

Social information to help build a sustainable aquaculture industry

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This article examines how and where, social information can add value to decision-making in the aquaculture industry. Government and industry managers face a range of challenges and require quality information to make good decisions in what is a very complex operating environment. The social sciences can assist managers to solve a range of problems by filling important information gaps about the social dimensions and impacts of industry development and natural resource management. The Community Perceptions of Aquaculture Project undertaken by the Bureau of Rural Sciences provides an example of how the social sciences can support aquaculture development, planning and management.

We discuss challenges facing industry and government managers and how social research can help address these challenges. It considers aquaculture in the context of the broader fishing industry, explores the aquaculture decision-making environment and gives examples of how and where social information has been used to support better decision-making.

Background - the Australian Fishing Industry

Australia's fishing industry comprises three major sectors, commercial fishing, aquaculture and recreational fishing, which, collectively, are worth approximately US\$2 billion annually (DAFF 2006). The fishing industry, commercial fishing and aquaculture, is the fifth most valuable Australian rural industry after wool, beef, wheat and dairy. Fisheries production in Australia tends to rely on high unit-value species, such as rock lobster, shrimp,

abalone and tuna. About 9,000 commercial fishing boats operate in Australia of which about 1,200 currently hold Commonwealth fishing concessions and the rest have State licenses. The industry directly employs about 21,000 people in the catching and harvesting sector and 4,000 in processing (DAFF 2006).

Aquaculture is the fastest growing primary industry in Australia, valued at US\$732 million in 2003/04, and accounts for approximately one third of the total gross value production of the seafood industry. Most of the aquaculture species in Australia are high value species aimed at export markets. There are over 40 species being commercially produced and include finfish, crustaceans and molluscs. Most of the production comes from high value species, such as tuna, pearl oysters, salmon, oysters and shrimp. The industry tends to be regionally based and it is estimated that approximately 6,000 people are employed in the aquaculture sector (DAFF 2006).

Recreational fishing in Australia is also a major industry and a popular leisure activity. Approximately three million Australians engage in recreational fishing and international tourists spend over US\$210 million on fishing each year. These activities often have benefits to regional areas, including employment opportunities in the tackle, boating, tourism, charter and associated industries.

Fisheries Management – a Complex Operating Environment

The commercial fishing and aquaculture industries depend on access to highly valued, shared natural resources, particularly marine and coastal

environments. Consequently, a wide range of stakeholders are interested in sustainable management of the fishing industry and involved to varying degrees, formally and/or informally, in making decisions about locating and operating different industry sectors and addressing a range of industry issues and challenges.

Locating, operating and sustaining wild catch and farmed fishing industries presents particular challenges for government and industry managers, as well as a range of other stakeholders, including researchers and communities (Figure 1). The particular characteristics of the commercial fishing and aquaculture sectors mean that some challenges are common to both sectors, while others vary. Fisheries managers need effective frameworks and tools to help them make decisions about the following:

- **Resource conservation, access and allocation:** Given the declines in fish stocks and most of Australia's major fisheries being classified as 'fully fished' (DAFF 2006), there are important questions to be answered about what constitutes sustainable use of scarce marine and coastal resources. There are also decisions to be made about how those resources should be allocated among user groups competing for access, such as different sectors of wild catch fisheries, recreational fishers, aquaculture operators and conservation.
- **Fishing industry and communities:** All sectors of the fishing industry, recreational, wild catch and aquaculture, make valuable contributions to the Australian community at national, regional and local scales, including direct em-

ployment and income in coastal areas, flow-on activities, industries, employment and broader lifestyle and health benefits. It is important to find ways to maintain these social, economic and cultural benefits that wild and capture fisheries make to communities, while minimizing and mitigating any negative effects of changed management regimes, including restricting or closing wild catch fisheries, expanding established aquaculture farms or bringing in new aquaculture developments.

