

Constructing confidence: rational skepticism and systematic enquiry in local ecological knowledge research

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Abstract. Key attributes of the social research contributions on indigenous ecological knowledge (IEK), local ecological knowledge (LEK), and traditional ecological knowledge (TEK) are analyzed using the most frequently cited literature generated by the “ISI Web of Knowledge” and “Google Scholar” search engines. They are further exemplified by an examination of two contrasting approaches to the analysis of IEK/LEK/TEK. The results show that IEK/LEK/TEK is treated predominantly via definitions, and few articles examine concepts, research design, methods, or operational attributes. Consequently, there is no consensus on the content of IEK/LEK/TEK, the primary components of which await examination via focused research. These are fundamental issues, since IEK/LEK/TEK misrepresented by social research would probably deepen disempowerment of those it purports to champion. Research topics are suggested to address these issues.

Key words: indigenous/local/traditional ecological knowledge; rational skepticism; research design; research methodology.

INTRODUCTION

Basic problems characterize the key attributes of social research contributions to documenting, representing, and interpreting what is most commonly known as indigenous ecological knowledge (IEK), local ecological knowledge (LEK), or traditional ecological knowledge (TEK). These are the use of apparently unsophisticated theories or concepts that, combined with often undocumented and nonsystematic research designs and methodologies, result in either unwarranted or indefensible outcomes. Further, the acceptance as proven of often romantically idealized assertions, particularly within the present politically charged atmosphere, have compromised the potential of social research contributions to assist disempowered resource users. This has become so evident that IEK/LEK/TEK is frequently characterized as “sacred,” such that research-driven inspection of knowledge claims, and in particular philosophies regarding the validity of Western knowledge, are dismissed as disrespectful and dedicated to the furtherance of Western epistemologies.

From our perspective, the importance of documenting and understanding IEK/LEK/TEK is linked closely with the interrelated environmental, economic, social, and ethical issues of resource management based on Western science. Western science-based resource management has demonstrably not delivered environmentally and economically sustainable extraction. An alternative approach is required. In addition, resource

management based on Western science is ideologically and functionally aligned with corporate behavior that excludes a wide variety of “small” community natural resource users. This kind of research, which is fundamentally concerned with social justice, focuses on ecology-associated knowledge to legitimate alternative knowledges and practices, is widely considered to facilitate empowerment of marginal communities. The approach assumes that peoples having intimate relationships with “the natural world” develop rich understandings about natural resources and ecosystems. These might contain insights for sustainable resource use while, at the same time, buttressing the capacities and cultures of the peoples concerned (see Holm [2003] for an important analysis of these issues). However, as we demonstrate, there is no consensus on the content of IEK/LEK/TEK. This means it connotes different qualities for different researchers.

The atmosphere of political correctness enveloping the critical examination of IEK/LEK/TEK compels us to state unambiguously at the outset that we recognize and accept as a given the potential importance of IEK/LEK/TEK to designing alternative and more “people-oriented” approaches to resource management. We are not challenging that approach. Here we are criticizing the ways in which it is mostly researched, represented, and then served up to nonspecialist audiences, since we concur that “[r]eal power is political, economic, social power, and while it is crucially influenced by ideas, it will be so only if those ideas have some authority” (Williams 2002:9).

In a fairer world “ethical space” might be broad enough to accept as co-equals IEK/LEK/TEK and

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Western scientific methodologies and institutions if, indeed, their separation is not a false dichotomy (cf. Agrawal 1995). However, that time is not yet here. Neither will wishful thinking, academic protest, or the politically correct vilification of those who think differently make it so. On the contrary, these approaches are more likely to entrench the determined opposition diehards. Like it or not, until replaced at some future time, Western science is the dominant paradigm that sets the prevailing standard. So the fight for the co-equal treatment for indigenous and other nonmainstream cultures and their knowledge needs to be practical, and to demonstrate the validity of IEK/LEK/TEK in terms understandable to the dominant culture. Then the political process may be used to ensure that IEK/LEK/TEK is respected, and is incorporated into resource management designs.

That approach is brilliantly exemplified in the case of the New Zealand Maori and the return of their traditional fishing rights (Ruddle 1995), where systematically documented and validated LEK of resources and environments provided persuasive evidence of traditional property rights recognized by customary law. Based on a simple and culturally sensitive methodology in which Maori IEK/LEK/TEK was validated by Western fisheries biological research methods and from the historical records of early Western voyages of exploration and other such sources, the New Zealand Maori bodies of LEK and related practices were validated, and immediately accepted as legal evidence in the process of restoring usurped rights.

Further, there are serious risks with the acceptance of an "ethical space" that unconditionally accepts all-comers as co-equals. As Johannes (2003:121) noted: "Observing the resonance of ... environmental rhetoric among Westerners, some indigenous people have adopted it. And this has brought the inevitable temptation to use it to influence the outcomes of resource management or development initiatives. ..." Worse than mere naïveté is that, with its own taboos, Western social science is replete with intellectual dishonesty. In particular, Johannes condemned the taboo that "... prohibits many from acknowledging that there are traditional maladaptations in non-Western cultures ... (and) many anthropologists, for example, maintain the fiction that all cultural practices are beyond censure. ..." Such naïveté has led to severe and perhaps unanticipated problems in settings such as Pacific Island nations, where "... some island elites have been quick to exploit the cultural relativist stance ... [and] use this position not only to warn off outside critics but also to justify their exploitation to their own people" (Johannes 2003:121). Perhaps the final irony is that "... emboldened indigenous politicians who despoil their islands' natural resources tell critics "stay out of this. You don't understand our culture. These actions are in accord with our traditional customs" (Johannes 2003:123).

Surely respect for and the empowerment of participants engaged in research processes is achievable only through a transparent practice that addresses questions openly and honestly. To question knowledge claims and to posit systematic research as appropriate do not themselves express disrespect. Such expressions of rational skepticism do state that claims need to be examined through transparent and accountable means, to achieve confidence in their reliability. Without question, this becomes ever more urgent when such knowledge claims are posited as the basis for sustainable resource management and community/people empowerment. Although "truth" may be contested, there can be no question respecting the place of "truthfulness" within research processes and in the relating of outcomes. Confidence in the authority of research rests largely on presumptions that researchers are truthful (Williams 2002).

Opinions differ. Sillitoe (1998), among others, has argued that indigenous knowledge proffers considerable, even revolutionary, potential in terms of achieving sustainable resource management while affirming and strengthening resource dependent peoples and their cultures. Holm (2003), among others, argues that ecological knowledge is not completely or accurately represented when documented through the lens of Western science, and that the acts of "filtered" documentation and representation are guided by that which will legitimize IEK/LEK/TEK within the perspectives, practices, and interests of Western science, and its knowledge for management purposes. Holm continues that such practice will likely accomplish little other than further disempowerment and marginalization, and certainly cannot be said to capture or represent IEK/LEK/TEK in itself and of itself. Yet, Agrawal (1995), in a frequently cited paper, contends that the posited separation and conflicted dynamics of Western and "traditional" knowledge are essentially ridiculous and largely unhelpful, assuming *inter alia* research is concerned to better understand and improve the lives of the disadvantaged. These diverse perspectives also embody the conviction that the differences in Western science and IEK/LEK/TEK epistemologies are less an issue than the advantages of drawing on and reconciling shared attributes and strengths. After all, both these epistemologies are "empirical" in so far as they are driven basically by insights derived from confirmed observations and experiences.

