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Version: Published Version

Article:

Evely, Anna C., Fazey, Ioan, Pinard, Michelle et al. (2008) The influence of philosophical perspectives in integrative research. Ecology and Society. art52. ISSN: 1708-3087

Synthesis

The Influence of Philosophical Perspectives in Integrative Research: a Conservation Case Study in the Cairngorms National Park

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ABSTRACT. The benefits of increasing the contribution of the social sciences in the fields of environmental and conservation science disciplines are increasingly recognized. However, integration between the social and natural sciences has been limited, in part because of the barrier caused by major philosophical differences in the perspectives between these research areas. This paper aims to contribute to more effective interdisciplinary integration by explaining some of the philosophical views underpinning social research and how these views influence research methods and outcomes. We use a project investigating the motivation of volunteers working in an adaptive co-management project to eradicate American Mink from the Cairngorms National Park in Scotland as a case study to illustrate the impact of philosophical perspectives on research. Consideration of different perspectives promoted explicit reflection of the contributing researcher's assumptions, and the implications of his or her perspectives on the outcomes of the research. We suggest a framework to assist conservation research projects by: (1) assisting formulation of research questions; (2) focusing dialogue between managers and researchers, making underlying worldviews explicit; and (3) helping researchers and managers improve longer-term strategies by helping identify overall goals and objectives and by identifying immediate research needs.

Key Words: *adaptive co-management; interdisciplinarity; philosophy; social–ecological resilience*

INTRODUCTION

Over the last 30 years, there has been increasing emphasis on understanding social processes and phenomena in relation to environmental management, including linking the work of natural and social science researchers (Shepherd and Bowler 1997, Weber 1998, Song and M'Gonigle 2001, Orr 2002, Peterson et al. 2002, Stoll-Kleeman and O'Riordan 2002, Lane and Macdonald 2005, White et al. 2005). However, there has been only limited integration of the social sciences with natural sciences (e.g., Soulé 1985, Fazey et al. 2006), and with increasing recognition of environmental crisis (e.g., Callicott et al. 1999, Millennium Ecosystem Assessment (MA) 2005), there have been louder calls for inter- and transdisciplinary approaches to help understand and manage environmental problems (Newell 2001, Bruce et al. 2004, Reich and Reich 2006).

An interdisciplinary approach aims to integrate different disciplines and methods in ways that yield new understandings about an issue or problem that would not have been possible through traditional single-disciplinary perspectives and approaches (Bammer 2005). A transdisciplinary approach goes further by involving a range of stakeholders in the research, including nonacademics, who play a role in setting research agendas and questions (Tress et al. 2004). Both approaches require greater engagement between disciplines that have traditionally worked separately (Newell 2001, Bruce et al. 2004, Tress et al. 2004, Graybill et al. 2006, Reich and Reich 2006).

Despite the above, integration of the natural and social sciences generates significant challenges (Nyhus et al. 2002, Cheng et al. 2003, Fox, et al. 2006). One such challenge is dealing with the wide range of underlying philosophies (a system of values that a person adheres to) and epistemologies (understandings of what can constitute knowledge, or what can be known) of the different people involved (e.g., Huntington 2000, Fazey et al. 2006). In environmental research, the worldview traditionally held by the natural sciences tends to

dominate (Shepard et al. 1992, Barry and Oelschaeger 1996, Lélé and Norgaard 2005, Sawa 2005) and this makes it difficult for social science researchers to have their worldviews understood and incorporated. Differences between worldviews can result in misunderstandings (Steffy and Grimes 1986, Lélé and Norgaard 2005), further reducing the willingness of different parties to work together and the likelihood of finding novel solutions to complex problems.

One important area where integration of social and natural science research is desirable is in understanding motivations and roles of volunteers in conservation (Gittell 1980). Volunteers are key to many conservation projects worldwide and, since the 1960s, public participation has become an increasingly important aspect of natural resource management and environmental action that would not exist without the help of dedicated volunteers (Ryan et al. 2001). Public participation can widen the range of information sources and perspectives contributing to decision making. This enriches the overall quality of governance, leading to better, more applicable management decisions (Wondolleck and Yaffee 2000, Lawrence and Deagen 2001). Participation has the potential to improve sustainable development through the sense of ownership and empowerment it fosters, and by increasing the likelihood that conservation effectively meets community needs (Shepherd and Bowler 1997, Weber 1998, Song and M'Gonigle 2001, Peterson et al. 2002, Stoll-Kleeman and O'Riordan 2002, Weston et al. 2003, Lane and Macdonald 2005, White et al. 2005).