- Social acceptability:** Many stakeholders and communities are interested in the social, economic and environmental sustainability of fishing industries. There are concerns that if current wild catch fishing regimes are not curtailed, particular fish populations will continue to decline. Yet there are also concerns about the localized impacts on fishing industry-dependent communities if fishing activities are restricted, as well as strong cultural preferences in Australia for consuming seafood. In the case of aquaculture, there are mixed views on the industry’s environmental, social and economic benefits and costs, namely whether the industry can and/or does address shortfalls in fisheries resources or adds to the pressures on fisheries resources. Some see aquaculture as supplementing declining seafood supplies and providing a more renewable sector than wild-catch. Others see aquaculture as environmentally damaging, including by changing local fish populations and presenting risks to wild stocks through fish escapes and diseases. Fisheries managers need regular access to rigorous information about how stakeholders and the public think about the sustainability of wild and capture fisheries, as well as the effects of those views on the industry’s overall credibility and viability. Such information can help to build policies and management plans that are sufficiently responsive to those interests.
- Market access and certification:** Fisheries managers seek ways to ensure that the industry has sufficient access to diversified, viable, new and/or growing markets. This may include addressing community concerns about the sustainability of fish through certification, for instance, and ensuring high standards of food safety to allay community concerns about potential food safety risks. Greater co-ordination and co-operation across different governments and industry groups and improving collation and dissemination of market information can help to take advantage of new and growing market opportunities (DAFF 2006).

These issues contribute to the complexity of establishing and maintaining viable wild capture and farmed fisheries. Deciding how to address the interrelated fisheries management issues is a major, overarching challenge faced by government, industry fisheries managers and a range of other stakeholders and communities (Figure 1).

Making Decisions about Aquaculture

A range of challenges face the fishing industry, not the least of which is deciding how to respond to those chal-

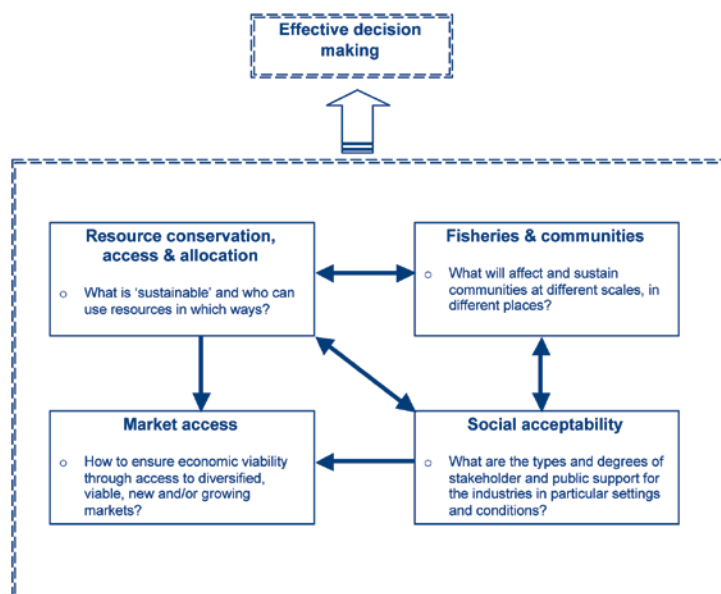


Fig. 1. Fisheries (wild capture and farmed) industry challenges.

lenges. How decisions are made in particular settings and conditions directly influences what decisions are made. This article is primarily focused on the key decision context and tasks that make up the intricate process of developing, locating and operating aquaculture activities. The numerous stakeholders and government agencies interested and/or directly involved in these processes adds to the complexity. Aquaculture managers, government and industry, grapple with numerous risks and uncertainties when making decisions and timely use of social research at key points in those processes can fill important information gaps.

In Australia’s federal system, the federal government and state/territory governments share official management of many of the country’s fisheries. The federal government is responsible for fisheries outside the three nautical mile territorial sea limit and the state/territory governments for those in their adjacent waters unless agreed otherwise under “Offshore Constitutional Settlements.” All three levels of play a role in aquaculture management. However, the state and territory governments have primary responsibility for aquaculture and those duties are wide ranging, including support for industry development, allocating and approving sites for aquaculture operations and regulating and managing aquaculture activities. There are also differences in how aquaculture is regulated and administered across the states/territories.

Figure 2 loosely represents the different tasks involved when state/territory governments and the aquaculture industry set about developing, locating and operating aquaculture farms. Early on in the process, the main tasks involve establishing broader resource management and development policies, as well as more specific aquaculture policies and management plans. These tasks involve setting goals and making decisions about how to achieve those goals. At the later implementation stage, policies and management plans are put into practice and may eventually lead to the establishment and operation of new aquaculture farms or