Thus the clear abandonment of rational skepticism as the guiding philosophical and research framework fundamentally compromises both the potential for substantive social research contributions and, more importantly, the potential authority of IEK/LEK/TEK to drastically change local community empowerment and self-determination (Sillitoe 1998). This is the fundamental problem that concerns us here.

In this article we examine core ideas and arguments of social research contributions on IEK/LEK/TEK using

TABLE 1. Cited literature search results (articles).

Cited work	ISI Web of Knowledge		Google Scholar	
	No. citations	Rank	No. citations	Rank
Cited articles				
Berkes et al. (2000)	166	1	249	1
Berkes (2004)	78	2	120	3
Huntington (2000)	73	3	87	10
Olsson and Folke (2001)	52	4	100	5
Stevenson (1996)	47	5	67	14
Turner et al. (2000)	41	6	68	13
Usher (2000)	41	7	46	20
Davis and Wagner (2003)	34	8	45	21
Gadgil et al. (2000)	27	12	41	24
Huntington (1998)	31	9	41	25
Olsson et al. (2004)	not listed		91	8
Aswani and Hamilton (2004)	29	10	not listed	
Pierotti and Wildcat (2000)	28	11	39	45
Ferguson and Messier (1997)	26	14	40	44
Johannes et al. (2000)	not listed		79	11
Cited books				
Berkes (1999)	not listed		355	1
Berkes et al. (2003)	not listed		253	3
Berkes and Folke (1998)	not listed		120	5

Note: According to ISI Web of Knowledge (search date 8 August 2008) and Google Scholar (search date 16 January 2008).

the most frequently cited literature as generated by the ISI Web of Knowledge and Google Scholar search engines. There are two basic reasons for this. First, since citation signifies that research is regarded as meaningful and contributory, it follows that the most frequently cited papers are judged by the research community as important, and therefore the appropriate focus for analysis. Second, because the qualities of the most frequently cited research literature arguably exert disproportionate influence on the way the research community examines and represents IEK/LEK/TEK, they are the preferred and appropriate candidates for careful examination. Although we are aware of an unfortunate tendency to demonstrate “scholarship” by padding lists of references, and we realize, of course, this would artificially inflate citation counts, there is no reliable way of estimating the scope of the problem. Findings from the literature are exemplified by an examination of two contrasting approaches to the analysis of IEK/LEK/TEK.

We suggest several corrections for social research contributions to advance meaningfully and simultaneously the theory and application of IEK/LEK/TEK. Specifically, we argue the need to champion and exercise rational skepticism throughout the research process, especially if the intention is to generate and to advance evidence-based understandings. We do this because rational skepticism (also known as “scientific skepticism” or “skeptical inquiry”) employs critical thinking and inductive reasoning to query claims and theories that lack empirical evidence. This approach does not automatically reject unusual claims; rather, it simply requires a firm evidentiary basis prior to accepting an assertion as valid (cf. Kurtz et al. 1994).

ANALYSIS OF THE LITERATURE

Methodology and procedure

The research literature examined was selected through the citation evidence generated by the ISI Web of Knowledge (WOK; *available online*)⁴ and Google Scholar (GS; *available online*)⁵ search engines. Both were used to search titles, abstracts, and numbers of citations for the topic areas: local ecological knowledge, traditional ecological knowledge, indigenous ecological knowledge, fishers’ ecological knowledge, fishermen’s ecological knowledge, and local environmental knowledge. Although not exhaustive, we judged these terms to be those most commonly employed and so the most likely to capture the core literature as indicated by citation evidence (Table 1).

The initial WOK search was conducted on 12 December 2007, with verification searches on 17 January, 6 February, 26 May, and 8 August 2008. This identified 221 titles, which were then rank ordered through a WOK facility. The GS search was conducted on 16 January 2008, and identified 6344 titles. We initially intended this to be an independent check on the WOK results. All GS search results reporting at least two citations were entered into an Excel spreadsheet, yielding a total of 168 titles. These were then rank-ordered based on the citation evidence reported. The sizable difference in search results is explained largely by the WOK limiting searches to a field of 8700 “leading” research journals. In contrast, GS searches the key words through a much broader range of prospective sources, including books,

⁴ (<http://apps.isiknowledge.com/WOK>)

⁵ (<http://scholar.google.ca/schhp>)

edited collections, online material, class reading lists, and the like, in addition to research journals.

The top 25 cited papers published in research journals as identified through both the WOK and GS results were extracted and compared. Because only four of the top 10, and 11 of the top 25 titles were common to both results, we chose to focus our examination on the combined “top 10” of both the WOK and GS searches, a total of 15 research papers. Notably, three of the five most highly cited papers in the WOK and GS results were the same. In particular, the papers identified by the WOK engine are provided with a yearly citation rate profile. This profile shows a sustained and high rate of annual citation for the most frequently cited papers. Although invariably the most cited papers have been published for at least a number of years, their citation record is much more than simply an artifact of their date of publication. In addition, we have incorporated three selections of the most frequently cited books, edited books, or papers in edited collections, as derived from the GS search. The WOK database excludes books, monographs, and edited collections. We judged Shiva’s *Biopiracy: The Plunder of Nature and Knowledge* (1997), identified by the Google search as the second most cited work, as sufficiently off topic to be excluded from consideration.

We also created a database of the IEK/LEK/TEK research literature referenced by the top 20 cited papers, as identified through the WOK search. The cited research in three WOK papers ranked in the original top 20 was excluded, as these were concerned with either literature reviews for teaching purposes or highly specialized topics (e.g., fire ecology among Australian aboriginals). None of those three fell within the original top 10 of either the WOK or Google Scholar search results. In addition, items were excluded from the references entered into the database when they were obviously unique to particular empirical foci, e.g., government reports, biological surveys, and descriptions of biological species. In total, 485 references were derived from the WOK top ranked papers. Only 16.7% of these (81) are cited more than once, and only 5.4% (26) received three or more citations. As might be expected, many of the most frequently cited research papers are also found among the most referred to pieces in the WOK and GS lists, which include dollops of self-citation.