In the UK for instance, Byrne (2005) estimated that 11 (out of 55) million people defined themselves as "participants" and four million defined themselves as active "volunteers." In 2006 for Scotland alone, the voluntary sector was worth an estimated £2.52 billion to the economy, accounting for approximately 3% of the Annual Gross Domestic Product (The Scottish Government 2006, Volunteer Development Scotland 2007). Within the context of conservation, application of social research to understanding what motivates volunteers to remain involved in long-term schemes is believed to be key for ensuring sustainability of schemes with limited funding. Insights from the social sciences are, therefore, vital in order to achieve sustainability (Ryan et al. 2001).

The aim of this paper is to aid the process of integration of social and natural science research by explaining some of the different philosophies underlying social science, and how these philosophies can affect research strategies, methodologies, and outcomes. We first explain the differences between some of the main social science research philosophies. A framework is then used to assess the impact of different philosophical approaches on research aimed at understanding motivation of volunteers in a water vole (*Avicola terrestris*) conservation project in the Cairngorms, Scotland.

This paper is not meant to be an exhaustive review or critique of the philosophies discussed, nor is it meant as a critique of a positivist worldview. Instead, it provides a basic introduction to the complexities of some of the philosophical views held by researchers and practitioners, and aims to further discussion about the difficult task of bridging traditional disciplinary boundaries.

Different Philosophies of the Natural and Social Sciences

In general terms, the philosophical perspective of positivism is the basis of most research in the natural sciences. Positivism assumes that an objective reality exists that is independent of human behavior and is, therefore, not a creation of the human mind. To a positivist, science provides the observer with an objective account of the world as a concrete entity, one that is separate from human intention and purpose (Dyson and Brown 2006). The senses are used to accumulate data that are objective, discernible, and measurable, thus methods are chosen to obtain estimates of the truth, using data and estimators that are both unbiased and as precise as possible (such as species counts to measure species diversity, or demographic parameters such as survival rate, age distribution or sex ratio). It is this philosophy and its values of external validity (the degree to which the conclusions in a study would hold for other persons in other places and at other times) and reliability (the consistency of results gained) that drive natural scientists in their choice of methods.

Although positivism is a widespread worldview in the social sciences, it is not the only one (Morgan and Smircich 1980, Dyson and Brown 2006). Some

social scientists hold the view that a positivist approach does not provide the means to adequately examine human feelings, emotions, and values, such as those that underpin volunteer involvement. To many social scientists, human emotions, feelings, and values cannot be studied in a positivist manner as they are subject to many influences on behavior, feelings, perceptions, and attitudes that cannot be quantified. Because the exploration of human feelings and emotions is important in the study of many human-related conservation issues, some researchers argue that understanding why people value some species and why they wish to be involved in conservation programs is beyond the scope of positivist methodology. Some positivist approaches, such as "willingness to pay" and enabling people to rank their choices, go some way toward addressing this shortfall in approach (Kotchen and Reiling 2000), but do not fully account for the subjective nature of human reasoning and choices.

In much of the social sciences, the use of quantitative data and statistical analysis is regarded as the indispensable hallmark of research (Gewirth 1954, Crane 1999). Quantitative approaches are associated with a positivist worldview and, thus, are compatible with the values embraced by the natural sciences. Collaboration between natural and social scientists arises more readily between groups that share the notion of a "truth out there" that can be estimated and quantified. Such collaboration is facilitated by the common ground the positivist social and natural scientists share.

Restricting social research to a positivist approach, however, may yield an incomplete understanding of the issues, reducing the possible scope of a study. Such limitation may be overcome if other worldviews and associated methodological approaches are considered. Within the social sciences, there is much variation in views on how research should be approached and carried out. For a natural scientist beginning to work with social scientists, the range of methodologies resulting from differing philosophies may seem disconcerting, particularly when working with social methods rooted in philosophies far removed from positivism, such as subjectivism as detailed below.

Contrasting Positivism and Subjectivism in Social Science

There are two important contrasting philosophical views that are applied to varying extents by social scientists. These are the differing philosophies of positivism and subjectivism, which lie at extreme ends of a gradient of philosophies (Table 1). In social science, positivism often results in the use of standardized research instruments, such as questionnaires and the collection of quantitative data, to give an approximation of the real world (Skinner 1957, 1965, Morgan and Smircich 1980, Firestone 1987, Crane 1999, Dyson and Brown 2006). For example, local attitudes toward conservation and tourism in and around Komodo National Park (KNP), Indonesia were assessed using questionnaires to collect quantitative data; this method provided generalizable social facts about the relationship between increased tourism and conservation values (Walpole and Goodwin 2001). This study used stratified sampling and hypothesis testing, which assumed there is a common view held by categories of individuals, and that a sample of each category gives an estimate of this common view, such that inferential statistics can be used for testing the null hypothesis that groups hold similar views. Results of the study showed support for conservation of KNP, although the study failed to reject the null hypothesis, finding a lack of evidence that beneficiaries should value the park more than nonbeneficiaries. This latter result is counter intuitive, suggesting benefits from tourism do not result in increased conservation support. Walpole and Goodwin (2001) recommended a further study to examine this.