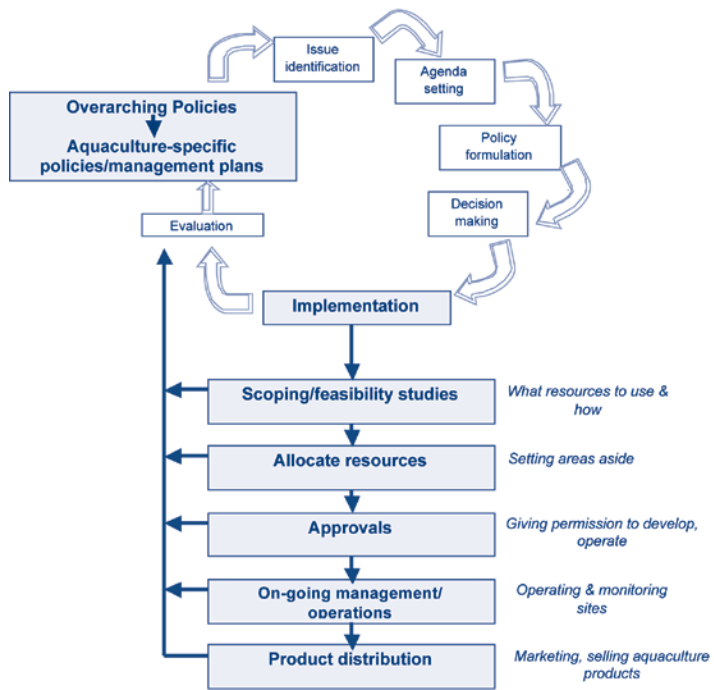


Fig. 2. Key components of aquaculture decision making processes.

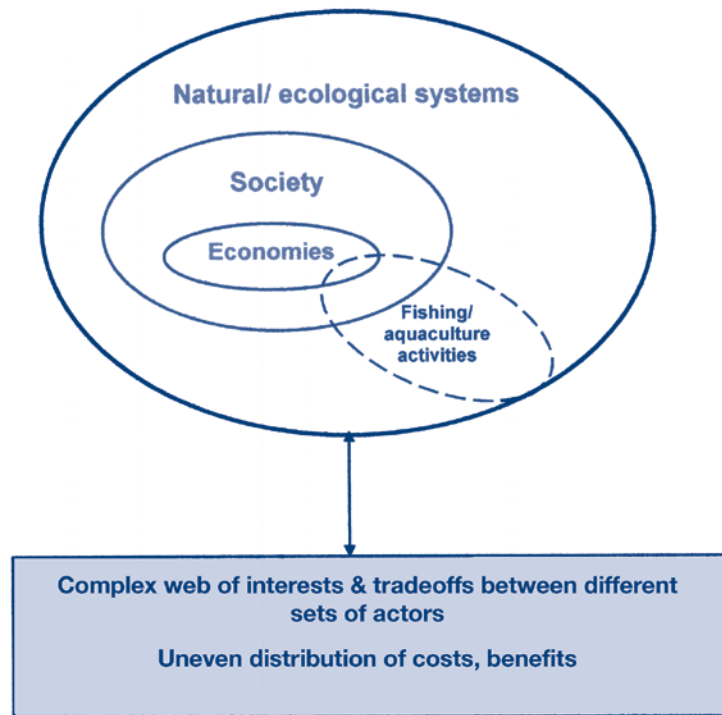


Fig. 3. The challenge of sustainable development of natural resources, fishing and aquaculture.

to changes in existing operations, such as expanding or restricting activities. During this phase, aquaculture managers are typically seeking to identify:

- **Scoping and feasibility studies:** what biophysical resources, coastal and marine sites and species, are available for use and what kind of use can be sustained under particular conditions and markets.
- **Resource allocation:** appropriate processes for setting aside specific areas and sites for aquaculture use and providing for tenure, allocation of leases.
- **Approvals:** whether to give aquaculture developers permission to undertake activities at a given site and establishing conditions for those operations.
- **Management/operations:** effective conditions for establishment, operation and ongoing management of aquaculture zones and particular farms, required extension services and particular scientific monitoring at designated sites.
- **Product distribution:** effective and efficient means to market and sell aquaculture products.

During all these processes, from the earlier stages of formulating policies and management plans to the later implementation and evaluation tasks, aquaculture managers, industry and government alike, require quality information to help them understand key issues; define what problems will be addressed and how; consider their choices and alternatives, as well as identifying the consequences of those choices; identify who needs to be consulted and how; take action; and, reflect on whether those actions are achieving the desired results.

Social Information to Support Decision Making

Traditionally, fisheries managers have sought a range of information about the biological and physical features of marine and coastal environments to help them respond to the industry challenges, including fish stock assessments and sea floor surveying. More recently, there is growing recognition that responding to natural resource management challenges, like sustainable development of the fishing and aquaculture industries, also requires an understanding of the social systems in which these industries are embedded and which have a range of social, economic and environmental benefits and costs (Pickworth *et al.* 2006)(Figure 3).

