Training Manual on Incorporation of Traditional Knowledge into the Description and Identification of Areas Meeting the Scientific Criteria for Ecologically or Biologically Significant Areas (EBSAs)

INTRODUCTION

A Story About Knowledge

The Creator called the trickster, Nanaboozhoo, to his side and told Nanaboozhoo that one last creature was to be lowered to Earth by the Creator and that this last creature, the human being, would be given a special role as custodian or caretaker of creation. The Creator had decided to balance this responsibility, to instill humility, by making it difficult for human beings to come by knowledge for survival.

So Nanaboozhoo was charged with the task of finding a place to keep knowledge, to make knowledge difficult to come by, so that humans would remain humble in their custodial task. So Nanaboozhoo enlisted the help of all the animals. “Where should knowledge be kept?” Nanaboozhoo asked.

The mighty salmon said, “Let me take it on my back down the river to the one great ocean and hide it in the water’s depths. Human beings will not find knowledge there.”

Nanaboozhoo replied, “No, human beings are destined to explore the ocean depths, and they will too easily find knowledge there.”

The great bear cried, “Let me put knowledge on my back and carry it into the mountains. There I will hide it so that my younger brothers stay humble in their task.”

“No,” said Nanaboozhoo, “Human beings will surely travel to all the mountaintops and will too easily find knowledge.”

Even the powerful eagle, the Creator’s messenger, offered a solution: “Let me carry knowledge to the moon where I will hide it from the human beings according to the Creator’s plan.”

Nanaboozhoo shook his head, saying, “No, my friends. Human beings will one day even travel to the moon and will too easily find knowledge.”

All were silent, thinking, until the mole spoke up. Spending her life so close to the earth, without eyesight but with great vision, the mole said, “I know where you can keep knowledge so that it will be very difficult to find. Only the most courageous, curious and humble human being will thus find it if you keep knowledge here.”

Nanaboozhoo asked, “Where, my sister?”

“Put it inside them,” the mole replied. “Put it inside them.”

Quoted from the University of the Arctic training module (Module 4) on traditional knowledge. Written by Gord Bruyere and Einar Bergland. Online at uarctic.org/Module_4_4fU4I.pdf.file

The purpose of this training manual is to improve the participation of indigenous peoples and local communities in the process of describing areas meeting the CBD scientific criteria for ecologically or biologically significant marine areas (EBSAs) (annex I to decision IX/20) and to ensure that their knowledge is incorporated to the greatest extent possible, with their full and effective participation. The manual also provides information about how traditional knowledge can, through participatory methodologies, be integrated into the EBSA process.

The benefits that traditional knowledge (TK) can bring to environmental research, assessment, monitoring and management have long been recognized by both scientists and governments. Similarly, traditional knowledge can greatly benefit the EBSA description processes. As will be highlighted in this manual, traditional knowledge can provide observations of species, their biology and behaviour, as well as observations of conditions and trends in areas and populations. Traditional knowledge can provide information in its own right or validate and add value to existing scientific information. With its often more holistic approach, TK can also increase knowledge of environmental linkages and inform better management decisions in the future.

Since 2011, the Secretariat of the Convention on Biological Diversity (CBD) has been holding regional workshops to facilitate EBSA description, and relies on the best available scientific information to do so, pursuant to decisions X/29, XI/17, and XII/22. Traditional knowledge, where it exists, can significantly contribute to describing areas that meet EBSA criteria. While some experience exists, particularly on the national and regional levels, the application of traditional knowledge and involvement of indigenous peoples and local communities in the EBSA process has to date been limited.

Some of these limitations may have to do with the nature of the EBSA process, which is based on regional workshops, an approach that sometimes makes it challenging for indigenous peoples and local communities to contribute in a meaningful way. Other limitations have to do with the capacity of indigenous peoples to participate both in data collection and compilation, and in the workshops themselves. The scientific community may also not be familiar with traditional knowledge and does not know well how to work with it, and this poses another challenge that needs to be overcome. Challenges and ways to overcome them will be discussed in more detail in this manual.