In contrast, the subjectivist view of reality emphasizes the importance of understanding the process through which human beings fix their relationship to the world (Morgan and Smircich 1980). That is, it accepts that individuals generate their own reality, one shaped by their emotions and experience, and that this social world is in continual flux as people create and recreate their reality in relation to an ongoing interchange of perceptions, meanings, feelings, emotions, and motives (Table 1; Kuhn 1977, Dyson and Brown 2006). To the subjectivist, it is an individual's view of the world that is important, as this drives his or her behavior. Emphasis is placed on trying to understand the depth, variety, and qualities of an individual's experience and perceptions, compared with

Table 1. The core ontological assumptions guiding positivism and subjectivism, adapted from a table in Morgan and Smircich (1980).

	Extreme Subjectivism	Extreme Positivism
Perspective on reality	The social world and what passes as "reality" are a projection of human perception and an act of people's creative imagination. In its extreme, there may be nothing outside of oneself: a person's mind is the world.	The social world is a concrete, real thing that affects everyone. It can be thought of as a structure composed of a network of causal relationships between its essential parts. The social world is as concrete and real as the natural world.
Perspective on the researcher	Reality cannot be fully understood, as human processes interpret events in consciousness before fully understanding its structure or meaning. The researcher will explicitly state what they believe to be their influence on the results of the research, taking into account that they cannot be objective.	Reality is an objective phenomenon that lends itself to accurate or inaccurate—depending on variance—observation and measurement. "Any aspect of the world that is not in some form of observable activity or behavior must be regarded as being of questionable status".
Perspective on humans	Humans use their intuition and experience to make the world into a meaningful form. Human beings shape the world using their own immediate experience.	Human beings behave and respond to stimuli in predictable ways. Although perception may play some role in response, behavior remains lawful and rule governed and is a product of the world (and stimuli to which they are exposed).

positivism, which tries to distinguish causal relationships (Firestone 1987, Eigenbrode et al. 2007). To the subjectivist, any notion of a representative sample of individuals from a given group being used to provide an estimate of a view shared by individuals from which samples can be drawn is invalid. Rather than using, for example, a stratified sampling design, a subjectivist might opt for a snowball sampling technique, whereby interviewees are identified by previous interviewees as key individuals. The subjectivist would reject estimation hypothesis testing, and would use more qualitative methods (Table 1; Morgan and Smircich 1980).

The application of research strategies underpinned by subjectivism presents results in very different ways than those in the natural sciences. For example, qualitative textual analysis (analysis of transcripts and text to find common themes, etc.), and transcripts of local beliefs can all be counted as evidence by social scientists, depending on the study. The presentation of such information may be structured as quotes around which the subjectivist

researcher explains common themes, or in a table where the most common themes are presented. In relation to the example of the KNP, a subjectivist might use qualitative research methods (e.g., interviews). This gives an interviewer the flexibility to follow up on new ideas, probe questions, and investigate motives and feelings related to conservation and tourism benefit. Such an approach would be inductive, where prior knowledge of the important questions to ask is not assumed.

Perhaps the strongest argument for a subjectivist approach to conservation issues is the fact that conservation is concerned with human choices and actions and not just with mechanistically dependent relationships (Table 1). It is often impossible to identify a clear causal relationship between something such as benefits from tourism and individuals' conservation values because people form their opinions in very diverse ways.

In summary, philosophies of subjectivism and positivism differ in their perspective of what constitutes social reality (Table 1). Extreme

positivism is largely derived from a mechanistic idea that the human social world has a closed and predictable structure, whereas extreme subjectivism emphasizes an open structure of diverse subjective experiences, with research dependent on understanding how human beings shape their world internally (Table 1; Morgan and Smircich 1980, Gadamer 1993, Dyson and Brown 2006).

SOME PHILOSOPHIES UNDERPINNING SOCIAL RESEARCH

Researchers in the social sciences adopt a wide breadth of philosophical views (Table 2). The table provides a framework to help researchers (1) be explicit about the philosophies that guide their research; (2) identify how a differing philosophy influences the research process; and (3) identify what insights may be gained by taking a different approach to research. In order to illustrate the effect philosophy has, we apply this table as a framework to a case study (see below).

