fish habitat issues.

Ideally, recreational fishers would be major participants in aquatic habitat rehabilitation. This is not yet the case. Recreational fishers are, therefore, a key audience for fish habitat messages.

The RFE project is a pilot, located within the Northern Rivers region of NSW. It is a well regarded fishing area and includes marine, estuarine and freshwater fishing.

The project had the four elements. The first was primary data collection from recreational fishers in Northern Rivers:

- face-to-face surveys – 40 fishers, 20 at both a freshwater and a saltwater site
- telephone survey – 500 responses from a targeted telephone survey.
- focus groups – 3 groups across the region with a total of eleven participants.

The second element was a desktop review of other surveys of recreational fishers and other literature relevant to targeting an education strategy.

The third involved liaison with an Advisory Group, made up of six recreational fishers.

The fourth aspect of the project was the development of the document entitled *More habitat … more fish: A strategy for educating recreational fishers about fish habitat*.

During the course of the project, members of the project team learnt significant things about recreational fishers that were then applied in various education and engagement activities. These activities involved recreational fishers, people from representative organisations and fisheries management advisory committees and fisheries management students. As such, the Strategy itself was trialled in effect as it was being developed. What was learnt is also being taken into the development of future fish habitat programs involving recreational fishers.

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Part 1: Navigation background & context

A. The Recreational Fishers' Education Strategy project

This project arose out of concern that the message about fish habitat was not being communicated effectively, despite many years' work with local communities on aquatic habitat rehabilitation projects and providing information about fish habitat issues.

Ideally, recreational fishers would be major participants in aquatic habitat rehabilitation. This is not yet the case. Recreational fishers are, therefore, a key audience for fish habitat messages.

Surveys of recreational fishers tend to concentrate on what they catch, where they fish and how much money they spend. To communicate effectively with recreational fishers, more information about their motivations for fishing, their knowledge of fish habitat and their preferred sources is needed.

The RFE project is a pilot, located within the Northern Rivers region of NSW. This region is bounded by the Pacific Ocean to the east and extends from the Queensland border in the north, south of Port Macquarie and west to Armidale. It is a well regarded fishing area and includes marine, estuarine and freshwater fishing.

Evidence was collected about the recreational fishing community within the region, where possible, and this information was then compared to what was known about recreational fishers more broadly. Data was then used to develop the education strategy, which while it may be applicable more generally has been developed to target the needs and issues associated with engaging recreational fishers about fish habitat in the Northern Rivers region.

The Recreational Fishers' Education Strategy (RFE) project was an initiative arising from an ongoing partnership between Industry and Investment NSW (I&I NSW) and Southern Cross University (SCU). The RFE project was funded by the NSW Government through its Environmental Trust.

Elements of the RFE project

The project had the four elements. The first was primary data collection from recreational fishers in Northern Rivers:

- face-to-face surveys – 40 fishers, 20 at both a freshwater and a saltwater site[1]
- telephone survey – 500 responses from a targeted telephone survey.[2]
- focus groups – 3 groups across the region with a total of eleven participants.[3]

The second element was a desktop review of other surveys of recreational fishers and other literature relevant to targeting an education strategy.

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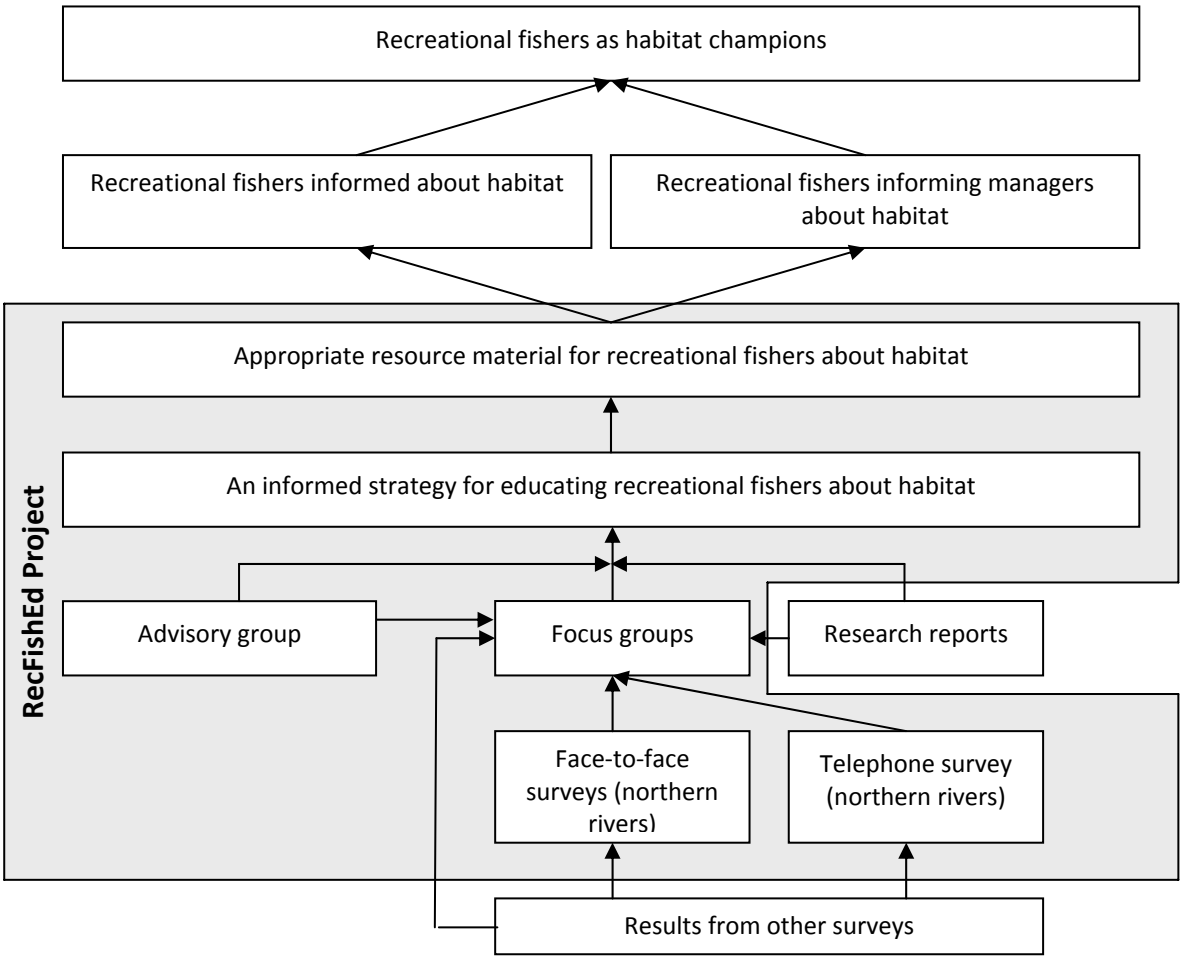
The fourth aspect of the project was the development of this document: *A Strategy for educating recreational fishers about fish habitat*.