Initial observations on the databases created

Several patterns are immediately apparent in the referencing practices of the most cited papers. For instance, there is a clear distinction in practice between Berkes et al. (2000), Berkes (2004), Olsson and Folke (2001), and researchers whose work focuses empirically on the Inuit and Native Northern North Americas (Stevenson 1996, Ferguson and Messier 1997, Huntington 1998, 2000, Wenzel 1999, Turner et al. 2000, Usher 2000). The former rarely reference the latter, whereas the latter do reference the former, particularly Berkes (1993). Yet, of the former researchers at least Berkes has

published in *Arctic* (e.g., 1979, 1982), a major outlet for the latter group’s research. He has also published extensively on Arctic-related matters (e.g., Berkes and Jolly 2001, Riedlinger and Berkes 2001, Berkes et al. 2005). Berkes is even acknowledged in Stevenson (1996), yet does not cite the paper in any of the articles examined. This is curious, particularly since several of the *Arctic* pieces are unique in their substantive concern with issues of LEK/TEK/IEK research design, methodology, data collection, and epistemology. In addition, the former group tries to link with the common property research literature (e.g., McCay and Acheson 1987, Ostrom 1990), whereas the latter address a broader set of social research and indigenous knowledge associations and issues.

Even more notably, few among the most cited explicitly and comprehensively locate their research in any meaningful way with respect to the vast literature on ecologically linked knowledge, beliefs, and practices that have been documented over the last 70 years, mostly in anthropology and geography, and which closely examines the relationship of ways of living, material and technological attributes, and worldviews to their ecological or environmental and temporal contexts. It is as if this research literature has simply ceased to exist.

DEFINITIONS, CONCEPTS, AND RESEARCH: A BRIEF REVIEW OF THE KEY ISSUES

Whether a phenomenon deemed as part of “ecological knowledge” is presented as just an untested definition for later affirmation based on “field experiences,” or as a precise concept organized for testing through rigorous research, has fundamental implications for both its intellectual credibility and usefulness in application. Therefore, the way in which IEK/LEK/TEK is conceptualized or not in some of the most frequently cited research papers illuminates several of our concerns (cf. Table 2).

Definitions

IEK/LEK/TEK is most commonly presented via definition. This has several important implications. First, a definition attests to and presents as a description “... a statement of the exact meaning of a word or the nature or scope of something...” (The complete definition of “definition” is: “noun, 1. a statement of the exact meaning of a word or the nature or scope of something. 2. the action or process of defining. 3. the degree of distinctness in outline of an object or image” [Compact Oxford English Dictionary 2008; *available online*].)⁶ Second, a definition attributes to a term a commonly understood precise meaning. Since in definitional meanings attributes are ascribed basically as lists of characteristics, a phenomenon demonstrating such attributes is, a priori, the “something” being characterized. From this, and as evident in Table 2, it is generally agreed that a phenomenon is IEK/LEK/TEK when it

⁶ (http://www.askoxford.com/concise_oxd/definition?view=uk)

TABLE 2. Examples of indigenous ecological knowledge (IEK), local ecological knowledge (LEK), traditional ecological knowledge (TEK), and conceptualization from among the most commonly cited articles.

Cited work	IEK/LEK/TEK concept/definition
Berkes et al. (2000:1252)	"... a cumulative body of knowledge, practice, belief, evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one and another and with their environment."
Berkes (2004:627)	"... a cumulative body of knowledge, practice and belief, evolving by adaptive processes and handed down through generations by cultural transmission."
Huntington (2000:1270)	"... the knowledge and insights acquired through extensive observation of an area or a species. This may include knowledge passed down in an oral tradition, or shared among users of a resource."
Olsson and Folke (2001:87)	"... (LEK) is knowledge held by a specific group of people about their local ecosystems ... it concerns the interplay among organisms and between organisms and their environment. LEK may be a mix of scientific and practical knowledge; it is site specific and often involves a belief component. LEK differs from traditional ecological knowledge (TEK) in the sense of historical and cultural continuity of resource use."
Stevenson (1996:281)	"... TEK may be viewed as being composed of three interrelated components: 1) specific environmental knowledge, 2) knowledge of ecosystem relationships, and 3) a code of ethics governing appropriate human-environmental relationships."
Turner et al. (2000:1276)	"... TEKW [W = wisdom] ... general characteristics ... are characterized within three broad themes: practices and strategies for resource use and sustainability; philosophy or worldview; and communication and exchange of knowledge and information."
Usher (2000:185)	"... TEK refers specifically to all types of <i>knowledge about the environment</i> [emphasis in original] derived from the experiences and traditions of a particular group of people."
Huntington (1998:237–238)	"TEK is the system of experiential knowledge gained by continual observation and transmitted among members of a community. It is set in a framework that encompasses both ecology and the interactions of humans and their environment on physical and spiritual planes."
Olsson et al. (2004:76)	"Traditional ecological knowledge is an attribute of societies with historical continuity in resource use practice ... and is defined as a cumulative body of knowledge, practice, and belief, evolving by adaptive processes, and handed down through generations by cultural transmission, about the relationship of living being (including humans) with one another and with their environment ... Local ecological knowledge and practice is an attribute of more recently evolved resource management systems and refers to a cumulative body of knowledge applied and developed by actors in a local context. It consists of externally and internally generated knowledge about resource and ecosystem dynamics ..."
Johannes et al. (2000:265)	"... knowledge passed from generation to generation of fishers and influences the nature, timing and location of their fishing."
Ferguson and Messier (1997:18)	"... 'traditional ecological knowledge' denotes the insights that indigenous peoples, through their traditional methods, have gained about the interrelationships among animals, plants, and the physical environment."
Gadgil et al. (2000:1307)	"Folk knowledge is maintained, transmitted, and augmented almost entirely in the course of applying it in practice ... Folk ecological knowledge and wisdom are therefore highly sensitive to changing relationships between people and their ecological resource base ... folk knowledge and wisdom, with their detailed locality- and time-specific content, are of value in many contexts."

embodies a compendium of at least the following three key attributes: a people's (1) shared system of knowledge or other expression about the environment and ecosystem relationships that is (2) developed through direct experience within a specific physical setting, and (3) is transmitted between or among generations. Yet, not all characterizations listed in Table 2 either share or emphasize similarly all those qualities. For instance, Turner et al. (2000) link a notion of wisdom with IEK; Olsson and Folke (2001) link TEK with some idea of cultural continuity and distinguish this from LEK; Berkes et al. 2000 opine "adaptive processes" as the engine of development; whereas Huntington (2000) and Stevenson (1996) emphasize observations and experiences. In other words, IEK/LEK/TEK means different things to different people.

A key concern is the basis for claiming that IEK/LEK/TEK is constituted of those three attributes. On what basis are common understandings of such notions as "knowledge," "ecosystem," "direct experience," and "intergenerational transmission" to be simply taken for granted as self-evident components of a "system of knowledge"? Claims about the key attributes of IEK/LEK/TEK must be based on an extensive body of systematic research that has examined and confirmed such qualities of each attribute (see *Some essential requirements for research in LEK*).