In order to move forward, there is a need to learn from initial experiences of integration of traditional knowledge into the application of EBSA criteria, with full approval and involvement of holders of this knowledge, and to consider issues related to training and capacity-building. Because this is a topic that is, at its heart, one of intercultural learning, there are two main audiences for this manual: (i) indigenous peoples and local communities and the organizations that work with them, and (ii) scientists and policymakers.

The international mandate for this endeavour are specified in many CBD COP decisions. In consistency with CBD article 8 (j) and Aichi Biodiversity Target 18, together with decisions IX/20, X/29 and XI/17, COP called a need to ensure the full, effective and meaningful participation of indigenous and local communities and the integration of traditional knowledge into the EBSA description process. The International Labour Organisation Convention no. 169 (ILO C169) and the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) set up an overarching framework for participation of indigenous peoples, including the need for national consultation based on the principle of free, prior and informed consent (FPIC).

The full mandate from the CBD Conference of the Parties is presented in the box below.

Decisions of the CBD Conference of the Parties related to traditional knowledge and the EBSA process

In paragraph 19 of decision XI/17, the Conference of the Parties (COP) to the Convention on Biological Diversity requested that the Executive Secretary further refine the training manuals and modules relating to ecologically or biologically significant marine areas (EBSAs), as necessary, including further consultation with Parties and indigenous and local communities. In this paragraph, the COP also requested the development of training materials on the use of traditional knowledge.

In paragraph 23 of the same decision, the COP welcomed the report *Identifying specific elements for integrating the traditional, scientific, technical and technological knowledge of indigenous and local communities, and social and cultural criteria and other aspects for the application of scientific criteria for identification of ecologically or biologically significant marine areas (EBSAs) as well as the establishment and management of marine protected areas* (UNEP/CBD/SBSTTA/16/INF/10), noting that the best available scientific and technical knowledge, including relevant traditional knowledge, should be the basis for the description of areas that meet the criteria for EBSAs, that additional social and cultural information**,** developed with the full and effective participation of indigenous and local communities, may be relevant in any subsequent step of selecting conservation and management measures, and that indigenous and local communities should be included in this process, as appropriate, particularly in areas with human populations and pre-existing uses.

In paragraph 24 of the same decision, the COP invited Parties, other Governments, competent intergovernmental organizations, and relevant indigenous and local communities to consider the use of the guidance on integration of traditional knowledge in the report mentioned in paragraph 23 above, with the approval and involvement of the holders of such knowledge, where applicable, in any future description of areas that meet the criteria for EBSAs and for the development of conservation and management measures, and report on progress in this regard to the twelfth meeting of the Conference of the Parties to the Convention.

The above decisions adopted by the COP provide for incorporation of traditional knowledge, innovations and practices of indigenous peoples and local communities into the EBSA process, and for the need to effectively engage them in EBSA description and identification.

This manual contains learning material for both indigenous peoples and local communities and for scientists/policymakers. The context for the manual is recognition of, and respect for, differing culturally based perspectives, world views and ways of knowing. An openness to "two-way" learning between cultures is an important pre-condition for those using this manual.

This manual is related to the Training Manual for the Description of Ecologically or Biologically Significant Areas in Open Ocean Waters and Deep-Sea Habitats (see http://www.cbd.int/doc/meetings/mar/ebsaws-2014-01/other/ebsaws-2014-01-sbstta-16-inf-09-en.pdf). The above training manual provides the reader with in-depth information about the application of the EBSA criteria, and the various analytical methods that are available for each individual criterion, as well as for multiple criteria. The present training manual, focusing on traditional knowledge and EBSAs, can be used either independently or as part of a broader training course that includes both scientific approaches and those relating to traditional knowledge. Because the previous "scientific" manual already explains the EBSA criteria in detail, this manual will not attempt to do so. The criteria and the CBD EBSA description process are discussed briefly, but mainly from the perspective of involving indigenous peoples and local communities.