Context



[1] Conducted in 2009 by 3rd year students from School of Environmental Sciences and Management, Southern Cross University.
[2] Only recreational fishers holding a recreational fishing licence and residing in northern rivers were contacted. The response rate for the survey was very high, with 83% of valid contacts agreeing to participate.
[3] Conducted in 2009 by an Honours student from the School of Environmental Sciences and Management, Southern Cross University.

B. Users of the Strategy

This Strategy is aimed at those people who are engaging in activities that involve recreational fishers and is especially relevant where the aim of these activities is to promote environmental knowledge and adoption of environmental behaviours. Planners, managers, regulatory staff, extension staff and educators in government, catchment management, university and non-government organisations can be guided by this Strategy when working with recreational fishers.

Recreational fishers are the core stakeholders targeted by the Strategy and its outputs.

C. Justification

In NSW, 1 in 5 people fish

Fishing is a significant recreational activity, both socially and economically.[4] One in five people in NSW are recreational fishers.[5]

Recreational fishing is dependent being able to go fishing – an experience that involves being outside in an environment that has at least some natural features and the potential to catch fish.

The social and economic benefits associated with recreational fishing are therefore dependent on there being fish to catch. The availability of fish to catch is affected by two key factors:

(i) the numbers and distribution of adult fish. This is affected by:

- competition for adult fish
- a global decline in fish stocks.[6] While not necessarily a clearly critical issue for recreationally important species in Northern Rivers, it is a systemic concern
- unsustainable fishing practices, including overfishing and illegal fishing by both commercial and recreational fishers.

(ii) the recruitment and survival of larval and juvenile fish. This is highly dependent on the availability of habitat. Northern Rivers has seen large scale loss and degradation of fish habitat.

fish habitat is the critical factor for a sustainable recreational fishery,

In terms of a sustainable recreational fishery, fish habitat is the critical factor. Detrimental changes to the health and availability of fish habitat is likely to continue given increasing human population and associated coastal development, lag effects of past urban and agricultural activities and changes to rainfall and temperature associated with climate change. In NSW, the extent of the loss of fish habitat is relatively well known[7], although the implications of this loss for fish stocks have not been widely recognised.

Habitat has not traditionally been considered in fisheries management, which has focussed on maintaining or improving fish stocks either by managing fishing activity or target fish species.[8] Management of fishing activities used a combination of input (effort) or output (catch) controls, predominantly the former.

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[4] See NSW survey (NSW DPI 2001), national survey (Henry and Lyle, 2001). See also localised surveys, eg Dominion Consulting (2005)
[5] See national survey (Henry and Lyle, 2001)
[6] Beckley and Ayvazian 2008, FAO 2006, Grafton 2006
[7] The particulars of fish habitat degradation and loss are not covered here. For more information, see www.dpi.nsw.gov.au/fisheries/habitat.
[8] Cowx et al 2010, Varjopuro et al 2008, Garcia et al 2003

This represents 'demand-side' management: managing the number and type of fish taken and the equity of that take. Such approaches have been criticised for not preventing the decline of some fisheries and failing to protect both non-target species and habitat.[9]

'Demand-side' management of fisheries resources can be complemented by 'supply-side' management. In biological terms, this means ensuring there are more fish *in situ* to be caught. Measures used include minimising the impact of fishing on mature and/or breeding stock or artificially boosting numbers via stocking. However successful breeding or stocking does not necessarily translate into successful recruitment. The way to sustain fisheries is to improve the conditions that enable fish to breed successfully and to maximise recruitment: that is, to maximise carrying capacity. In other words: to improve fish habitat.[10]

The way to sustain fisheries is to improve the conditions that enable fish to breed successfully and to maximise recruitment.

Current fisheries management approaches may not be sufficient to maintain, let along improve, fish stocks.[11] The availability and carrying capacity of habitat is critical. Good fish habitat is important not because it is where fish can be found but because the more there is of it, the greater the capacity of the system to support more fish and enable recruitment during years of high natural productivity.

Managing take is not enough – we also need to make more fish.

Fish breeding and recruitment is subject to a variety of factors that affect the sustainability of an adult population. In Northern Rivers these factors include:[12]

In Northern Rivers there are many factors limiting the capacity of fish to survive and thrive.

- Barriers preventing fish moving up- or downstream to spawning areas. Barriers include weirs, dams, floodgates and poorly designed road crossings and causeways.
- Larval mortality due to inability to reach shelter or growing out habitat areas, poor water quality, passage over or under weirs or predation by alien fish.
- Juvenile mortality due to lack of food, predation by both native and alien fish, barriers to migration and passage over or under weirs.
- Adult survival and fitness affected by availability of food, lack of structure for shelter, morbidity / mortality associated with poor water quality, paucity of habitat increasing stress due to competition.

[9] Varjopuro et al 2008
[10] Arlinghaus 2006
[11] A 2003 FAO Fisheries Technical Paper states "The relative failure of conventional fisheries management has been abundantly described" (Garcia et al 2003, p1)
[12] See also www.dpi.nsw.gov.au/fisheries/habitat

The only way this can translate into more adult fish is if there is adequate habitat available at times when fish spawn successfully and larval survival is high. That is, the environment has sufficient food, shelter and access to support the larvae entering the system, the growing out of juveniles and the condition of the adults. These resources give an area its 'carrying capacity'. Improving habitat increases carrying capacity which in turn has the potential to support greater numbers of fish reaching adulthood.

Improving habitat increases carrying capacity, which means it can support more fish

An integrated management approach is being promoted as the way to ensure the sustainability of fish stocks.[13] Such an approach explicitly acknowledges both human use and ecosystem factors in managing a natural resource. In relation to fisheries this is variously known as 'Ecosystem Based Fisheries Management' (EBFM) or the 'Ecosystem Approach to Fisheries' (EAF). Australia has gone some way towards adoption and implementation of EBFM.[14]

A key challenge with this approach is that social factors are as critical as ecological factors or scientific knowledge. Arlinghaus argues: [15]

Human obstacles are the primary determinants of management success in recreational fisheries.

> *… human obstacles are the primary determinants of management success in recreational fisheries … and … the importance of these obstacles is typically ignored or not accepted … .*

To be effective, integrated approaches need to deal with social factors. This includes: [16]

- good and inclusive governance arrangements. This includes dealing with different institutional arrangements, for example between government, not-for-profit, private and volunteer sectors
- ways of acknowledging the validity and the limitations of different knowledge systems, including 'scientific', 'expert', 'traditional' and 'local' ways of knowing
- ways of taking into consideration different value systems, for example between 'economic benefit', 'wise use', 'conservation' and 'preservation' beliefs
- ways of managing with limited data, both basic biological information and monitoring data
- ways of engaging with both direct users of the resource (for example, fishers) and other stakeholders.