Those are not self-evident attributes, but extremely complex social and cultural processes (e.g., Hirschfeld et al. 1982), which, if not accounted for through systematic research, run the risk of flawed understanding and misrepresentation. Depending on the kind and scale of such shortcomings, the peoples concerned would be

essentialized. This is a high point of intellectual indolence, since the philosophical doctrine of “essentialism” contends that things have an inherent set of characteristics that makes them what they are; the doctrine that essence precedes existence. Or worse, these people are further marginalized and disempowered when the object is to link “their knowledge” with direct responsibilities for resource management.

In summary, the definitional approach treats complex processes and phenomenon as self-evident and socio-culturally simple. They are not. Rather, they are appropriate and necessary foci for systematic research. The definitional approach misrepresents understanding and misdirects research attention away from the primary components of IEK/LEK/TEK, which mostly remain to be properly examined.

Concepts

Unlike the definitional approach, that based on concepts regards phenomena as abstract ideas, whose attributes arise from a particular and identifiable theoretical framework concerning the factors that organize human relationships and affect the human condition. (The complete definition of “concept” is: “noun, 1. an abstract idea. 2. an idea to help sell or publicize a commodity [Compact Oxford English Dictionary 2008; *available online*].”⁷ For instance, within the theory of cultural ecology in social anthropology and human geography, IEK/LEK/TEK *might be* conceptualized as a people’s shared system of knowledge or other expression about the environment and ecosystem relationships that is developed through direct experience within a specific physical setting and transmitted inter-generationally. From the theoretical perspective that in every distinct environmental, demographic, and technological context, culture, economics, and politics mediate the satisfaction of societal requirements, IEK/LEK/TEK might be regarded as that aspect of a culturally framed belief system most directly arising from and concerned with food production and other material needs. There is a venerable literature on this theoretical perspective (see e.g., Harris 1968, Vayda and McCay 1975, Orlove 1980, Little 1999). In this case, IEK/LEK/TEK would arise mostly from an assemblage of internal direct experiences in particular environments. This stands in contrast to an external approach based on the philosophical principles of Western scientific practice, which includes observer independence, replicable findings, and transparent research methodologies with standard units and categories. In other words, using the once familiar emic-etic perspectives of Harris (1968, 2001), the characterization of IEK/LEK/TEK corresponds closely with the “emic” (or “internal”) perspective; that is, the categories and conceptual schemes, rooted in a particular culture, and expressed through

peoples’ accounts, descriptions, and analyses of experiences, relationships, and understandings.

The critical point is that both perspectives are valid yet entirely different ways of understanding and explaining phenomena. They must not be conflated. Using research practices expressing external normative principles and procedures, the social researcher engages with the concepts internal to a specific society.

A conceptual rather than definitional approach to IEK/LEK/TEK that keeps the distinction clear, while fostering the documentation and study of understandings internal to a particular society cannot be simply assumed. We are acutely aware of the political freight associated with these issues, and much of the recent treatment of and interest in IEK/LEK/TEK, particularly the dialogue that characterizes IEK/LEK/TEK as an alternative epistemology to post-colonial and hegemonic epistemology embedded in and expressed by “Western science.” Indeed, it is likely the peoples represented in the IEK/LEK/TEK literature do not describe their understandings as “ecological knowledge.” As one informant reportedly observed, “Traditional knowledge? Never heard of it. I didn’t even know I had it. What’s the world thinking of it for . . . ?” (Stevenson 1996:280).

“Ecological knowledge” and similar ideas are a Western scientific construct that purports to represent and, most importantly, conceptualize perspectives and experiences that are mostly internal to a particular society. Therefore, the key elements of this Western construct should form the core subject of systematic study that would be realized in part through using the central ideas to enable reliable documentation, examination and comparative analyses. Treating IEK/LEK/TEK definitionally is inimical to theoretically driven and substantive social research.

Few of the most cited articles approach IEK/LEK/TEK conceptually (Table 3). Exceptions are those by Stevenson (1996), Olson and Folke (2001), Davis and Wagner (2003), Robbins (2000), and Aswani and Hamilton (2004). In these articles IEK/LEK/TEK is discussed as a dynamic phenomenon shaped in important ways through the interplay of such external factors as resource management, political processes, and the interests of socio-political-economic power with local-level experiences, interpretations, and understanding. Moreover, the local level is further complicated by its socio-political organization, social differentiations resulting from gender, ethnicity, and social class, among other factors, and by often complex and nuanced power relationships. The approach demonstrated by Stevenson (1996), Olson and Folke (2001), Davis and Wagner (2003), Robbins (2000), and Aswani and Hamilton (2004) accords with Nygren’s (1999) contention, in taking issue with both the prevailing dismissive Western science and the “noble savage” holistic wisdom approaches, that argues for the analysis of “...local knowledges as heterogeneous ways of knowing that emerge out of a multidimensional reality in which diverse

⁷ (http://www.askoxford.com/concise_oed/concept?view=uk)

TABLE 3. Research attribute summary of the most commonly cited articles specified by ISI Web of Science and Google Scholar.

Cited work	Theorizes and/or conceptualizes IEK/LEK/TEK (often definition)	Presents operationalized concepts for study/test	Research design and methodology discussed/described	Sampling procedure specified
Berkes et al. (2000)	yes	no: overview article	no: overview article	no: overview article
Berkes (2004)	yes	no: overview article	no: overview article	no: overview
Huntington (2000)	yes	not apparent	yes: overview of four methods	yes: peer recommend
Olsson and Folke (2001)	yes	not apparent	yes: survey/key informants/focus groups	yes: peer recommend/survey/focus group—association leaders
Stevenson (1996)	yes	not apparent	yes: doing rather than retelling and participatory action research (PAR)	yes: footnote led/controlled research
Turner et al. (2000)	yes	not apparent	general attributes re: ethnography and document research	no
Usher (2000)	yes	not apparent	yes: identify experts/variety of methods	yes: identify experts
Davis and Wagner (2003)	yes	yes	yes: mixed methods/identify experts	yes: identify experts
Robbins (2000)	yes	yes	yes: mixed methods	yes: stratified sample (selection method unspecified)
Aswani and Hamilton (2004)	no	not apparent	yes: participant observation + purposive sample interviewing + resource surveys	yes: recognized experts
Pierotti and Wildcat (2000)	yes	not apparent	no	no
Huntington (1998)	yes	not apparent	yes: village council permission—semi-structured interviewing	no (selection method unspecified)
Olsson et al. (2004)	yes: for both TEK and LEK, with distinctions	not apparent	no: overview	overview
Johannes et al. (2000)	yes (generally)	not apparent	no: overview	overview
Ferguson and Messier (1997)	yes	not apparent	yes: pre-tested interview protocol with map overlays	yes: peer (local advisors) recommended “experts”

cultural, environmental, economic, and socio-political factors intersect” (1999:282). These concerns are central to the more conceptual approaches noted above. Yet they are virtually absent when IEK/LEK/TEK is treated definitionally, as in Berkes, Colding and Folke 2000; Berkes 2004; and Olson, Folke and Berkes 2004.