Reducing the different philosophies to the single dimension of extreme positivism and subjectivism does not fully explain the variety, or represent the full breadth of perspectives in the social science. It does, however, illustrate some of the major differences in the philosophies underpinning social research, including differences in what represents adequate knowledge, and different research strategies and methods used. It also highlights that advocates of a particular position may incorporate insights and methodologies from others (Morgan and Smircich 1980). The following sections explain the different philosophies outlined in Table 2.

A Continuum between Extreme Subjectivism and Extreme Positivism

Along the positivist–subjectivist continuum different philosophies have different worldviews, which lead to changes in both methodology used and beliefs in the degree to which social phenomena can be generalized or are context specific (Table 2). Moving from extreme positivism to extreme subjectivism, the ontological view (understanding of the nature of the world) shifts from seeing the social world as a concrete structure toward the view that the social world is more a concrete process.

Structural Realism

Like positivism, structural realism believes scientific theories offer true descriptions of the structure of reality, but conceives that the social world is a process that changes throughout time (Table 2; Chakravarrty 2004). A structural realist may incorporate qualitative data collection into their methodology in order to more fully understand a process of change. For example, a structural realist investigating optimization of a wildlife management program will describe the structure of its management in quantitative terms, such as the number of tiers of management and their inter-relations, how managed species interact with each other and their environment. The researcher will also incorporate insights from qualitative research into the influence of personality, behavior, and interactions of the people within that structure on the success of the management.

Critical Realism

This view alters the core ontological assumption to incorporate the role of human perception of reality. That is, like structural realism and positivism, there are objectively knowable, mind-independent realities, but the influence of human perception and cognition in shaping that reality is acknowledged (Table 2; Yeung 1997). The natural world is viewed as a range of heterogeneous systems, each with their own distinct mechanisms. The combined effect of these systems means that the outcome of an intervention is not predictable, but mechanisms that produce tendencies can be researched (Houston 2001). For example, the uptake of monetary incentives for keeping wetland in fields cannot be based only on objective arguments, but must also include the farmer's sense of what it means to be a good farmer. A critical realist, therefore, approaches research to identify and analyze psychological and societal systems that may cause these unpredictable tendencies (Bhasker 1989, Houston 2001). A methodological approach involving qualitative data may be used in conjunction with quantitative data allowing insights from human perception.

Transcendental Realism

Transcendental realism can be thought of as a bridge between extreme positivist and subjectivist views of the social world. This position recognizes the limitations of the human mind in understanding an

Table 2. Some of the many different philosophies that underpin social research, presented along a positivist–subjectivist continuum. The table demonstrates how the philosophies influence research strategies and methodologies, etc. (based on Crockett 1950, Brandt 1957, Feyerabend 1962, 1981a, 1981b, Husserl 1962, 1965, Marcuse 1965, Ricoeur 1978a, 1978b, 1978c, Sneed 1982, Burgess 1983, Brown 1987, 1998, Bourdieu 1991, Eger 1993, 1997, Yeung 1997, Moran 2000, Hellman 2001, Chakravartty 2004, Mayer 2006, and on extensive discussion with 12 researchers from different social science backgrounds at Aberdeen and Aberystwyth University).

	Positivist Approaches to Social Science				Subjectivist approaches to Social Science		
Philosophy	Extreme Positivism	Structural Realism	Critical Realism	Transcendental Realism	Hermeneutics	Nominalism	Extreme Subjectivism
Core Ontological Assumption	Reality as a concrete structure	Reality as a concrete process	Reality as an interplay between a concrete structure and influenced by perception	Reality is both a projection of human imagination and a concrete structure.	Reality as a social construction	Reality as a realm of symbolic exchange	Reality as a projection of human imagination
Methodological Criteria	External Validity, Researcher led, Quantitative, Empirical	External and Internal Validity, Researcher/participant led, Quantitative and Qualitative, Empirical	External and Internal Validity, Researcher/participant led, Quantitative and Qualitative, Theoretical and empirical	External and Internal Validity, Researcher/participant led, Quantitative and Qualitative, Theoretical and empirical	Internal Validity, Participant led, Qualitative, Theoretical and empirical	Internal Validity, Participant led, Qualitative and Quantitative, Theoretical and empirical	Internal Validity, Participant led, Qualitative, Theoretical and empirical
Types of Questions	Demographic and project related	Demographic and project related to structure of reality	Demographic and project related, acknowledging human perception of reality	Demographic and project related to human understanding of reality	Study of participant behavior	Participant response related to understanding of words	Participant response related to project
Research Strategy	Experiments, Surveys, Action research, Case studies	Ethnography, Case studies, Grounded theory	Survey Ethnography, Case studies, Grounded theory	Experiments, Ethnography, Case studies, Grounded theory	Documents, Speeches, Stories, Ceremonies, Advertising,	Ethnography, Case studies, Grounded theory	Ethnography, Case studies, Grounded theory
Method of data collection	Questionnaires, observation	Interactive interviews, Questionnaires	Interactive interviews, Questionnaires, which may use qualitative questions	Interactive interviews, Questionnaires	Structural semiotics, Discourse analysis, Psychoanalytic criticism, Interviewing, Ethnographic techniques	Interviews, Participant observation	Interviews, participant observation
Type of Analysis	Statistical methods	Statistical methods	Statistical methods	Statistical methods, Inferential statistical analysis phenomenological analysis	Dialectical process involving three "moments:": Social historical analysis, Formal analysis, Interpretation–Reinterpretation	Content analysis, Thematic analysis, Discourse analysis, Interpretive phenomenological analysis	Content analysis, Thematic analysis, Discourse analysis, Interpretive phenomenological analysis