[13] See for example Curtin and Prellezo 2010, Pitcher et al 2009, Francis et al 2007, Arlinghaus 2006, Garcia et al 2003
[14] Pitcher et al 2009
[15] Arlinghaus 2006, p47
[16] Varjopuro et al 2008

One of the challenges for fisheries managers is to increase and support the participation of recreational fishers in matters relating to fish habitat. Recreational fishers represent an expansive social network, some of whom act as guardians for their local environment, and they have a vested interest in preserving and increasing fish stocks.[17]

The consultation – participation continuum is well recognised, as are the challenges associated with initiating and sustaining active participation among stakeholders.[18] In terms of recreational fisheries management, the challenge has four core elements:

- the knowledge, or lack of, about fish, their life histories, how they use habitat and how they are affected and affect ecosystem changes
- the capacity of government to do engage in meaningful and sustained ways
- the interest and commitment of members of the recreational fishing community
- the need to recognise the commitment of some recreational fishers to active participation in co-management opportunities.

Most of the human dimension obstacles to sustainable recreational fisheries management relate in some way to communication (see Appendix 3). Communication with recreational fishers will be improved if they are approached in ways that are meaningful in terms of what they need and want to know and how they generate fishing knowledge.

People endorse whichever position reinforces their connection to others with whom they are important commitments (Kahan 2010).

Facilitating effective communication requires: "practical support for participants as well as acceptance of ways of communication apart from rational argumentation in the scientific manner … [and] by facilitating the necessary integration of various knowledge forms and perspectives …".[19] Often expert and local knowledge is represented and formatted very differently, limiting communication, reinforcing difference and hindering the capacity of all involved to find common ground.[20]

Scientific information is neither enough or sufficient for engaging with recreational fishers.[21] Values, motivation, trust, locus of control and sense of community all inform the degree to which people participate in any education and/or engagement process.

Scientific information is neither enough or sufficient for engaging with recreational fishers.

In addition, there is widespread lack of knowledge about fish ecology and uncertainty regarding the factors influencing fish

[17] Cowx et al 2010, Granek et al 2008, Arlinghaus 2006
[18] See for example, QDPC 2004 CHK
[19] Varjopuro et al 2008,p 152
[20] Varjopuro et al 2008
[21] Li et al 2010

habitat and hence the sustainability of the fishery. Scientists have to be willing to use the best available data to engage with and educate both policy makers and recreational fishers.[22] Recreational fishes are interested in knowing more about the fish they catch, their biology and habitat but the ways this information is presented is usually perceived to be impenetrable by fishers.[23] All stakeholders have to recognise the limitations of available data and understand that fisheries resources have to be managed despite ongoing conditions of uncertainty and change in both social and ecological systems.

It is important in social and economic terms that recreational fishing continues as a sport in a sustainable fashion. It is therefore important to engage recreational fishers in the task of habitat management and hence in the sustainability of the fisheries. Engagement will be based on commitment, passion and understanding. Commitment and passion come partly through their love of their sport and partly through a sense of community.[24] To date, there has been little evidence of a sense of a community concerned with fish habitat. Understanding the central importance of habitat, the implications of doing nothing and the benefits of habitat rehabilitation for fishers is critical. This understanding depends on communication based on good relationships with recreational fishers and providing relevant information in appropriate ways. This is an educative task.

It is important in social and economic terms that recreational fishing continues as a sport in a sustainable fashion.

This educative task should be based on best practice principles,[25] reflecting:[26]

> *A progression that begins with an appreciation and awareness of aquatic environments, expands to include the acquisition of knowledge and the development of skills for interacting with the environment, and culminates in ascription of personal responsibility to the care of aquatic resources and responsible behaviour to them.*

This document is designed to support the efforts of those involved in fisheries management and assist them to engage more effectively with recreational fishers through targeted and evidence-based education for fish habitat outcomes.

[22] Cowx et al 2010, Francis et al 2007
[23] Li et al 2010
[24] Sense of community is a core concept. It is composed of four elements: membership, influence, reinforcement, and connection. The relationship between these elements is dynamic. See Appendix 4.
[25] See Appendix 5
[26] Fedler 2001

Part 2: Background

Effective education of and engagement with recreational fishers requires:

A. a good understanding of who recreational fishers are

B. addressing process issues. These are discussed in this section in terms of:

- the significance of fishing motivation.
- fishers' information preferences.
- fishers' engagement preferences
- barriers to participation in fish habitat rehabilitation

C. addressing content issues, including:

- fishers' habitat knowledge gaps.

The implications of these issues are summarised in Part 3 'Communicating effectively with recreational fishers'.

A. Recreational fishers

While recreational fishers are not the targeted users of this Strategy they are the core stakeholders for whom it has prepared.

i. Diversity within the recreational fishing community

There's no such person as a 'typical recreational fisher'.

Other than going fishing, recreational fishers have little in common with each other. Apart from the majority being male, they can be any age, socio-economic status, ethnic background, occupation and from any geographic location.[27]

There appear, however, to be clusters within the recreational fishing community: subsistence fishers (people who by necessity fish for food), trophy / sport fishers, experiential fishers and occasional / holiday fishers.

Most fishers fish less than 12 times per year.[28] In the Northern Rivers region, only 26% of fishers fish on a weekly or daily basis. Most have been fishing for over 15 years (91%) and were taught to fish by a parent (69%). Slightly more fish from a boat (55%) than from the shore (45%). Fishing estuaries and marine waters (45% and 44% respectively) is more common than fishing freshwater (11%).[29]

[27] See NSW survey (NSW DPI 2001), national survey (Henry and Lyle, 2001)
[28] National surveys by Henry and Lyle, 2001 and RecFish 2003.
[29] RRFE PROJECT (2009) unpublished data

Most fishers do not belong to a fishing club, however the membership rates in the Northern Rivers region is 14%,[30] which is somewhat higher than the national rate of 6%.[31]

ii. Why recreational fishers fish

The majority of fishers in Northern Rivers fish for recreation, relaxation and the enjoyment in being outdoors (74%). A minority fish for food (16%).[32] This is consistent with data from other surveys of fishers across NSW and Australia.[33]

It's the experience of 'going fishing' that's important.

More detailed information about motivation[34] confirms the importance of relaxation/recreation and fishing as a multi-faceted experience, of which catching fish is a part (see Table 1). Indeed, the 'pleasure of catching fish' was rated more important that 'catching fish for food'.[35] In general, it is the whole experience of 'going fishing' that is important.

Table 1: The relative ranking of motivations for fishing from different surveys.*

Motivation		Northern Rivers (I&I NSW 2009)	Henry & Lyle 2001		Ormsby 2004	Schramm & Gerard 2004	Fedler & Ditton 1994
			NSW	National			
Relaxation	Relax and unwind	4	1	1	1	1	1
	Escape routine		-	-	5	3	2
	Enjoy nature	2	-	-	7	5	3
	To be outdoors		3	4	2	2	8
	Solitude	-	7	7	9	4	6
Recreation	Recreation	1	-	-	-	-	-
	Competitions		8	8	-	10	-
	Pleasure of catching		-	-	3	3	4
Social	To be with family	4	4	3	4	7	7
	To be with friends		6	6	6	9	5
Catching fish	Fish for food	3	5	5	6	8	9
	Fish for sport	5	2	2	8	6	3

* '1' is the highest rank, indicating the most common or important motivation.