The development and operation of any sustainable natural resource industry, such as fishing and aquaculture, is, in large part, a social challenge. Humans live in and depend on earth's ecosystems and use its natural assets: soil, plants and animals, air and water, to produce a range of goods and services. Those good and services have to serve many different interests and not all uses and users are compatible. Conflicts over natural resource use occur in large part because of the different views that people have about how to best allocate, develop and manage natural resources and the varying degrees of influence they bring to bear on decisions. Today, it is widely accepted that natural resource management generates a range of costs and benefits that are unevenly distributed in space

and time across different people, groups, organizations, cultures and regions (Dale *et al.* 2001). Hence, sustainable management of natural resources is about influencing the interactions between people and the ecosystems they depend on for their livelihood and well being, as well as the physical outcomes of these interactions (Clark *et al.* 2000).

Social research (sidebar 1) can help aquaculture managers address aquaculture industry sustainability challenges by filling important information gaps about how the industry is viewed, its effects on communities and how to make decisions about addressing these and other challenges (Figure 4). In this article, we focus on three key themes:

- Identifying public values, beliefs, attitudes and behavior in relation to aquaculture.
- Understanding aquaculture's social benefits and costs.
- Identifying appropriate governance arrangements for strategic decisions.

The themes are closely intertwined. There will be a range of views on natural resource use and its costs and
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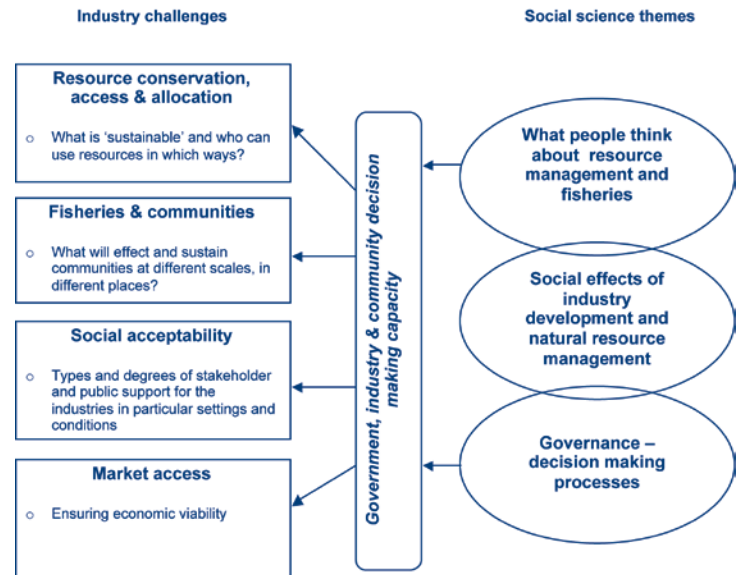


Fig. 4. Interrelated social science themes can help address industry challenges.

Side Bar 1

Social Science Research

Social science is focused on people and their behavior, as well as interactions among people, in the context of cultures and social and institutional structures (Punch 2005). 'Social science' or 'social research' is conducted in order to describe, explain and/or predict how individuals and groups behave. This information can be used to inform decisions about which policies or initiatives might be most usefully implemented to solve everyday issues or problems, or evaluate the effectiveness of such policies in meeting their objectives (Henn *et al.* 2006).

There are multiple perspectives within the social sciences. Social scientists have different views about the true nature of the social world (ontology), how best to understand and communicate about that world (epistemology), understanding the essence of human nature, and which techniques and tools (methodology) are most appropriate and effective for investigating the social world (Burrell and Morgan 1979). The social sciences also include numerous disciplines, which are used to improve understanding of a range of study areas, and some of the better-known social science disciplines include psychology, sociology, anthropology, economics, and political science (Punch 2005).

Social science disciplines

Sociology, psychology, anthropology, human geography, history, philosophy, demography

Planning, history, political science, public policy, law, economics

Law, justice and legal studies, sociology, public administration

Economic theory, environmental/resource economics, institutional economics

Topics/Foci

Group processes, communication, values, perceptions, learning, decision-making, conflict resolution, social impact assessment

Policy and political processes, institutional settings, organisational arrangements, programme evaluation

Analysing/describing law

Economic values, allocation of resources, property rights

(Mobbs and Dovers 1999)

Some of the well known methods of collecting primary data in social research include survey research (self administered questionnaires, telephone surveys, mail surveys, personal interviews), group interviews (brainstorming, nominal group technique, Delphi technique, formal field interviews). Secondary data is collected through statistical and non-statistical documentary data, historical analysis, and literature reviews (Bright *et al.* 2003).