(con'd)

| Potential Inter-pretation | Generalization, inductive and deductively valid arguments Hypothetico-deducto mode | Generalization, although does not allow contingent gen-eralizations to be treated as necessary causal mechanism, Hypothetico-deducto mode | Abstraction and retroduction, Generalization, although does not allow contingent gen-eralizations to be treated as necessary causal mechanisms. Hypothetico-deducto mode | Process of retroduction, a posteri reasoning, use of analogies, Generalization, although does not allow contingent gen-eralizations to be treated as necessary causal mechanisms | No Generaliz-ation | No Generaliz-ation as there can be no universal truth | No Generalization |

objective reality, and takes into account the degree to which reality is a projection of the imagination (Parsons 1999). Recognizing the ideas of critical realism, the transcendental realist works to understand why, in an experiment, A will give rise to result B, whereas in reality, A may give rise to B, C, D, etc. For example, a modeling exercise may predict a simple causal relationship between field verge width and field vole (*Microtus agrestis*) abundance. But, in reality, there are many differing interactions that impact on field vole abundance, including social factors, such as farmers' attitudes and conservation values. This leads the transcendental realist to a belief that social systems are open systems that do not follow the same lawful regularities that natural systems do (Viskovatoff 2002). Therefore, the researcher studies the cause of individual social actors' behavior. Because of this, both qualitative and quantitative data are used to get a full picture of social phenomena. Whereas critical realism recognizes that differences exist between experiments and real life, the transcendental realist actively seeks to understand why this may be the case.

Hermeneutics

The Hermeneutics philosophical view represents a shift along the continuum increasingly toward the view that there are limits to being able to discern a "real" social world. Hermeneutics views the social world as a concept that is socially constructed. Therefore, research based on a hermeneutics approach focuses on understanding human behavior in order to give insight into the processes by which a person's view of the social world is constructed. For example, Agrawal's (1999) work on the interpretation of the term "community" in resource management used a hermeneutic approach. The conceptual origins of the term "community" were explored by looking at the different ways the term had been used in texts. Aspects of the term "community" seen as most important to advocates for resource management in those texts were then researched. Through understanding human behavior using qualitative methods, the researcher aims to assess how reality is constructed for certain individuals or social groups.

Nominalism

Here, the social world is investigated as a realm of symbolic discourse, incorporating various types of communication where the meaning of spoken or written language may be descriptive or symbolic. Research focuses on understanding the nature and patterning of the symbols that humans use to work their way through their perception of reality (Crockett 1950). In this view, ideas represented by words do not have any existence beyond a person's imagination (Brandt 1957). For example, in a nominalist-based study, numerous different responses were given when participants were asked about the meaning of the term "biodiversity," including one participant who thought it was a type of washing powder (Department for Environment Food and Rural Affairs (DEFRA) 2003). Therefore, there is a variety of perceptions of a single term, and even those sharing the same general understanding had different specific interpretations. Because of this variety, the term "biodiversity" has no absolute real existence, its meaning is relative and specific to the immediate context and situation from which it is generated. Through nominalism, researchers aim to understand peoples' individual concepts of terms or other symbols, such as a cup of coffee, or a red rose, in order to construct a certain social group perception of reality.