In Northern Rivers there was some variation in motivation according to gender, club membership and age bracket, however 'recreation' was always clearly the main motivation. Catching fish (for sport or for food) was the second ranked motivation only for males, club members and those aged 25 to 44 years. Relaxation was the second ranked motivation for females, non-club members (the majority of fishers) and all other age brackets.[36]

Understanding the reasons why fishers fish is important because it helps to map the motivation profiles of the recreational fishing community. An understanding of motivation profiles can provide insight into the types of intervention strategies that are more likely to be effective (see discussion below).

[30] RRFE PROJECT (2009) unpublished data
[31] National surveys by Henry and Lyle, 2001 and RecFish 2003.
[32] RRFE PROJECT (2009) unpublished data
[33] See for example, Sutton (2006), Fedler and Ditton (1994)
[34] For example, NSW survey (NSW DPI 2001), national survey (Henry and Lyle, 2001), Ormsby (2004), Schramm & Gerard (2004), Fedler & Ditton (1994)
[35] Ormsby (2004)
[36] RRFE PROJECT (2009) unpublished data

iii. Attitudes towards and knowledge about habitat

The majority of fishers in Northern Rivers learn about fish habitat through their fishing experience (53 %) and from parents and family (42 %). Other recreational fishers are also an important source of information (21 %).[37]

Recreational fishers' understanding of the importance of fish habitat is highly variable. When asked, recreational fishers do rate habitat and habitat rehabilitation as important, ranking it second only to recreational fishing education as an activity to improve recreational fishing.[38] However, it appears that the understanding is 'good habitat = good fishing' rather than 'good habitat = more fish'.

It may seem counter-intuitive that recreational fishers need education about fish habitat. However, engaging with recreational fishers highlights that there are gaps in both knowledge and understanding.

Recreational fishers know where to find adult fish. They do not necessarily understand or have accurate knowledge about the ecological features and systems that support juveniles and recruitment. When asked what factors were contributing to the decline in fish numbers, habitat was recognised as important in a general sense. However, fishers were often more concerned with the impact of commercial fishing. Their immediate concern was the competition for the available adult fish, rather than the reduction of potential numbers of adult fish through habitat decline and loss.

Fishers were able to identify some general features of fish habitat that are important in terms of maintaining fish population, for example, seagrass, good water quality and riparian vegetation. However, these features were usually associated with adult fish and therefore good fishing, rather than recruitment and carrying capacity.

In addition, it was common for recreational fishers to misunderstand how fish use habitat and/or the use of habitat at different stages of the life cycle. For example, many fishers believe that the fish they target spawn in estuaries. This is true for one or two species (for example, Australian bass) but not for most of the species targeted by recreational fishers.

Specific knowledge gaps are discussed below.



[37] RRFE PROJECT (2009) unpublished data
[38] NSW DPI (2008). 'Habitat' in this instance is inclusive of specific habitat features (eg, seagrass) and qualities (eg water quality).

B. Process issues

i. The significance of fishing motivation

Using the available data on motivations for fishing it is possible to infer the motivation profile of recreational fishers.[39] Profile groups have different affinities, both positive and negative, for various types of message. The known motivations for fishing can be sorted according to known categories and then mapped according to which profile group finds each category positive or negative (see Table 2).

What this mapping suggests is that recreational fishers fall into two motivational groups: so-called 'Pioneers' and 'Prospectors'. In addition, it appears that the 'Settlers' group are not represented among recreational fishers because the motivations for fishing have a negative or strongly negative affinity for people fitting this profile. This profile derived from data on recreational fishers generally is confirmed is relation to those in Northern Rivers. Although there are some aspects of 'recreation' that are likely to appeal to people who fit the 'Pioneer' type, it appears that the majority of fishers in Northern Rivers fit the 'Prospector' profile.

Table 2: The motivational profiles of recreational fishers, based on data on motivation for fishing.*

Known motivation for fishing	Pioneer	Prospector	Settler
Relax and unwind	× - ××	✓✓	×
To be outdoors	✓✓	××	~
Enjoy nature	✓✓	××	~
Pleasure of catching	(××) (visible success)	✓✓	× - ××
To be with family	✓✓	××	~ - ×
Escape routine	~	✓✓	× - ××
Close to water	✓✓	××	~
Fish for food	(××) (visible success)	✓✓	××
To be with friends	✓✓	××	× - ××
Fish for sport / challenge	~	✓✓	××
Solitude	(✓✓) (self choice)	××	~
Learn about nature	(✓✓) (nature)	××	~
Improve skills	~ - ×	✓✓	×
Test equipment	(✓✓) (novelty)	(×) (novelty)	××

× negative affinity ×× strongly negative affinity ✓positive affinity ✓✓strongly positive affinity

* Where the motivation is less clearly mapped to an attribute, the most appropriate attribute, and the associated affinity, has been noted in brackets.

[39] The motivational mapping used here is based on the work by campaignstrategy.org (see www.campaignstrategy.org). It is consistent with the concept of 'cultural cognition' (see for example, Kahan 2010)

People who fall into the Pioneer profile have predominantly inner directed needs. [40] They look forwards, like change and discovery, as long as it ethically acceptable, and are largely unworried about status. When confronted with a global, long term problem, people in this group are more likely to respond with 'it's a problem'. If offered a solution, the response is likely to be 'If it's for the good of the planet, or has an ethical imperative, we must do it. I'll do it myself and hang the consequences.'

Prospectors are outer-directed, they need both high self-esteem and the esteem of others. They live for today and seek rewards in terms of status, achievement and recognition. They are unconcerned about belonging, security and identity as they perceive they have those already. When confronted with a global, long term problem, people in this group are more likely to respond with 'that's not a problem unless it affects my prospects for achievement and success'. If offered a solution, the response is likely to be 'I'm not taking up causes or things that may not work but if it's the done thing and makes me look good, it's for me. We should organise!'

The Settlers, who do not appear to be fishers, need to belong, they tend to look backwards to a better yesterday and dislike anything new as this threatens identity, belonging and security. When confronted with a global, long term problem, people in this group are more likely to respond with 'that's not a problem unless it immediately affects my family, my local area, my identity, my traditions'. If offered a solution, the response is likely to be 'I'd rather not change and someone in charge should do something, but if other people like me are involved, then okay.'

Understanding motivational profile is an important tool to guide how information is framed and presented. This is illustrated in Table 4.

Table 4 illustrates the key point that while a segment of the recreational fishing community may respond positively to a specific strategy, other segments of this community are likely to react negatively.