The training materials in this manual are expected to improve the meaningful participation of indigenous peoples and local communities, as well as the integration of their knowledge with their full consent, in the process of EBSA description. It is also expected to improve the understanding of scientists and policymakers about the nature of traditional knowledge, its ethical uses, the worldviews encompassing this knowledge, and how it can greatly improve EBSA description.

The specific learning objectives can be found in the box below.

LEARNING OBJECTIVES

After completing this training manual you will be able to:

- **Describe some of the challenges for indigenous and local community participation in the EBSA process, and possible ways to overcome these challenges**
- **Develop an understanding of the nature of traditional knowledge, its applications in the EBSA process, and some of the methods through which this can be achieved**
- **Consider ethical issues related to the application of traditional knowledge, and access available guidance on designing a research project working with indigenous peoples and local communities**
- **Plan how to facilitate the incorporation of traditional knowledge, and the full and effective participation of indigenous peoples and local communities in the EBSA process in your country.**

HOW TO USE THE TRAINING MATERIALS

As mentioned in the introduction, this training manual has two principal audiences: (i) indigenous peoples and local communities and organizations working with them, and (ii) scientists and policymakers. Each user group may find some sections of this manual more useful than others. **For indigenous and local community representatives,** sections relating to what EBSAs are (section 3) may be of particular interest. Section 4 relating to traditional knowledge may contain information that indigenous participants already know, but it is likely that comparison with science, topics related to ethical considerations and available tools will be of interest. Section 5 on integration of traditional knowledge into the EBSA process will also be of interest. **For scientists, managers and policymakers**, sections relating to traditional knowledge and working with communities (section 4) should be of primary interest.

MODULE 1: WHAT ARE ECOLOGICALLY OR BIOLOGICALLY SIGNIFICANT MARINE AREAS (EBSAs)?

Objectives of this module:

This module will briefly introduce the concept of EBSAs, including how EBSAs are described/identified by the CBD, how CBD facilitates the description of areas meeting the EBSA criteria, and how EBSAs differ from management measures. The module will also discuss the ways in which EBSAs are important to indigenous peoples and local communities and what benefits participation in the EBSA process might bring these communities. Challenges of participation will be discussed, and ways to overcome these challenges will be offered. The module will also address how scientists and policy-makers benefit from working with indigenous peoples and local communities, and from undertaking joint research integrating traditional knowledge and science.

We anticipate that this section will be useful for both indigenous peoples and local communities, and scientists/policy-makers.

This module consists of the following sections:

- **a. Introduction**
- **b. How does the CBD describe/identify EBSAs?**
- **c. Differences between the description/identification of EBSAs and management measures**
- **d. Why are EBSAs important for indigenous peoples and local communities?**
- **e. What are the challenges to effective participation of indigenous peoples and local communities in the application of the EBSA criteria?**
- **f. What do communities get out of the EBSA process?**
- **g. What do scientists get out of working with indigenous peoples and local communities?**

Learning objectives:

After going through this module, you will be able describe what EBSAs are and what CBD has done to date towards the description of areas meeting the EBSA criteria.. You will also gain insight into why the participation of indigenous peoples, local communities and scientists is important for describing areas meeting the EBSA criteria, and what challenges might stand in the way of effective collaboration.

Mori wa umi no koibito

A Japanese saying meaning "the forest is the sweetheart of the sea", highlighting how the well-being of one area is connected to that of another.

a. How does the CBD describe/identify EBSAs?

The EBSAs are special areas in the oceans that serve important purposes, in one way or another, to support the healthy functioning of the oceans and the many services that they provide. The oceans are increasingly threatened by various human activities, such as overfishing, destructive fishing practices, illegal, unreported and unregulated fishing activities, along with pollution, marine debris, transfer of invasive alien species, illegal dumping and the legacy of historical dumping, seabed mineral extraction and noise pollution. The combined impacts of these threats as well as the potential impacts of climate change and ocean acidification have placed thousands of species at risk of extinction, and have impaired the structure, function, productivity and resilience of marine ecosystems.

At the same time, the oceans are severely under-protected within global systems of protected areas, and ecosystem-based management is lacking. The EBSA process is an effort by CBD Parties to locate those areas that are significant ecologically or biologically, and that may become priorities for future management.