Extreme Subjectivism

Altering the core ontological assumption from reality as a realm of symbolic exchange, extreme subjectivism views the reality as a projection of human imagination. This means that unlike nominalism, where there is a focus on the names given to certain objects in reality, the extreme subjectivist believes all reality is subjective and different for each individual. For example, when investigating conservation values within a specific social group, a subjectivist researcher would carry out open interviews allowing the interviewee to express their own values in their own way. The researcher would then look for common themes among those interviewed to gain an impression of the conservation values of the group. Interviewees may be selected using a snowballing method allowing each interviewee to identify other potentially important interviewees. The results of such research would identify common themes, for example, in what the major problems are in a project, allowing management to either act immediately to solve these problems or carry out further research.

Implications of the Different Philosophies for Understanding Social Processes: a Case Study of the Cairngorms Water Vole Conservation (CWVC) Project

Background to the research

In order to illustrate the influence that different philosophies can have on research, we use the CWVC Project as a case study. The project aims to facilitate sustained removal of American mink (*Neovison vison*) in the Cairngorms National Park through an adaptive co-management approach involving participation by volunteers.

The CWVC Project (http://www.watervolescotland. org) is an example of a modern conservation problem: that of controlling an introduced predator on an inland site that is protected by legislation. Control and eradication of introduced predators known to impact negatively on native fauna is an urgent, contentious, and emotive modern conservation issue (Czech and Krausman 1997, Aars et al. 2001, Manchester and Bullock 2000). Throughout Europe, American mink have negative effects on a range of native fauna, including European mink (*Mustela lutreola*) (Maran and Henttonen 1995), coot (*Fulica atra*), and moorhen (*Gallinula chloropus*) (Ferreras and Macdonald

1999), various colonial nesting sea birds (Craik 1997), and the water vole (Macdonald et al. 2006).

Within the UK, American mink have had a catastrophic effect on water vole populations, and have been largely recognized as reducing water vole populations by 88% since 1989 (Strachan et al. 2000). In recent decades, this trend has accelerated, and the water vole is currently the UK's most rapidly declining mammal. As a result, the species is a priority under the UK Biodiversity Action Plan and has partial protection under 1998 amendments to the Wildlife and Countryside Act (1981). In areas where residual water vole populations exist, their numbers are low and there is evidence of increased extinction rate in the vicinity of mink, with a possibility of the extinction of water voles in the UK (Aars et al. 2001). Due to their widespread invasion and the associated high costs of control, nation-wide elimination of American mink is unlikely to be feasible (Manchester and Bullock 2000).

Within the UK, the Cairngorms National Park still holds substantial water vole populations within a defensible area because of the large number of stakeholders with economic interest in mink control. Thus, the principal objective of the CWVC project is to secure the Cairngorms National Park as a key water vole area within the UK, through community-led mink monitoring. The project makes use of floating rafts (Reynolds et al. 2004) to monitor mink populations and target trapping efforts to the areas where mink are known to be present, making the prospect of large-scale eradication of the mink across the park and in its wider surrounding areas realistic.

This adaptive co-managed project is one of the largest water vole conservation projects to be undertaken in the UK. The project has 3 years of funding and a number of disparate stakeholders. Current management involves a steering group with members including representatives of Aberdeen University, Scottish Natural Heritage (a government body), and the Cairngorms National Park, which have contributed either funding or time to the management of the project. The management group consists of three full-time water vole officers and three university researchers who also attend the steering group. Water vole officers coordinate and encourage mink monitoring by volunteer participants and are in charge of mink control in different areas of the park. The volunteer group consists of gamekeepers, fishing managers, farmers, and members of the local public who

monitor the GCWT mink rafts for footprints and either report mink presence to the water vole officer of their area or to another volunteer qualified to trap and dispatch mink humanely. Some volunteers remove mink themselves.

The Importance of Understanding Volunteer Motivation

Resolving human–wildlife conflicts successfully requires participation of local communities and other stakeholder groups in formulating management decisions, and potential solutions are only likely to succeed if they are acceptable to those continuing to work on the ground (Orr 2002, Olsson et al. 2004, Redpath et al. 2004). As part of its series of experiments to guide the adaptive management approach, the CWVC project investigates a number of both social and biological key issues simultaneously. A key social question for the project is, therefore, "what motivates volunteers to participate?"

Analyzing the Potential Impact of Taking Different Philosophical Perspectives

The CWVC project aims to research volunteer motivation and use the results to inform future management decisions. However, the way in which motivation is understood and the methodology used to study it will influence the potential outcomes of the research. The study used the framework in Table 2 to map out four different methodological possibilities for investigating motivation and the impact the approaches would have on management strategies. This aimed to provide a more targeted approach to researching volunteer motivation.