Regardless of whether IEK/LEK/TEK is either simply defined or conceptualized, only Robbins (2000), Davis and Wagner (2003), and Usher (2000) of the 15 papers reviewed approach IEK/LEK/TEK as requiring much more than just confirmation. Usher asserts that TEK “... must be subject to verification and testing” (2000:188), while Robbins observes that the “... account that prevails as truth will narrate [control] ... [k]nowledge groups ... become knowledge communities and thereby, knowledge alliances” (2000:141). Both express

the critical understanding that all knowledge systems are dynamic within their cultural and political contexts wherein knowing and truth are variable, and frequently contested. These perspectives are not widely evident in the most commonly cited articles, yet they embody key attributes of rational skepticism, that essentially defines first principles in all scientific inquiry and social research. It might be argued that previous research, as evident in the literature, empirically and reliably has established the attributes of IEK/LEK/TEK. If so, it is not evident in the literature referenced within most of the articles we have examined.

Research

As in all research, social research requires that theoretically informed concepts about actual human

TABLE 3. Extended.

IEK/LEK/TEK tested/verified	IEK/LEK/TEK concept/theory modified and/or advanced
no: overview article	no
no: overview	no
no (documented)/yes (verified)	no
no (documented)/yes (verified)	yes: inputs from outside knowledge (science)/dynamic learning
no (documented)/no (verification)	yes: dynamic/inputs from outside/complementarily and contested knowledges/layers
no (documented)/no (verification)	no
yes (documented)/yes (in principle)	no
no/no	no
yes (documented)/yes (verified)	yes: relation of power/interest to the construction/representation of knowledge
no (previously documented)/yes (tested for verification)	yes: variation in knowledge systems as a result of differing local histories
no	no
no	no: confirmations
no	no
no	no
no	no

relations and the human condition be employed to enable systematic study. This requires researchers to document and measure phenomenon that are either conceptually predicted or attributed. That is, “[m]easurement turns abstractions (concepts) into reality” (Bernard 1994:31). So the extent to which any social research informs understanding of the human condition and contributes to predictive theoretical models rests on qualities that range from research methodology and sample selection, through the particular attributes of information gathering tools and procedures, to the specifics of the word selections, phrases and sentence constructions employed when asking questions and gathering information. As Bernard asserts “. . . the science that emerges from a strict operational approach to understanding [and testing conceptual definitions] is

much too powerful to water down with backtracking” (Bernard 1994:32). In contrast, unsystematic research designs and practices generate results of little or no use. Additionally, “[o]perational definitions permit scientists to talk to one another using the same language. They permit replication of research and the unlimited re-definition of concepts by refining of instruments. As operational definitions get better and better, our ability to test theory gets better, too” (Bernard 1994:32).

Although the operational attributes of social research are critical, the majority of the most cited IEK/LEK/TEK research articles neither describe nor discuss these characteristics of either their own primary research or that of others. Methodological issues and concerns are the primary focus of several papers (e.g., Stevenson 1996, Huntington 2000, Usher 2000), yet even these fail to describe how key concepts are operationalized. Of the 15 papers reviewed only two (Robbins 2000, Davis and Wagner 2003) directly address this.

Of deeper concern is that those papers positioned as research overviews rarely discuss research design, methods, and concept operationalization or testing (e.g., Berkes et al. 2000, Johannes et al. 2000, Pierotti and Wildcat 2000, Berkes 2004, Olsson et al. 2004). These include the papers with by far the most citations (Berkes et al. 2000, Berkes 2004). Framed essentially as reviews (as noted earlier, the literature review is extremely selective, largely ignoring the research and debates found in the numerous research papers published in such journals as *Arctic*) they devote little attention to IEK/LEK/TEK research design and methodological attributes. This is a problem because assessments of these attributes of research are arguably the first order of priority in determining whether research outcomes are meritorious, and their absence suggests that an author is more interested in winnowing the literature to confirm preferences and affirm prior conclusions, rather than in rigorous assessment of the research and its contributions. The absence of these qualities in the paper co-authored by Olsson and Folke (2001) is curious, since their well-cited empirical study demonstrates such careful attention to research design and methods that it exemplifies social research best practices.

As is clear from the foci within all of the most cited literature, IEK/LEK/TEK research claims to be centrally concerned with connecting research outcomes to empowering indigenous and local peoples, particularly with respect to resource management policy. Given these stated intentions, there should be no question that the attributes of the research establish that the data and outcomes are reliable, representative and comprehensive, particularly when used to make recommendations for resource management policy. Doing otherwise would not advance the interests of indigenous and local resource harvesters, and would likely expose them to increased risk and vulnerability. Rigorous assessment and comment on IEK/LEK/TEK research designs and methodological practices are essential to assuring that

research is assayed according to the highest standards of expected practice and data reliability. Notably, few of the papers reviewed, through their explicit focus on research design and methodological issues, acknowledge the importance of this (e.g., Stevenson 1996, Huntington 2000, Usher 2000, Davis and Wagner 2003).

In contrast, analysis of the most cited literature reveals that the elements comprising IEK/LEK/TEK concepts are rarely tested rigorously through research explicitly designed for this purpose (Table 3). At best, the research documents IEK/LEK/TEK through vaguely specified means, and in so doing verifies it. As a result, it rarely advances understanding of core concepts and theoretical frameworks, being little more than an exercise in affirmations and confirmations. The exceptions again are the work of Stevenson (1996), Olsson and Folke (2001), Robbins (2000), and Aswani and Hamilton (2004). As with Nygren (1999) and others, these researchers emphasize the need to understand the dynamic qualities of IEK/LEK/TEK and, in key aspects, the ways and means it is shaped by such externalities as state resource management.

ANALYSES SHORT-CIRCUITED: TWO APPROACHES TO IEK

Social researchers expressing concern about the quality, character, and interpretation of evidence associated with positions that champion the interests of dispossessed, disempowered and colonized peoples have been roundly criticized (e.g., Sahlins 1993, Ranco 2007). The recent debates on North American indigenous peoples' traditional knowledge, and its linkage with sustainable resource management provides an outstanding illustration of this (Dove 2006, Hames 2007).

In 1999, Shepard Krech III published *The Ecological Indian, Myth and History* (Krech 1999). He examined a variety of secondary information to ascertain "[t]o what degree does the image of the Ecological Indian faithfully reflect Native North American ideas through time [; and,] [t]o what extent have Native North Americans been ecologists or conservationists?" (1999:27). This book occasioned a maelstrom of passionate criticism. Just posing these questions was taken by many as a further expression of Western hegemony and colonization of Native Americans and their cultures. The notion that Native Americans aboriginally lived in harmony with the earth and that they possessed a very special knowledge of and respect for Nature's pulse has become sacrosanct. Consequently, research such as Krech's that adopts and expresses an intellectual posture of rational skepticism respecting such claims is condemned, both within and without the academy, as either blindingly naïve or blatantly racist (cf. Harkin and Lewis 2007, Ranco 2007).