In 2008, the ninth meeting of the Conference of the Parties to the Convention on Biological Diversity (COP 9) adopted the following scientific criteria for identifying ecologically or biologically significant marine areas in need of protection in open-ocean waters and deep-sea habitats:

- Uniqueness or rarity
- Special importance for life history stages of species
- Importance for threatened, endangered or declining species and/or habitats
- Vulnerability, fragility, sensitivity, or slow recovery
- Biological productivity
- Biological diversity
- Naturalness

These criteria and their meaning will be discussed in more detail in Module 3.

In 2010, at their 10th meeting, the Conference of the Parties to the Convention on Biological Diversity requested the Executive Secretary to organize a series of regional workshops with a primary objective to facilitate the description of EBSAs through application of scientific criteria and other relevant compatible and complementary nationally and intergovernmentally agreed scientific criteria, as well as the scientific guidance for the application of EBSA criteria.

As of April 2016, 12 of these regional workshops have been held, and they have resulted in the description of a number of areas meeting the EBSA criteria. The map (www.cbd.int/ebsa) below shows areas meeting the EBSA criteria that have been considered by the Conference of the Parties at their 11th and 12th meetings.

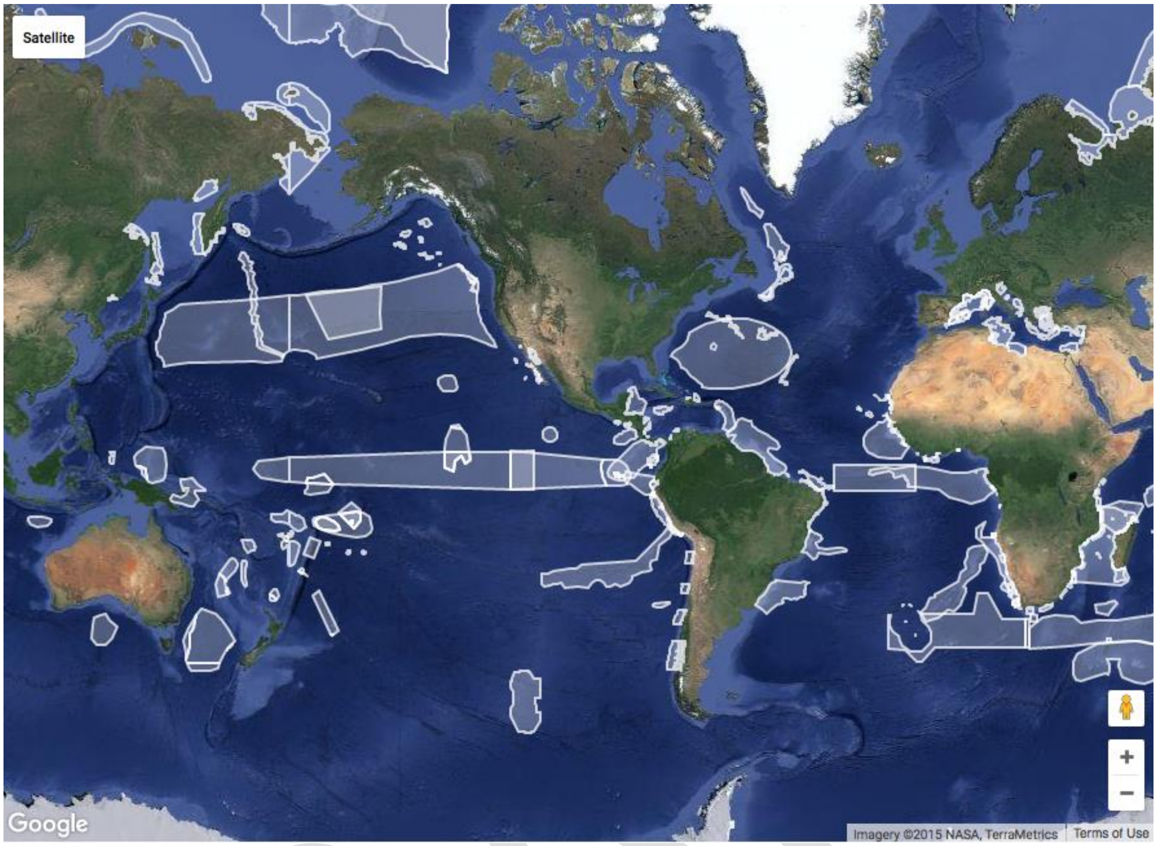


Figure 1: Areas meeting the EBSA criteria that have been considered by COP 11 and 12 (www.cbd.int/ebsa).

To date, workshops have taken place to consider the following 12 regions: Western South Pacific, Wider Caribbean and Western Mid-Atlantic, Southern Indian Ocean, Eastern Tropical and Temperate Pacific, North Pacific, South-Eastern Atlantic, Arctic, North-West Atlantic, the Mediterranean, North-East Indian Ocean, Northwest Indian Ocean, and the Seas of East Asia.

These workshops have been science-based and have been able to consider traditional knowledge in a limited manner, depending on the availability of relevant experts and information.

A training manual to facilitate capacity development with regard to the scientific description of areas meeting EBSA criteria was developed in 2012, and provides details about suggested scientific methodology. This manual is available online at https://www.cbd.int/ebsa/resources?tab=training-materials. The present manual relates to the use of traditional knowledge in EBSA description, and can be considered as a companion to the scientific training manual.

b. Differences between the description/identification of EBSAs and management measures