The potential effect of each philosophical view was mapped. The results were then discussed with six researchers and practitioners of the CWVC project and 12 social sciences researchers from Aberdeen University. The approach that best fit the needs of the project were chosen by the project managers.

RESULTS

The results of the mapping processes (Table 3) demonstrate that, although the ultimate aim of the research remains the same, taking different philosophical views affects the nature of the question, research strategies, and methodologies, and generated significantly different insights for management.

Positivist: Assessment of motivation with a positivist approach allows research questions to be answered quantitatively about specific aspects of the social world (Table 3). This allows the project to investigate if and how participant motivation is related to various social demographic factors, as well as allowing the project to combine ecological data with social data in order to understand if volunteer motivation is linked to ecological data, such as number of mink trapped or encounters of signs of mink. Use of empirical data allows larger numbers of participants to be questioned than could be possible using a qualitative approach. Researchers would be able to determine which types of volunteers contribute most to the program. It may, therefore, help guide the selection process of future volunteers and inform management as to what types of intervention by project officers would increase the retention of differing types of volunteer. The approach would not, however, provide insights as to why any observed differences may exist, possibly limiting the development of a more coherent understanding of volunteer motivation.

Transcendental: The transcendental realist approach allows managers to gain insights from feelings and emotions into what participants believe influences their motivation, providing both qualitative and quantitative data. A transcendental realist approach enables researchers to ask why motivation may be linked to ecological data—such as number of mink trapped or signs of mink—therefore, providing a more holistic approach to understanding of motivation, which can be used in the development of future workshops, focus groups, and motivational activities. Questionnaires incorporate questions that provide qualitative data as well as quantitative data, which may be usefully combined with ecological data to provide further information to guide the project. As such, it incorporates benefits from a positivist approach as well as from a more subjectivist approach.

Hermeneutic: In order to address the causes of any differences in motivation, a hermeneutic approach allows qualitative insight into participant behavior. This type of study into motivation would help the project to prepare specific interventions aimed at re-

Table 3. The influence of various philosophical assumptions on research into volunteer motivation within the Cairngorms Water Vole Conservation Project. Based on Table 2's framework.

	Positivism	Transcendental Realism	Hermeneutics	Subjectivism
Question	What Factors influence participant motivation?	What factors do participants understand as influencing their motivation?	What causes differences in motivational behavior between participants in the CWVC project	What factors influence participant motivation in the CWVC project
Research Strategy	Stratified survey of samples from categories of volunteers identified a priori	Ethnographic study involving key participants	Use of different kinds of documents, i.e., meeting minutes, emails, documents about project involvement, as well as past documents, which may help to understand previous projects and past information about participants	Ethnographic (a research strategy attempting to describe meanings and understandings of members of a culture in detail) study involving key participants identified by the study. There is no specific hypothesis
Method of data collection	Questionnaires	Questionnaires using qualitative and quantitative questions	Structural semiotics (the study of signs and texts and how they are represented and interpreted)	Interviews
Type of Analysis	Inferential statistics. Estimation and test of hypotheses	Phenomenological analysis (interviews are transcribed and key themes identified from frequency of appearance)	A dialectical process involving three "moments:": social historical analysis, formal analysis, interpretation–reinterpretation	Thematic analysis
Presentation Type	Graphs, Tables	Discussion	Discussion	Discussion
Potential Interpret-ation	Evidence that some types of participants are more likely to be retained (e.g., single volunteers vs. members of organized groups) or and identification of variables and interventions that increase this, (e.g., presence of otters, water voles/, mink)	Phenomenological analysis will gain insight into how individual participants understand what they are motivated by. The use of quantitative questions alongside this gives insights for the project management, but can also be generalized and provide guidance for other similar projects	Using the results of this hermeneutic approach, trends in behaviors, which may motivate participants in the project, are elucidated, including past project involvement, their family's historic involvement in the Cairngorms	The thematic analysis allows themes to be identified in the interviews as to participant motivation, thus giving insight into the participants' real motivations. This is of particular use to the management of the project
How is management guided by the results?	Management has knowledge on what type of volunteers are better retained that can be extrapolated to a large number of volunteers. Results can be combined with biological data	Management can incorporate insights given by volunteers as to what motivates them. Quantitative results can be combined with biological data to analyze if motivation is linked to mink encounter frequency	Management is able to identify differences in levels of motivation and provide a varied means of re-motivating volunteers. Data cannot be combined with ecological data as they are not quantitative	Results are specific to the project, allowing management to provide varied means of re-motivating volunteers. Data cannot be combined with ecological data as they are not quantitative

motivating participants, as well as providing insights that could guide future research into motivation. Although there are many different methods available in this approach, through use of document analysis, the project gains valuable insight from materials that are already present, i.e., meeting minutes, emails, etc.