Krech did not anticipate either the extent to which his research would be co-opted by opponents of Native American entitlements as 'proof' of indigenous peoples' rapaciousness and irresponsibility, or the tidal wave of invective-laced criticism from academics and activists (Krech 2007). He appears to have assumed that social

researchers have a responsibility to pose difficult questions, particularly with respect to received wisdom, and that claims of fact and knowledge should withstand the test of evidence. For *The Ecological Indian* Krech described his methodological approach as one of triangulating different kinds of evidence (archaeological, ethnohistorical, ethnographic, archival, biological, and documentary) to examine knowledge and verify claims of fact (Krech 2007:18). This is a standard research method employed to establish the reliability and efficacy of evidence. Nonetheless, questions should be and have been raised by experts in the field respecting the comprehensiveness of the sources Krech employed, his interpretations of those sources, and the extent to which triangulation was demonstrably employed (cf. Tanner 2001, Feit 2007).

Because Krech's approach is located centrally within the research traditions of Western social science, it was criticized by some as the embodiment of a colonizing and hegemonic Western philosophy of knowledge that strives to discredit all others, particularly those of indigenous peoples. Yet, his approach proceeds from an intellectual posture of rational skepticism, which posits that the most robust and reliable approach to understanding anything about the human condition is one that is systematic in examining evidence to dissect issues, as well as for "testing" claims of knowledge or fact. Rational skepticism, mobilized through systematic research designs and methodologies, is the essential intellectual orientation necessary for social research to provide useful and insightful understandings with potentials to actually inform and empower. The best practices in this research tradition examine the difficult questions and challenge received wisdom and preferred contentions. As such, they offer substantial prospects for understanding and knowledge. In contrast, research guided, at best, by naïvely expressed good intentions and explicit political agendas or, at worst, by vulgar careerist self-interest, will produce little other than affirmations of preferences and testimonials to intellectual fashion.

Coincidentally, also in 1999, Firket Berkes published *Sacred Ecology: Traditional Ecological Knowledge and Resource Management* (Berkes 1999). Berkes states that his objective is to explore "... the need for ecological insights from indigenous practices of resource use, and the need to develop a new ecological ethic in part by learning from the wisdom of traditional knowledge holders ... by treating traditional ecological knowledge as a knowledge-practice-belief complex" (1999:14). Unlike Krech, Berkes expresses no intention to engage a research enquiry to examine the qualities, efficacy and parameters of traditional ecological knowledge. These are treated as a standard or received wisdom. Rather, his approach assumes efficacy, which he then strives to verify and demonstrate, focusing on the linkage between traditional ecological knowledge and sustainable natural resource management. Berkes does this largely by providing a selective review of the research literature

combined with his own research observations among some of Canada's Northern Cree, all in a manner designed to confirm and affirm his original assumptions. Thus, Berkes's book exemplifies a championship that expresses little of the rational skepticism ordinarily expected to guide research-based approaches and analyses.

For instance, Berkes reviews different ideas about traditional ecological knowledge before settling on a preferred rendition. However, it is not apparent that he considered asking whether or how his preference is to be examined. The same can be said for his selection and treatment of the literature. To simply state that traditional ecological knowledge is "... a cumulative body of knowledge, practice and belief, evolving by adaptive processes and handed down through generations by cultural transmission" (1999:8) leaves us, from a research perspective, with little but a definition. Posing theories and concepts is necessary to the research enterprise; yet, in itself, is wholly insufficient. At some point the laborious, messy, and preference challenging work of actually examining the phenomenon and of 'testing' the ideas needs to be engaged, as does employing the results of research to inform and reformulate theories and related concepts. As noted earlier, in the language of standard social research, it is essential to "operationalize" theory-based concepts so that they may actually be examined with respect to the appropriate human setting or phenomenon. However, at no point in his treatment does Berkes examine the relationship between design, methods and outcomes of research.

To say the least, the empirical study of knowledge is challenging (Hirschfeld et al. 1982). From the outset, what counts as knowledge? All the subsets of questions that need to be posed to answer this involve different levels and units of analyses, with accompanying differences in concepts, research designs and methodologies. At best, Berkes employs the "covering all the bases" device of acknowledging such challenges, without ever substantively contributing to their study or resolution. The result is largely an exercise in affirmations and vacuous championship. Yet Berkes's book has been cited hundreds of times and been well received, whereas Krech's, a study explicitly demonstrating concern for evidence and systematic examination, is the target of severe criticism.

There are several additional concerns with the published approaches in social research to IEK/LEK/TEK. Perhaps the most important among them is idealizing IEK/LEK/TEK.

IDEALIZING IEK/LEK/TEK

There are considerable dangers and intellectual dishonesty implicit in uncritically accepting and romanticizing IEK/LEK/TEK. Johannes (1994) recognized this when he observed that uncritical appreciation can be almost as bad as none at all, and that overblown claims have provoked a backlash that plays into the hands of those who quickly recognize the powerful rhetorical tool that the notions of traditional resource management and

IEK/LEK/TEK provide; but, then often selectively use only those facts that accord with their case. An example is the conflating of an imputed sacredness with ecological wisdom (e.g., Durning 1992, Suzuki and Knudtson 1992, Berkes 1999), and such phrases and terms as "sacredness of ecological systems" or "sacred ecology" of indigenous peoples (Ruddle 2007).

Arguably, characterizing traditional ecological knowledge as expressing the "sacred" explicitly situates it in contrast, if not opposition, to the "profane," which can be studied through research driven by rational skepticism. While hopefully intended as little more than a catchy adjective, the word "sacred" associates qualities with traditional ecological knowledge that for some would situate the phenomenon beyond the scope of meaningful systematic study, especially if the intention is to demonstrate its effectiveness as a tool for such mundane "real world" purposes as resource management. Describing understandings as sacred, and part of a magico-religious worldview is one thing; subjecting them to research-based verification and tests of validity and reliability is entirely another exercise. Certainly any claim, as Berkes (1999) attests, that such culturally embedded beliefs and practices are an important, alternative and empowering basis for sustainable resource use and management must rest on a foundation provided by the aforementioned culturally embedded beliefs and practices. Otherwise, faith in beliefs and the assumption that belief translates directly into behavior are held as a sufficient basis on which to manage resource allocation and use. The absence of any effort to determine validity in these matters is a serious deficiency that deepens misunderstandings and disarms the capacity for meaningful social research.

As Harris reminds us, "[b]elieving a given proposition is a matter of believing that it faithfully represents some state of the world, and this fact yields some immediate insights into the standard by which our beliefs should function. In particular, it reveals why we cannot help but value evidence and demand that propositions about the world logically cohere" (2004:51). While the best of intentions may underscore the conduct and representation of social research, it is the character and quality of the evidence as determined by research design and the ways evidence is gathered and analyzed that enable us to advance understanding.