In 2010, COP 10 noted that the application of the EBSA criteria is a scientific and technical exercise, that areas found to meet the criteria may require enhanced conservation and management measures, and that this can be achieved through a variety of means, including marine protected areas and impact assessments. COP 10 also emphasizes that the identification of ecologically or biologically significant areas and the selection of conservation and management measures is a matter for States and competent intergovernmental organizations, in accordance with international law, including the United Nations Convention on the Law of the Seas.

c. Why are EBSAs important for indigenous peoples and local communities?

"The land is our life. Without the land we can't survive. It's as simple as that."
by George Smith, Cree-Metis Trapper

Areas that meet EBSA criteria, particularly on the coasts, are generally areas that indigenous peoples and local communities depend on for their livelihoods. EBSAs support a multitude of life, from the very small ocean creatures to the largest ones found on Earth. These are the areas where fish are found in profusion, or where they spawn and feed. Migratory marine mammals, turtles and seabirds that are important for communities for subsistence, cultural or spiritual reasons use these “special areas” to breed, give birth and feed. EBSAs can be places where the habitat supports a particularly rich variety of marine animals and plants, or where unusual species can be found. They can be coastal watersheds where fish travel to spawn, and from which young hatchlings head out to the sea.

EBSAs that are located far from the shore may not be directly used by indigenous peoples and local communities, but they are still important to them because of the intricate connections that exist between coastal and offshore systems. In the tropics, sea turtles that hatch on local beaches and fish that spawn around seagrass beds can travel far offshore into the deep sea in their adult lives. In the Arctic, ice edge ecosystems in offshore areas provide important feeding areas for fish that are utilized by indigenous peoples on the coast. Similarly, whales, seals and polar bears are important for indigenous peoples, and migrate between nearshore and offshore areas. In this way, these areas demonstrate that all things are connected.

To put it simply, most coastal areas that meet the EBSA criteria may not be only sources of livelihoods for indigenous peoples and local communities, but they can be places upon which they depend on their survival.

d. What are the challenges to effective participation of indigenous peoples and local communities in the application of the EBSA criteria?

There are several reasons why the participation of indigenous peoples and local communities in the EBSA description process has been challenging thus far. Some of those reasons are summarized in the bullet points below.

- **Providing for full and effective participation is time consuming**, and sufficient time will need to be scheduled for building relationships with communities, gaining prior informed consent, and collecting and applying traditional knowledge. This will make the EBSA data collection process longer, but the results will be worth it.