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benefits those views will have varying degrees of influence on what are defined as problems and what approaches and tools are used to meet industry challenges. Timely use of social information can build the capacity of fish managers, as well as a host of other stakeholders.

What Do People Think About Aquaculture and Why?

Achieving a sustainable aquaculture industry is a key challenge, because different social sectors, organizations, the stakeholders affiliated with these sectors or organizations and the wider community have differing values, attitudes and belief systems about using natural resources, such as marine and coastal environments and the species living in those habitats. Sustainability is subject to varying interpretations and what constitutes good aquaculture practices may be both controversial and contested. The varying perspectives may, in turn, affect support for the aquaculture industry.

Values, beliefs, attitudes and behavior are the factors that influence people's preferences, choices and actions and are part of people's belief systems that people use to make decisions (Rokeach 1968, Schwartz 1992). People use values as criteria to select and justify actions and to evaluate people, non-human organisms, objects or events. Attitudes are seen as more specific than values and are directed toward specific objects or classes of objects, including living organisms. Attitudes also reflect beliefs and influence individual actions in relation to the object of the attitude. Beliefs refer to how people accept if something is true or valid and can refer to a belief system or ideology that is closely linked to their underlying values.

People develop their basic values, attitudes, beliefs and corresponding behaviors in the context of the culture and society they live in and/or are exposed to. Some of the factors influencing people's values and atti-

tudes include a wide range of aspects of their society, culture and immediate situation, including their family context and lifestyle, religious beliefs, the values and attitudes of the groups they mix with and their exposure to other social influences, such as the mass media. As they mature, people often tend to seek out particular groups and roles, professional, interest-based and political, that are consistent with their values and experience in these groups or roles, in turn, tends to reinforce their tendency to perceive problems and solutions in the ways that are typical of their peers or colleagues.

The outcome of these processes is that different individuals from different backgrounds will have different values, attitudes and beliefs that will influence how they perceive and react to new issues or problems they face. The way problems are perceived and framed influences how these problems are understood, who participates in problem-solving and how and what values will be favored by actions and results (Clark *et al.* 2000, Harding 1998, Swaffield 1998, Bardwell 1991). In turn, these divergent views can lead to tensions at any stage of formal and informal decision making about aquaculture, inasmuch as people attend to and interpret information differently.

Controversy can be mistaken for disputes over facts, but it is mostly about a clash of values. Failure to acknowledge the values of different stakeholders and incorporate them into decisions can lead to further conflicts or tensions, which, in turn, lead to additional costs, time and plan changes; difficulties in obtaining approval for aquaculture policies, programs or projects; and, also, to inappropriate decisions. Government and industry interactions with other stakeholders can be improved when value differences are acknowledged. This kind of understanding encourages people to focus less on positions, for or against, and more on their potential shared interests and aspirations.

Social research in an aquaculture context seeks to understand the factors that shape behaviors and how those behaviors affect and/or are affected by aquaculture activities. This infor-

mation can help aquaculture managers meet the challenges of resource conservation and allocation, identify aquaculture's social effects and build the industry's social acceptability (Figure 4) by answering questions such as:

- How do stakeholders and communities perceive aquaculture business operations or management agencies and policies?
- What do people know about aquaculture and its use of natural resources?
- How do people value marine and coastal environments that aquaculture depends on?
- What do people believe the benefits and costs aquaculture will be for them/their communities (NOAA Coastal Services Center 2006)?

Understanding Aquaculture's Social Effects

Developing and managing natural resources can result in an uneven distribution of benefits and costs across society. Natural resource management's social impacts are integral to aquaculturists, policymakers and politicians as they underpin the successful development and implementation of their policies, programs and projects. One key social research tool, social impact assessment (SIA), helps managers understand the positive and negative impacts of resource development and formulate plans or strategies to mitigate adverse consequences and enhance the reach of the benefits (Lane *et al.* 2001). Social impact assessment can improve the effectiveness of NRM decision making because it complements other scoping, feasibility and impact assessment tools that are primarily focused on biophysical resources and conditions

Social impact assessment is a process of analyzing and managing the intended and unintended consequences on the human environment of planned interventions, such as policies, and any social change processes invoked by those interventions (Vanclay 2002). Aquaculture managers need to understand how aquaculture and the natural resources it relies on are valued. They also need to know how those shared resources are used now and what does it mean for