[40] This and the examples that follow are sourced from campaignstrategy.org

Table 3: The likely responses by Pioneer and Prospector motivational profiles to messages based on different strategies

Strategy basis	Examples of activities / messages*	Pioneer		Prospector	
		Positive affinity	Negative response	Positive affinity	Negative response
Self direction (creativity, self choice)	You remake the future	✓			×
Novelty	You remake the future	✓			
Universalism (nature, openness, justice)	Ethical campaigns on issues	✓			×
Benevolence (caring, loyalty)	Care-based campaigns	✓			×
Hedonism	Social events to be seen at, with celebrity		×	✓	
Achievement (visible ability / success)	Prizes, tests and competitions		×	✓	
Power (material wealth, control others)	'Stop cheats', enforce rules, 'Watch' groups, keep assets		×	✓	
Security (safety, National security)	Fight off alien threats, resilience, cut costs, sustain local identity, safety		×		×
Conformity (propriety, rules)	Follow leaders		×		×
Stimulation (adventure)	New stuff, top designs, extreme activities			✓	
Tradition (religious)	Uphold tradition			✓	

* Source: campaignstrategy.org

What this shows is that no one strategy is likely to work for recreational fishers. Education strategies will have to incorporate a range of approaches in order to affect increased knowledge and behaviour change within the recreational fishing community.

An example of how this approach has been applied is provided in Appendix 6.

ii. Fishers' information preferences

Fishers' preferences in terms of where, how and from whom they get information are important if accurate information about fish habitat is going to be prevalent in the recreational fishing community.

Confidence

Fishers in Northern Rivers have the most confidence in information from other fishers (Figure 1).[41] However, this confidence is not uncritical and is placed primarily in fishers recognised as being 'good' fishers, that is, fishers who catch fish, and usually known personally.[42]

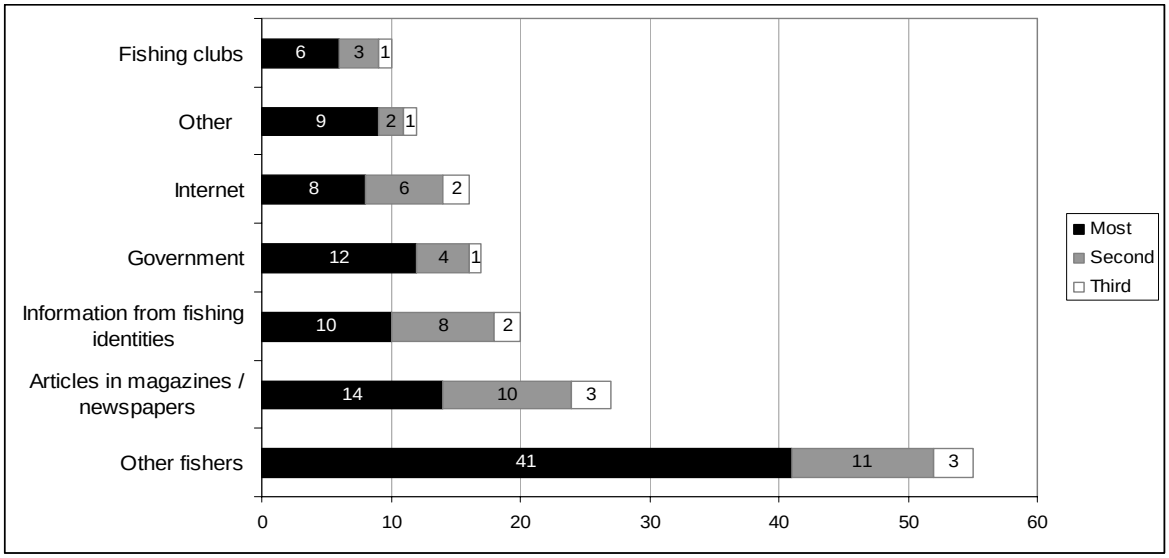

Figure 1: Fishers' confidence in sources of information (%, n=500). Source: RFE Project, unpublished data.

This highlights the importance of having accurate information about fish habitat circulating within the fishing community.

Scientific information

There is some indication that recreational fishers are interested in learning more about fish biology and ecology. Most are not satisfied with their current access to information about fisheries research and fish habitat.[43]

Information sources

Recreational fishers access information from a wide variety of sources. In Northern Rivers, other fishers are the predominant source.[44] Television, magazines, bait and tackle shops and newspapers are also sources but of far less significance. Other research identifies television shows, newspapers and information in boat and tackle shops as sources that are used a lot by recreational fishers.[45]

[41] RFE PROJECT (2009) unpublished data
[42] Unpublished data from RFE project focus groups
[43] Li et al 2010
[44] RecFish (2003), RFE PROJECT (2009) unpublished data
[45] Sutton 2006

Information preferences

The majority of fishers in Northern Rivers would *prefer* to access fish habitat information online (66 %) (Figure 2). This is despite the fact that they have relatively low levels of trust in information online. Articles in fishing magazines (17 %) and word of mouth (14 %) are the next most preferred.

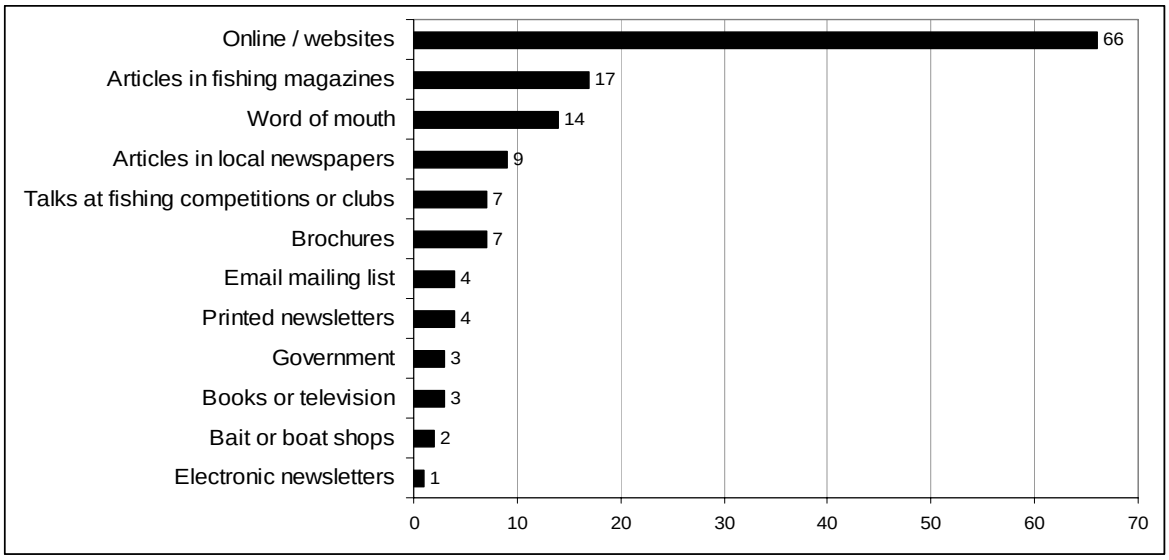

Figure 2: The information preferences of recreational fishers (%, multiple responses allowed).

This preference is a shift from older data from a broader group of recreational fishers[46] which indicated a preference for accessing fishing information from television fishing shows (28%), followed by mailed newsletters (18%). Internet or emailed information was ranked equal third with fishing magazines (14%).[47]

iii. Fishers' engagement preferences

Recreational fishers value face-to-face opportunities to share habitat information. Face-to-face options include special meetings, such as the Fishers for Fish Habitat Forum, and talks at events where fishers are gathering, such as club meetings or competitions.