- **Many indigenous peoples and local communities have limited resources** for engaging in third party research projects or assessment work, providing traditional knowledge or traveling to workshops. Thus volunteering for such projects is often not feasible and additional resources will be required.

- **The use of traditional knowledge alongside science, is new to many scientists and decision-makers.** Thus, scientists and decision-makers may not trust the validity of traditional knowledge, nor know how to go about applying it in research projects or assessment work. In other cases, traditional knowledge is seen to be relevant only when adapted to the specialized narrative of science, and thus much contextual knowledge (including myths, practices, values and beliefs) may be discarded in favour of knowledge that can be "validated" using scientific criteria.

- **The territories and lands of indigenous peoples in many regions do not conform to national borders**. This is, for example, the case in the Arctic where both the territories of the Sami and the Inuit span several countries. This places a burden on the participation of indigenous peoples, who would have to attend several national preparatory EBSA meetings to provide inputs to a regional workshop. The national approach to EBSA nomination may thus lead to important information from indigenous communities being left out, and also has the potential of limiting the holistic consideration of migratory species that cross national borders. While participation in regional workshops could potentially remedy this problem, for some countries that would not include their national waters in the consideration by the regional EBSA workshops, the contribution of indigenous peoples from these countries can become very limited.
- **Communication barriers may arise from different languages and styles of expression.** Different cultures have different styles of communication, and some indigenous people may not, for example, feel comfortable in participating in a meeting format being organized by UN/international organizations. They may also not be comfortable communicating in English (or other United Nations language, depending on the workshop location), and translation of scientific and management concepts to indigenous languages is difficult, given that many words and concepts do not have equivalent words associated with them. The scientists and policymakers at EBSA meetings may also be unfamiliar with concepts of traditional cultures and worldviews when those are translated to them, and thus the messages may be lost on them.

From the list of challenges above, it becomes clear that simply inviting indigenous peoples and local communities to participate in an EBSA workshop is not enough to achieve integration of traditional knowledge. This goal will require that those compiling information related to the application of the EBSA criteria actively arrange opportunities for meaningful participation by indigenous people and local communities both at the national and regional level. Capacity-building and resources will also be required for communities to undertake the work required to collect and document traditional knowledge. And finally, capacity- and awareness-building for scientists and policymakers is also required if they are to fully appreciate the importance of traditional knowledge.

Module 3 of this manual will address some of the ways in which challenges can be overcome, and are intended to be used as capacity-building materials towards this end.

e. What do communities get out of the EBSA process?

While there are many challenges to overcome, there are also substantial benefits that can be gained by indigenous peoples and local communities through their participation in the EBSA process. But it is not only communities that stand to benefit. In the end, scientists and policymakers, as well as the entire EBSA description process will benefit from the effort.

For communities, the benefits include strengthening knowledge through its use, community self-reliance and empowerment, and intergenerational transmission of knowledge.

In summary, benefits for communities include some of the following:

- **Communities have the possibility of gaining international recognition for a resource/area that they depend on**, drawing attention to the need to maintain its long-term health and resilience. Participation in the EBSA process may provide recognition for place that supports a community culturally and economically, and that is important for conservation and sustainable use of marine and coastal biodiversity;

- **In an increasingly global world, no one is an island**. Neither can a community be isolated from the changing world around it. While traditional knowledge is specific to one location, collaboration with scientists on a national, regional and international level will provide the means for understanding and addressing larger spatial scale issues. For example, collaboration with scientists can provide the community information about the entire range of habitats used by a migratory species of importance.

- **Participation in the EBSA process provides communities a chance to define what EBSAs mean from a local perspective**. This will provide communities a chance to incorporate a bottom-up component into a global process.

- **EBSA workshops may serve as a catalyst for communities to collect and document their own information and traditional knowledge** in a form that retains their ownership of this information. Having this information in a more accessible format may help in its transfer to the next generation.

- **Preserving traditional knowledge also contributes to the cultural and social goals of self-reliance,** including the ability to support traditional lifestyles by creating strong, ongoing appreciation within the community of its history and its roots. For indigenous peoples, the best means to protect traditional knowledge may be to ensure its continuity as a dynamic, evolving system reflecting the lives of the community.