SOME ESSENTIAL REQUIREMENTS FOR RESEARCH IN LEK

Key concepts

There are many potential key concepts depending on the nature of the research being undertaken. However, two stand out, characterized by their universality. These are (1) the nature of knowledge and (2) the concept of "systems of knowledge."

The nature of knowledge.—From the outset, the nature of knowledge must be queried, since it can never be assumed automatically that all persons in even a culturally or socially homogeneous community reflect or

understand knowledge in common. Indeed, what is meant by such ideas as “commonly” and “shared,” and how should these be studied? Further, what is the relationship between individual knowledge as some amalgam of personal experiences, reflections, and social learning, and shared or collective knowledge? In what ways do individual experiences and reflections inform, augment, and change a knowledge system, and how do persons learn of it? What are the specific attributes of knowledge learned? Do we assume that a knowledge system is essentially closed; an entity unto itself? Or, do we treat it as open and dynamic? If so, in what ways do external processes contribute to and have an impact on it? How is this to be known if there are contested knowledges, and what social processes/relationships are engaged?

“Systems of knowledge.”—This term is used widely, as by us in the preceding paragraph. If for any given piece of research a system of knowledge is assumed, then it becomes essential to describe (1) the extent to which knowledge is shared and can be described as a “system”; (2) the manner in which direct individual or small group experiences create shared knowledge; (3) the conditions causing change in knowledge systems; (4) the functional characteristics of knowledge systems within their specific socioeconomic and cultural contexts; and (5) the ways shared knowledge systems are transmitted from one generation to the next.

Research design and methodology

The credibility of research on IEK/LEK/TEK is compromised by the use of nonsystematic research designs and practices, the apparent failure to operationalize key concepts for systematic study, and a failure to analyze even the most basic attributes and dynamics of social and economic differentiations and power relationships, both at the local level and between the local and external arenas. None of the oft-stated goals for documenting IEK/LEK/TEK, of engaging these as prospective sources for alternative and sustainable natural resource management strategies, and of advancing the social justice agenda of the disempowered and marginalized, are well served through social research practices and treatments that are elementally unaccountable. This is of paramount importance, because poorly designed and badly conducted research will not generate data that instills confidence and advances understanding. Rather, it will convey the impression that these are not really that important to the outcomes. Although all aspects of research design and operationalization of key concepts are important, measurement of phenomena and the selection of informants are critically so. Here we limit our discussion to the latter.

The selection of informants.—Poor information often results from choosing the wrong sources of information; therefore, the success of research and any resultant management design depends heavily on using the “right” research informants. For the practical purposes

of designing and managing resources, research should reveal three characteristics of a community’s local knowledge base: (1) the breadth of the knowledge, (2) the depth of the knowledge, and (3) the comparability of one community’s knowledge with the local knowledge of other communities.

Research is of little value if it is of poor quality, or if its results are suspect. In other words, good research must be able to unhesitatingly accept public scrutiny and respond convincingly to criticism. The results of any field research must be robust enough to withstand severe criticism from the general public, as well as from such specialized sectors as financial backers, vested interests, disappointed people left out of a potential project by the results of the research, one’s research peers, and “others,” including “elders” and “traditional elites.”

Deciding what comprises “local knowledge” is a critical subject that must be clearly understood before any field research (especially interviewing) begins. There are several fundamental considerations: (1) Not all persons in a community are the same in both the level and character of their local knowledge. (2) Defining the scope of local knowledge, i.e., how widely must statements, experience, etc., be shared by the members within a community before they can be regarded as “local knowledge?” For example, some knowledge might be held by a single, self-perceived “expert,” and not be shared by the community. So, in such a case, is the material to be regarded as “local knowledge” or just “anecdote?” (3) Knowledge and the vested interest on which it is based will vary among individuals in a community. So, what is the range of this knowing? Who knows what, and how exactly? And, when and how did they come to know? (4) Some items of what might be considered “local ecological knowledge” might have originated elsewhere. This last consideration is becoming especially important in a now globalized world with cell phones and rapid information exchange. In addition, the incorporation of the “external” into the “local” likely occurs just because all “local (including aboriginal) peoples” are incorporated into dominant social, political, and economic processes that compel “local” compliance with “external” values, rules, practices, and understandings. That means some parts of a supposedly “local knowledge” likely will be widely shared, and not at all unique to a particular community.

Before any study is *planned*, its *scope* needs to be specified. That means prior to actually selecting informants, a researcher must decide on what basis and how to identify such persons. Before making those two key decisions, the “knowledge domain” must be defined. That is, based on a lifetime of experience and observation, a person will specialize, say, in making fermented fish sauce. But (s)he will also know others things. So what is important? Which of those activities (domains) is of main or primary importance? And how important might the other things also be?

It is also fundamental to be aware that information is both time sensitive and time rich, from which it becomes important not only to “capture” an expert’s knowledge, but also changes within that knowledge over time. Further, it is necessary to relate those changes and developments to such changes as (1) local environment and resource availability, (2) social and economic change, (3) required compliance with external agents and power, and (4) other locally relevant factors.

The most efficacious way to identify expert informants is through *systematically gathered peer recommendations*, using a structured sampling technique to ask all local people in the fish sauce business, for example, whom they consider to be the persons who know most about making fish sauce. Depending on community size, a list of several or more persons will probably be named. These are rank-ordered, and face-to-face interviews conducted with them in terms of their rank order. “Local ecological knowledge” is a strange term, because it never really is just “local,” and the researcher must learn over roughly what size of geographical area so-called “local knowledge” is shared. If it is widespread, informants will be required within a group of villages.

Anything less than *a systematic methodology* for gathering local knowledge immediately raises important questions about the field data, particular on quality, accuracy, and legitimacy. They must all be of a high level to ensure successful research.

The procedure described in the preceding paragraph assures that those considered most knowledgeable within communities or a social group will be identified, and, hopefully, included within the group interviewed in depth. Equally important, it also ensures persons considered less knowledgeable will not be mistaken for local experts, and that local elites with vested interests will be screened out.

The role of the sacred

The absence of any effort to determine the validity of describing understandings as sacred and part of a magico-religious worldview is a serious deficiency in the research literature that deepens misunderstandings and disarms the capacity for meaningful social research. Certainly any claim, as Berkes (1999) attests, that such culturally embedded beliefs and practices are an important, alternative, and empowering basis for sustainable resource use and management must rest on a foundation provided by culturally embedded beliefs and practices. Otherwise, faith in beliefs and the assumption that belief translates directly into behavior are held as a sufficient basis on which to manage resource allocation and use. This latter posture is irrational and anti-research, and does no more than position indigenous magico-religious beliefs as a faith-based system in conflict with rational skepticism.

The unanalytical acceptance of idealized notions

Research often misrepresents IEK/LEK/TEK by a simplistic acceptance as proven of such idealized notions as “indigenous,” “community,” “beliefs,” “knowledge,” and “traditional.” This can be exemplified by the term “traditional.”