Online options for getting habitat information from fishers are also supported.[48]

iv. Barriers to participation in fish habitat rehabilitation

The most important barrier to fishers getting involved in habitat work is knowledge: knowledge about what habitat is important and why, and about what can be done to improve fish habitat.

Knowledge about funding sources and lack of funding is also important, as is access to other resources (people, equipment, and so on).[49]

[46] RecFish Australia 2003

[47] It is possible that part of the difference in preference relates to the question being asked in relation to information about fish habitat as against about fishing in the earlier surveys.

[48] Based on data collected via an anonymous survey of participants at the 2009 and 2010 Fishers for Fish Habitat Forums.

C. Content issues

i. Fishers' habitat knowledge gaps

In general, recreational fishers in the Northern Rivers understand that fish make use of particular types of habitat and habitat features. However, there are some clear indications of where their understanding about fish habitat and how fish use habitat is minimal or incorrect. These are summarised below.

The importance of habitat

There is a persistent under-rating of the importance of habitat degradation and loss as a factor affecting fish numbers. Recreational fishers in Northern Rivers consistently rate habitat loss as important, however equally or nearly so are 'over fishing by commercial fishers' and non-compliance with recreational fishing restrictions (bag and size limits).[50] Water quality is also rated highly as important, however this is seen as primarily a development issue, that is, something caused by urban and agricultural development rather than something specifically to do with fish habitat.

Where fish breed

Many fishers appear to believe that most species of fish spawn in estuaries. Estuaries are important nurseries, and only a couple of recreationally important species spawn there.

Specific life history and habitat use

Detailed understanding of how particular species use habitats and how this use changes over their life history does not appear to be widespread. To be fair, there is relatively little scientific life history information about many species available and much of what is known by fishers is based on observation and anecdote.

Habitat change

Fishers appear to recognise to some extent that there has been loss or degradation of the habitat features that fish rely on, such as seagrass, mangrove and riparian vegetation. There is however a contradiction between habitat in general and specific habitat features.

Respondents were asked if there has been a change in the habitat for the fish they catch. Most said no (54 %). However, when asked to identify whether or not specific habitat features had changed between 10 and 30 % said these features have

[49] Based on data collected via an anonymous survey of participants at the 2009 and 2010 Fishers for Fish Habitat Forums.
[50] RFE PROJECT (2009) unpublished data. This is consistent with other research, for example, see Sutton 2006.

either not changed or improved.[51] This could be an example of so-called 'shifting baseline'[52] where people take the current situation as normal without recognising either that their starting point was a degraded situation and/or the slow negative changes that occur and are almost unnoticeable.

Fishers also appear to be uncertain in terms of either the relevance of specific habitat features to fish or how these features may have changed. Key examples include freshwater pools and riffles and saltmarsh.

[51] RFE PROJECT (2009) unpublished data. This data comes from the 2009 telephone survey and focus groups and from surveys conducted at the 2009 and 2010 Fishers for Fish Habitat Forums.
[52] Pauly 1995

Part 3: Educating recreational fishers about habitat

One of the key tasks for fisheries managers is to engage recreational fishers in the challenges of managing and improving fish habitat. A critical aspect of this engagement is the education of recreational fishers about fish habitat.

Educating recreational fishers about fish habitat faces challenges related to this specific community as well as process and content issues. These are discussed below.

A. Challenges

- People endorse material that reinforces their connections to others they see as like themselves and confirms their beliefs about how the world works.[53] Yet, recreational fishers are a diverse community. The range of socio-economic features, knowledge skills, values and motivations is broad. The only common factor is participation in the activity labelled 'fishing', which in itself encompasses many different tools, techniques, activities and environments. There is no one engagement tool or approach that will reach recreational fishers.

How do we engage a diverse community?

- Recreational fishers want to go fishing. It is their sport and their recreation. Getting people involved in proactive development or even maintenance associated with any recreational activity is hard, especially as it is usually voluntary. Part of the challenge is also that hard work now will not usually equate to an immediate improvement in fishing experience.

How do we make the link between habitat rehabilitation and fish for the future?

- Fish habitat is part of 'the commons', the environment that provides ecosystem goods and services and belongs to everyone. Assuming responsibility for improving an area of habitat means that other people, who may have done nothing to contribute, will benefit or even profit. 'Why should I?', 'It's not my responsibility' and 'What difference will fixing up this small bit make?' are illustrative of barriers to engagement associated with working on 'the commons'.

How do we ensure everyone feels a share of the responsibility for maintaining fish habitat?

How do we maintain enthusiasm and commitment?

[53] 'Cultural cognition' – see for example Kahan 2010. Se also Appendix 4 'Sense of community'

- ‘Fish habitat’ describes a specific suite of features of aquatic environments. These environments are largely degraded, under pressure from aquatic and terrestrial factors and dynamic systems subject to broader, long term climatic change. All of these factors affect the impact of any habitat rehabilitation activities. The relative lack of control over the system and the potential for catastrophic failures due to external factors (storms, floods, drought for example) means that enthusiasm can be eroded by lack of progress.

B. Process issues

A. Most fishers fish for recreation, relaxation and for the enjoyment of being outdoors. Getting involved in fish habitat needs to be seen as part of the overall enjoyment of the sport and fish habitat information needs be framed in ways that link it with primary motivations for fishers engaging in fishing as a sport.

B. Education and engagement of fishers about fish habitat needs to link in with concepts of:

   - being outdoors and being with family and friends using messages relating to being your own person, creativity, being part of nature, doing the right thing and caring for others and the environment.
   - relaxation, recreation and the sense of achievement that comes with catching fish using messages relating to enjoyment, achievement, adventure, following tradition and showing others how good you are.

C. Most Northern Rivers fishers learn about fish habitat from other fishers and experience. In addition, fishers are more confident about information sourced from other fishers, especially ‘good’ fishers, than they are about information from any other source.

D. Fishers are generally not learning about habitat from information provided by government and research institutions.

E. The majority of fishers in Northern Rivers would prefer to get fish habitat information online, despite it not being a source fishers had confidence in. However, printed material in magazines or with the recreational fishing licence has some support. Providing information for magazines can be a cost effective option.

F. Fishers in Northern Rivers responded positively to engagement activities about fish habitat. They prefer to be able to provide information to inform habitat rehabilitation via face-to-face interaction or surveys.

C. Content issues

A. In general, many fishers do not see the link between fish habitat and their catching of fish. They are not seeing 'what's in it for me'.

B. Fishers need a greater and more integrated understanding of how fish use habitat, in general and with reference to particular species.

C. The extent of habitat loss / degradation in the Northern Rivers and implications for the future of recreational fishing in this region are not well understood by fishers.

D. Fishers' concerns about competition for the take of adult fish, especially in relation to commercial fishing, need to be balanced with an understanding of carrying capacity and the potential for habitat rehabilitation to increase fish stocks.