- **Communities gain access to new scientific data** that may assist them in making management decisions in the future.

- **Collaboration with scientists may help traditional knowledge evolve, innovate and adapt to new ecological challenges**. Adaptation to ecological change by capturing the best of science and TK is likely to become an important component of ecological and social resilience of coastal communities.

The case study below provides a description of the benefits of participating in a biodiversity assessment process in the words of a fisher from Kerala, India.

Interview with traditional fisher Robert Panipilla from Kerala, India, about his involvement in the preparing a register of marine biodiversity.

What was your experience in preparing a biodiversity register of the marine environment of part of Thiruvananthapuram District?

For me, the work was not something totally new, but more or less a continuation of my longstanding involvement with fishers and fishing communities. Documenting the traditional knowledge of our small-scale fishers is a passion for me. I also realize that it may not be possible to do this a few years from now, as the situation on the ground is changing very quickly and we are in a transitional period. That is why I have been spending time, for a few years now, documenting the traditional knowledge and skills of our fishers. Hence, when Protsahan[1] and

[1] a community-based research initiative

KSBB[2] asked me to prepare a biodiversity register as a pilot programme, I was really happy and jumped at the opportunity.

In the vast and complex world of sea fishing there are several opportunities to observe new things and gain fresh insights. This particular study helped me to learn more about the importance of *tharapparukal* (hard floor seabed) for the productivity of our seas. Earlier, my focus was only on the rocky reefs and their characteristics. I believe there's still a lot more to learn about our sea and the life in it, and I'm convinced that one can do it only with the help and involvement of our traditional fishers.

In this particular study, my colleague was a girl from the fishing community, who is also a college student pursuing a degree course in biotechnology. I am very glad to report that her involvement in the study was an enriching experience for her too. She got an opportunity to present a paper on fishers' traditional knowledge at the National Biodiversity Congress held in Kerala. From an ordinary student, she soon became an exemplary product of the college, whose authorities conferred on her an award for 'innovative initiative'.

Excerpt from the full interview published in Samudra Issue No. 67. Online at http://www.icsf.net/en/samudra/article/EN/67-3987-The-Sea-Around-.html

f. What do scientists get out of working with indigenous peoples and local communities?

There are substantial benefits that scientists gain out of working with communities and traditional knowledge holders. While creating respectful relationships with communities and accessing and applying traditional knowledge take a substantial investment in time and resources, the resulting benefits include a better understanding through new information about the biology, ecology and species behaviour in a specific area, as well as improved knowledge about interlinked social-ecological systems.

In summary, benefits to scientists include some of the following:

- **Scientists gain access to new information that is locality-specific**, often from a much longer temporal scale than available scientific information. This may result in insights that are not possible from scientific knowledge alone.
- **When applied together, science and traditional knowledge can provide better understanding of cross-scale interactions and ecosystem dynamics**. Traditional knowledge has been repeatedly shown to extend our understanding of the spatial and temporal dynamics of biodiversity, including for individual species. In a world of rapid environmental change, TK holds essential lessons on how to cope with extreme situations.
- **Embracing a diversity of knowledge systems provides new understanding about interlinked social-ecological systems** and provides mechanisms for ensuring governance

[2] the Kerala State Biodiversity Board

for sustainable use of ecosystems. This type of understanding is essential to deal with new challenges in a rapidly evolving human-dominated world.

- **Traditional knowledge can provide a complementary perspective,** borne from long periods of shared observation and experimentation that are often lacking in conventional scientific knowledge.
- **Many places in the world lack scientific information, particularly from longer time scales.** Ignoring traditional knowledge would mean disregarding a vital source of information for environmental assessment, research and management.
- **Local and traditional knowledge are particularly necessary to enable assessments that are tailored to local understanding and needs**. Limiting the consideration of information for assessment and research to conventional science could also mean that science conducted in more developed countries (with larger scientific budgets) may dictate decision-making elsewhere. This situation is unlikely to serve local needs or be either politically acceptable or appropriate. There is often a mismatch between the needs of decision-makers and the conventional scientific knowledge available.