Subjectivist: Finally, a subjectivist approach enables volunteers to verbalize any motivations for their involvement in the CWVC Project, possibly identifying motivational factors or themes not previously considered by the researcher. Use of this approach would limit the project to data from a small group of participants due to the amount of time each interview takes to transcribe and analyze.

Data that produced quantitative results (i.e., from a positivist or transcendental realist approach) can be combined with biological data. Although an approach following philosophies of hermeneutics and subjectivism does not give quantitative data, results gained can guide management trajectory and inform the design of future research, as well as providing insights into what people's motivations are, why they are in place, and why there is a difference in what people do. This provides a "snapshot" view of common themes expressed by key participants. A more subjectivist approach to research may help in setting up the focus groups, helping the project design re-motivational strategies, as well as helping management become more community led and sustainable. With any of the philosophical approaches, use of a face-to-face method for data gathering may benefit the project in achieving its goal of sustainability by having greater contact with the community and establishing links with community members who may be instrumental in the future of the CWVC project.

A final consensus was reached by the management group on a transcendental realist approach allowing the project to gather both quantitative and qualitative data. It was decided that a questionnaire with qualitative and quantitative questions would be designed following input from a focus group, and data gathered face to face. Although Tables 2 and 3 separate all approaches and their methodologies from one another, they are not exclusive and the CWVC project selected its approach from more than one, deciding to first use a subjectivist approach with a focus group in order to identify the main questions to be asked using a transcendental realist approach.

DISCUSSION

Implications of Using the Framework

The mapping process (Table 2) enables researchers to make explicit their own implicit assumptions, as well as giving insight into what the results of research would be if different approaches were used. Use of Table 2 as a framework to map Table 3 allowed the research strategy chosen to be well considered, and the most suitable one (at this time) to be identified. The process had four important implications through: (1) Assisting formulation of research questions; (2) Focusing dialogue between managers and researchers, which made underlying worldviews explicit; and (3) Helping researchers and managers improve longer-term strategies by helping identify overall goals and objectives, and by identifying immediate research needs.

Choosing a research strategy is clearly context dependent, and one strategy will not always work in every situation (Toulmin 1972). Yet, strategies of data collection are restricted due to different disciplines being informed by different philosophies, which shape the way research is carried out and what methodological choices are made (Petrie 1976). The approach taken by this paper was helpful in breaking down these restrictions, which is of particular importance in an adaptive co-management context (Olsson et al. 2004). The management of complex adaptive systems benefits from combining different knowledge systems (Olsson et al. 2004), and the use of a framework such as the one provided in this paper facilitates this. Use of the framework enables managers to assess the benefits of different knowledge systems and to be explicit about their underlying assumptions, ensuring their insights and the methodologies of other disciplines can be better combined. Furthermore, mapping and discussing the different philosophies was believed to reduce the risk of entering into unsustainable and undesirable management trajectories.

Broader Implications of Understanding Philosophy

When working with social phenomena, it is important for researchers to consider their underlying philosophy when planning research and how this influences the research they conduct and the results they achieve. Influential philosophies all have their own concepts of what constitutes theory,

evidence, knowledge, and how we understand the world, as well as what our values as researchers should or should not be. An understanding of how philosophy influences research highlights the need to consider the range of methodological possibilities available to improve flexibility and effectiveness in understanding and solving a conservation problem (Morgan and Smircich 1980, Roebuck and Phifer 1998, Lélé and Norgaard 2005, Dyson and Brown 2006, Eigenbrode et al. 2007).

The philosophical positions within research are not simple static positions and researchers should not rely on research traditions to select a research strategy, instead of selecting the most appropriate method. A fixed philosophical view of conservation when working with social sciences can do little to help sustainability. If a positivist approach dominates social–ecological research, research will mostly be limited to a quantitative approach, reducing methodological possibilities and limiting understanding of social phenomena driving conservation problems.

CONCLUSIONS

Developing effective understanding of the practice of conservation and adaptive co-management requires integration of the natural and social sciences. Yet much debate and criticism is generated through poor communication and misunderstanding of personal philosophical worldviews. When such views are made explicit, less effort is involved in conflict over methodological superiority and greater effort can be devoted to more basic issues (Morgan and Smircich 1980). Greater attention to sharing personal philosophy and its influence on beliefs about research strategies and practical management will improve the effectiveness, efficiency, and sustainability of conservation.

Responses to this article can be read online at:
http://www.ecologyandsociety.org/vol13/iss2/art52/responses/

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