E. The habitat rehabilitation work being done by government, landholders, fishers and others in Northern Rivers is not well known or the value of this work understood.

F. Fishers are not confident about getting involved and are lacking specific examples of how other fishers went about identifying, organising, funding and implementing a project.

Part 4 Strategic directions

Principles

1. **Recognise that recreational fishers are not a homogenous community.**
2. **Recognise that fishers have different motivations for engaging in their sport.**
3. **Respect recreational fishers' knowledge.**

Key messages

More habitat – More fish

Habitat – the future of fishing

Habitat makes fish happen

Objectives

1. **To improve recreational fishers' knowledge of fish habitat and its role in producing fish.**

2. **To improve recreational fishers' understanding of the scale and implications of fish habitat loss and rehabilitation.**

3. **To contribute to recreational fishers playing an increasingly active role in fish habitat rehabilitation.**

Improve recreational fishers' knowledge of fish habitat and its role in producing fish

- Develop and support opportunities for fishers to learn from other fishers who (a) are seen as good fishers and (b) understand fish habitat.
- Build information sharing partnerships between fishers, fisheries management and research institutions.
- Make fish habitat information relevant for recreational fishers

Improve recreational fishers' understanding of the scale and implications of habitat loss and rehabilitation

- Provide information about changes in fish numbers in response to changes in habitat.
- Provide historical perspectives, based on oral and documented history, about fish habitat and fish availability in the past.

Contribute to recreational fishers being increasingly active in fish habitat rehabilitation

- Support the development of a sense of community of fishers involved in fish habitat.
- Build the relationships between fishers and other fisheries stakeholders
- Provide practical resources to support active involvement.

Priority actions

➔ Building the Fish Habitat Network (FHN) as an online resource

➔ Providing capacity on the FHN for fishers to:

- Provide information about their local fish habitat issues
- Ask questions about fish habitat
- Tell their stories about involvement in fish habitat rehabilitation
- Talk with each other about fish habitat issues

➔ Develop the Fish Habitat meeting program to

- Provide opportunities for face-to-face interaction between fishers, fisheries managers and scientists and other stakeholders
- Increase understanding of fish habitat science
- Gather local current and historical information

➔ Create media and multi-media resources on:

- Fish species and their habitats
- Latest fish habitat science
- Fishers involved in habitat rehabilitation

Part 5: Appendices

Appendix 1: References

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Appendix 2: Recreational fishing catch

While catching fish is not necessarily the main reason most fishers fish, it is, of course, an integral part of recreational fishing and collectively recreational fishers catch a lot of fish. This is important as recreational fishers appear to underestimate the total recreational catch and have ongoing concerns about commercial fishing impacts on fish numbers.[54]

It is estimated that the total recreational fishing catch in NSW is 13 million finfish (e.g. bream, whiting, flathead), 1.3 million baitfish (e.g. pilchards, yellowtail), 500,000 crabs and lobsters, 16 million prawns and yabbies, 1.2 million shellfish (e.g. abalone, pipi, oysters), 160,000 squid and cuttlefish and 300,000 miscellaneous species.[55] While about 200 species were reported in recreational catches from NSW, the key recreational species include flathead, bream, whiting, European carp, tailor and luderick.

Table A2 shows the species and tonnage caught by recreational and commercial fishers. The bulk of the commercial catch were generally species taken from coastal or offshore waters, while the major portion of the recreational catch was taken from estuarine waters.

Both groups of fishers harvested about 200 species of fish, but the total recreational catch was about 30% of the total commercial catch. Of the five key recreational species listed above (excluding carp), the recreational fishing catch was greater than the commercial catch for three species (flathead, bream and whiting).

[54] Unprompted comments arising from telephone survey and focus group research conducted for this project.
[55] NSW survey (NSW DPI 2001)

Table A2: Harvest of NSW recreational fishing catches compared with an estimate of NSW commercial fishery landings (grouped species). Source: NSW DPI 2001, Scandol et al 2006

Species	Fishing sector	
	Recreational (t)	Commercial (t)*
Saltwater / estuarine		
Sand whiting	230 - 460	130 - 145
Dusky flathead	570 - 830	120 - 130
Yellowfin bream	820 - 1070	350 - 380
Eastern sea garfish	Less than 10	20 - 40
Australian salmon	150 - 210	1000
Snapper	180 - 250	200 - 210
Silver trevally	100 - 210	240 - 260
Leatherjackets	110 - 180	500
Luderick	270 - 550	330 - 370
Spotted Mackerel	10 - 100	20 -30
Blue Mackerel	90 - 200	440 - 460
Catfish	30 - 50	15 -20
Mulloway/jewfish	100 - 500	35 - 40
Grey Morwong	130 - 210	20 - 40
Tuna/bonitos	40 - 110	120 - 140
Yellowtail kingfish	120 - 340	120 - 140
School Prawn	Less than 30	600
Blue swimmer crab	150 - 310	150 -170
Squid	Less than 20	15 - 20
Giant Mud crab	30 - 60	70 - 90
Freshwater		
European carp	876 - 877	
Redfin perch	61 - 62	
Golden perch	325 - 326	
Trout/salmon	122 - 123	
Australian bass/perch	46 - 47	
Murray cod	93 - 94	
Crayfish (freshwater)	77 - 78	

*This table is in tonnes. The harvest amounts are an estimate based on the 2001 National Recreational and Indigenous Fishing Survey and other studies undertaken by DPI in NSW (see Scandol et al 2006). Some species have been not included from the original. ** Data derived from a range of Commonwealth and State sources. Other species data based on a 5 year average of ocean fishery landings into NSW.

Appendix 3: Human dimension obstacles for recreational fisheries management

Source: Arlinghaus 2006

Note: While Arlinghaus bases his argument specifically but not exclusively on inland fisheries and notes that many of these are subject to private property or limited fishing rights, these obstacles have broader applicability to fisheries generally.

Obstacle	Consequences	Potential solutions
Societal scale		
Lack of social priority - recreational fisheries subject to economically and socially higher priorities such as agriculture, water / power supply, flood prevention, and so on	• Interests of anglers rarely considered by water and ecosystem managers or nature conservationists • Fishery stakeholders are not involved in consultation processes	• Evaluate the socioeconomic benefits of angling on regional and national scales • Lobby based on hard scientific data • Proactively seek input in water and ecosystem management
Lack of integrated approaches - an integrated approach to aquatic resource management is required, spanning all stakeholders potentially affected by management actions	• Erodes social – ecological resilience • Often disrupts ecosystem structure and function	• Rehabilitate ecosystem structure and function on larger scales • Create win-win situations for all stakeholders
Lack of cooperative institutional linkages - there is seldom a structured, open, honest and fair communication before management actions are taken	• Creates severe intra- and inter-sectoral conflicts amongst stakeholders • Unsustainable management measures taken	• Facilitate structured cooperation and communication • Provide expert advice and management plans
Lack of systems thinking - uncertainty, information gaps and correlations between slow (eg habitat change) and fast (eg angler responses) variables, - fishers may not accept that their practices are threatening fish communities and/or excluding other users / stakeholders.	• Rudimentary understanding of system behaviour leads to short-sighted management and shifting perceptions • Management failure occurs at larger scales	• Take complex systems approach • Incorporate anglers in system studies • Shift thinking and approach: empower anglers
Lack of research and monitoring - most fisheries are managed on limited experience where results from a few studies are extrapolated to other fisheries and / or negative impacts go unnoticed	• Invisible declines of fish stocks occur • Low fishing quality provided • Data-less management occurs	• Conduct cooperative research, gain funding for long-term monitoring • Educate for realistic expectations • Be precautionary
Individual or group scale		
Lack of shared values and stereotyped perceptions - Confusion and strong conflicts arise because of the different worldviews of multiple stakeholders	• Intense inter- and intra-sectoral conflicts occur • Leads to low level of cooperation and mutual acceptance, consumer attitude, free-riding behaviour	• Foster common values such as fairness and justice • Facilitate face-to-face interaction, sometimes with a facilitator