Given its various meanings and nuances, the term “traditional” is problematic, especially in legislative and policy contexts. Above all, it conveys a sense of time, such that something is traditional only if it has a *demonstrable* history of both long existence and of having been handed down through generations. As an extension of this temporal sense, “traditional” is often used to identify pre-modern cultures. This is confusing because different criteria are applied by mainstream and non-mainstream societies to resource use activities and associated behavior, which are regarded as routine cultural behavior by group members but as “traditional” by the larger society. In fisheries, for example, there is much confusion and conflation of the concept “traditional” with a fishery type, and usually with subsistence fishing. A binary opposition between “traditional” and “non-traditional” fisheries is illogical, because whether a fishery is “traditional” or not is quite independent of its type. Further, the use of the imprecise term “traditional,” as in “traditional management” and “traditional (ecological) knowledge,” has enabled proponents of Western management models to claim that if something is “traditional” ipso facto it is unsuited to modern conditions. In particular, it provides a perfectly tailored excuse for donors with different agendas, such as participatory democracy cloaked in a co-management design, to claim, for instance, that chiefly authority of “traditional management systems” is undemocratic and therefore antithetical to modernization. Further, some societies may see the term “traditional” as contemptuous or synonymous with “backward,” which might incline them to accept a Western management model as part of a development assistance package (Ruddle and Hickey 2008).

CONCLUSION

All research is fundamentally political; therefore, “arm’s length” postures are somewhat illusionary. Resource management and the empowerment of resource users, particularly when associated with subsistence harvesters and indigenous peoples, are inescapably and justifiably politically charged. Social research has a critical place and much to contribute in such contexts. But, the credibility and meaning of that contribution is wholly contingent on the qualities of the research and its purpose. Arguably, the mandated first task of the social researcher is to deliver research outcomes that provide reliable and meaningful insights and understandings, particularly where the interest is to attach research outcomes to such potentially life-shaping matters as the management of natural resources.

In particular, the exercise of rational skepticism requires an intellectual commitment to critical analysis, coupled with research designed and conducted to subject ideas and contentions systematically to the burden of rigorous proof. These are key elements to advancing knowledge and deepening understanding through research (cf. Grayling 2008*a, b*). Despite notable exceptions, much of the most cited IEK/LEK/TEK literature lacks even the notion of subjecting IEK/LEK/TEK claims to systematic examination. Skeptical study is so uncommon that much presented as “knowledge” amounts to little more than statements of either belief, faith, or preference.

However, to conduct such an exercise these days is daunting, when examining IEK/LEK/TEK claims for validity and reliability is assayed adamantly and very publicly as just an expression of Western scientific hegemony intended to discredit alternative, particularly indigenous, ways of knowing. Krech’s experience is not unique. For instance, Gilchrist et al. (2005) published a test of the reliability of Inuit LEK on duck migrations. A condemnatory response from Brook and McLachlan (2005) specified, among other hackneyed accusations, the limitations of science research and the resulting “truths,” and science research as a vehicle of Western hegemony and further disempowerment. Notably, they cite Berkes (2004) and Berkes et al. (2005) as the authoritative source on the appropriate foci for IEK/LEK/TEK research. This is not surprising, given that he has frequently assayed the meritorious qualities of “indigenous knowledge” relative to those of Western mechanistic, reductionist and positivist science (e.g., Berkes et al. 1998, Berkes 2004). For Brook and McLachlan (2005:3), research is advocacy; “[a] primary goal of any study that involves the application or collection of LEK should thus be to empower communities to contribute in meaningful ways and ensure the studies are of local benefit.” Further, they contend that “testing” IEK/LEK/TEK claims is fundamentally disrespectful of alternative ways of knowing and knowledge holders. A concern that research among indigenous peoples display respect is also noted by several among the most cited papers (e.g., Stevenson 1996, Ferguson and Messier 1997, Turner et al. 2000). For us, respect for participants is an elementary quality of the ethical conduct of research; one that is most directly expressed through honesty and sincerity, as well as assurances of transparency, accountability and inclusivity. In fact, such comportment embodies respect for participants through assuring the exercise of rational skepticism within research processes and the treatment of research outcomes. Our own experience reassures us that showing respect essentially requires researchers to represent truthfully and from the outset the characteristics, strengths, and limitations inherent in research. Examples from our research are reported in: Davis et al. (2004), Davis (2007), Ruddle and Chesterfield (1977), Anuchiracheeva et al. (2003), Khumsri et al. (2009). That “testing” claims of IEK/LEK/TEK is fundamentally

disrespectful of alternative ways of knowing and knowledge holders is yet another example of the “resurgent irrationalism” of our time. In contrast, scientific rationality, understood by us to embody rational skepticism as its first principle, fosters “. . . healthy skepticism that asks for good evidence and good argument, that applies critical scrutiny to propositions or claims, that suspends judgment while the evidence is pending, and accepts what the evidence says. . . , independently of prior wishes or partisan beliefs” (Grayling 2008*a*:55).

Social research can contribute much to portraying, understanding, and relating qualities of the human condition, and is uniquely positioned to contribute importantly to framing and understanding an approach to resource management that includes the knowledge, needs, and priorities of all who depend on “nature.” However, given the trends evident in the most cited literature, it is far from obvious that current social research is following a path to fulfill those important mandates.

Most of the other literature generally posits IEK/LEK/TEK as if exclusive unto itself and composed of several discrete elements (e.g., intergenerational transmission, experience and “ecological” understanding). Supporting documentation is, at best, based on unsystematic research. Thus, much of the research is unrepresentative and unreliable, producing data and outcomes that do not permit comparisons and generalizations. Consequently, it is ill suited for sustainable resource management policy recommendations.

Present standards of accountability and transparency need to be elevated, beginning with the requirement that researchers provide descriptions of research designs and methodologies sufficient to enable assessment of the reliability and representativeness of findings, and to facilitate comparison, generalization, and evidence-based conclusions. It is not unreasonable to expect that the research community engage in self-monitoring, and champion publicly transparent standards of practice, whereby it can be held accountable. Arguably, these standards embody core values and meanings associated with the normative understanding of the ethical conduct of research, and form key components of the basis for confidence in the conduct of and outcomes from social research. Deficiencies in these areas critically compromise its value and contributory merits.

It follows that the practitioners of IEK/LEK/TEK research must put their own house in order, lest they play into the hands of those who would pounce on ill-conceived and poorly executed research, using it as a tailor-made excuse to subvert or sabotage its application. Although, as demonstrated by our own publications, we are staunch advocates of the potential and role of IEK/LEK/TEK, nevertheless we question the direction in which some appear determined to take research. The implications of this direction need to be further explored. To this end we reaffirm the need for researchers to be

held accountable for knowledge claims: We suggest a number of important research topics, and we argue that research informed by rational skepticism is among the most basic and essential antecedents to research.

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