Obstacle	Consequences	Potential solutions
Lack of consideration for regional fish-angler dynamics - an overlooked aspect affecting management outcomes of the regional mobility of anglers and the resulting angler effort dynamics	• Homogenised angling quality • Anglers' satisfaction reduced on regional scales • Management fails	• Apply active adaptive effort management • Partially limit angler effort, first indirectly by soft paths • Create protected areas
Lack of objective communication of scientific findings - including the impact of recreational fishing effort	• Unawareness of potential negative impacts • No research is funded	• Increase communication of research results about positive / negative impacts
Lack of critical self-reflection - involvement in recreational fishing does not necessarily cultivate an opposition to environmental degradation, especially if related specifically to fishing activities	• Awareness of the need for responsibility is low • Little support for more restrictive management • Level of environmental concern is low • Unsustainable management measures supported	• Convince anglers to meet their own targets by more restrictive regulations • Facilitate personal experiences • Reduce fear of new approaches

Appendix 4: Sense of community

Table A4.1 (adapted from Kyröläinen 2001) outlines elements of developing and maintaining sense of community. It includes questions or comments that relate these elements to an engagement activity.

Table A4.1: Sense of community and community engagement

Element	Description	Engagement questions
Prerequisites		
Awareness	Perception, recognition, and understanding others' activities basic prerequisite for human interaction and communication. Awareness of others supports the recognition, acceptance, and reinforcement of norms guiding behaviour.	Do potential participants know that others share their interest / concern? How does the design of the engagement acknowledge what people have done / are doing/ are wanted to do?
Sense of social presence	Refers to the feeling of being socially present with other people, regardless of whether people are co-located or at a distance.	Are there opportunities for people to get to know one another, to build relationships?
Facilitators		
Criteria for membership	The parameters, characteristics, or boundaries that enable individuals to identify one another as members and that support a sense of belonging and identification with the community.	Are the criteria for participation in the engagement clear? Are participants distinguishable in some way from non-participants Are the boundaries of the engagement defined clearly?
Collective purpose	The shared values, goals, needs and interests that provide a sense of collective endeavour for the community.	Have the goals of the engagement been developed with participants and articulated clearly?
Social interaction, reciprocity	People working together and contributing to the community. The wider and deeper the involvement and mutual influence, the greater the sense of community.	Is the engagement passive or active? Do participants have opportunities to contribute and to make decisions affecting the engagement itself?
Norms and conformity	The range of acceptable behaviours and the mechanisms through which the communities influences its members to practice them.	Are the 'ground rules' for the engagement clear? Do people know and accept what is expected of them and what they can expect of others, particularly when expressing views on an issue?
Connections	The networks of roles that hold communities together, provide members with status options, and contribute to community identity and shared history.	Who are the power holders within the engagement activity?
Consequences		
Trust	The sense of security, emotional safety, and practice of shared norms that individual members have towards other individual members and the community itself.	What trust building work has been done? Is there mis-trust that has to be addressed, either within the participation community and/or between participants and government agents?
Accountability	The acceptance of responsibility for individual and communal actions and consequences.	How will the engagement process validate input? Who has sign-off and of what and when? Do people understand the context within which the engagement is occurring?

The following principles for enhancing the effectiveness of community engagement activities are inferred from the literature:

- Develop a sense of membership.
- Reduce the risks associated with participation.
- Provide opportunities for people to see what they have in common with other participants.
- Make the boundaries of the activity clear.
- Ensure participants have some influence.
- Ensure the activity is unambiguous and can be completed (not left unresolved).
- The more time and energy people invest, the more important the activity will become for them. Public recognition and reward become significant factors for both ongoing participation in a particular activities and likely participation in future activities.
- Don't walk away. The community of participants will bond to greater and lesser extents. There needs to be an ending and this ending should be formal to some extent (ritualised, use of common symbols important).

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Appendix 5: Guiding principles for boating, fishing and aquatic stewardship education

Source: Fedler 2001

Note: these principles are consistent with the broader environmental education literature.

Boating, fishing and stewardship education:

- Is learner-centred
- Constitutes a continuous and lifelong process for individuals, families and diverse social groups
- Considers aquatic resources in their totality, including natural, built, technological and social aspects (eg., economics, politics, cultural-historical, moral, aesthetic)
- Provides participants with opportunities to engage in the valuing process (ie., choosing, affirming, acting) as it relates to programs, program activities and their own growth and development.
- Follows the principles of inclusion with regard to program participation by minorities and people with disabilities.
- Begins with goals and objectives that relate to appreciation and awareness, expend tom include both knowledge and skills and culminate in [personal responsibility and responsible behaviour.
- Builds on local, state and national partnerships to support the development, implementation and evaluation of programs, as well as to support stewardship of the resource.
- Relies on a variety of systematic and continuous approaches to the assessment of participants and evaluation of programs so as to improve and eventually validate those programs.
- Support, engages in and makes use of the scientific, social, educational and other forms of research that have a bearing on programs.
- Recognises the critical role and the need top adequately support ongoing professional development for all personnel associated with these efforts and programs, including those suggested or implied in the above principles.

Appendix 6: Using motivational profiles

Understanding that there are two motivational profiles that recreational fishers appear to relate to can help to shape the ways in which materials and messages are presented.

In the following simple example, the two questions that headed the information flier were worded in such a way as to appeal more to one or other motivational group.

This challenge was worded to appeal to 'Pioneers'

This challenge was worded to appeal to 'Prospectors'

This statement was worded to appeal to 'Prospectors'

This statement was worded to appeal to 'Pioneers'

This statement was worded to appeal to 'Pioneers'

Part 6: Sample resources

Title	Type
Bream and habitat	Factsheet
Flathead and habitat	Factsheet
Mulloway and habitat	Factsheet
Australian bass and habitat	Factsheet
Murray cod and habitat	Factsheet
More habitat – more fish	Poster
Where would you rather fish?	Poster
Tips for engaging with recreational fishers	Guidelines
Habitat basics	Factsheet