The case study below describes the discovery by one prominent scientist, Robert Johannes, of the usefulness and insights to science provided by traditional knowledge and management systems. This discovery was followed by extensive research on topics related to traditional knowledge of the marine environment in the Pacific.

Customary marine resources management in the Pacific Islands

Robert Johannes conducted groundbreaking work in the mid-1970s on indigenous knowledge in the small island developing States of the Pacific (Johannes, 1978). His overview of traditional marine conservation institutions and practices in Oceania led him to conclude that ‘almost every basic fisheries conservation measure devised in the West was in use in the tropical Pacific centuries ago’ (Johannes, 1978: 352). This iconoclastic contribution opened the way for decades of research into the knowledge of indigenous, artisanal and commercial fishers, and these data have offered science invaluable insights into ‘stock structure, inter-annual variability in stock abundance, migrations, the behaviour of larval/post-larval fish, currents and the nature of island wakes, nesting site fidelity in sea turtles, spawning aggregations and locations, local trends in abundance and local extinctions’ (Johannes and Neis, 2007: 41). Johannes’s own work with fishers in the archipelago of Palau led to the documentation of ‘the months and periods as well as the precise locations of spawning aggregations of some 55 species of fish that followed the moon as a cue for spawning’ (Berkes, 2012). This local knowledge more than doubled the number of fish species known to science that exhibit lunar spawning periodicity (Johannes, 1981).

Excerpt from Nakashima, D.J., Galloway McLean, K., Thulstrup, H.D., Ramos Castillo, A. and Rubis, J.T. 2012. Weathering Uncertainty: Traditional Knowledge for Climate Change Assessment and Adaptation. Paris, UNESCO, and Darwin, UNU, 120 pp. Online at http://www.unutki.org/downloads/File/Publications/Weathering-Uncertainty_FINAL_12-6-2012.pdf

Check for understanding:

You can check your understanding by answering the following questions, the answers for which can be found in the text above:

1. What are the scientific criteria for identifying EBSAs?
2. What are some of the advantages for indigenous peoples and local communities from participating in the process for describing areas meeting the EBSA criteria?
3. What challenges might they face in regards to participation?
4. What are some of the advantages for scientists of undertaking collaborative research with indigenous peoples and local communities, and integrating traditional knowledge and science?

MODULE 2: HOW TO WORK WITH COMMUNITIES, AND DOCUMENT AND APPLY TRADITIONAL KNOWLEDGE

Objectives of this module:

This module tackles the very broad topic of working with communities, and documenting and applying traditional knowledge. While much of the module will be dedicated to discussing the nature of traditional knowledge, how it differs from science, and its potential application to the description of EBSAs, there are also other issues to consider. Importantly, the chapter recognizes that gaining access to and using this knowledge must be done with respect for community rights and interests, and with awareness of the cultural context within which the knowledge is gathered, held, and communicated. To facilitate this, the module introduces issues such as Prior Informed Consent, and tools such as the Tkarihwaié:ri Code of Ethical Conduct to Ensure Respect for the Cultural and Intellectual Heritage of Indigenous and Local Communities Relevant to the Conservation and Sustainable Use of Biological Diversity[3].

The module also addresses the importance of putting data collection and ownership in the hands of communities, and provides some practical examples of this. Finally, methods for the co-production of knowledge will be discussed.

We anticipate that this section will be most useful for scientists/policy-makers, though some sections might also be relevant to indigenous peoples and local community organizations.

This module consists of the following sections:

- **a. What is traditional knowledge?**
- **b. Traditional knowledge and science**
- **c. How is traditional knowledge used together with science in research, monitoring and assessment?**
- **d. Traditional knowledge and sustainable management**
- **e. Issues related to collecting and documenting traditional knowledge**
- **f. Methodologies for documenting traditional knowledge**
- **g. Validation of traditional knowledge**
- **h. Putting data collection and ownership in the hands of communities**
- **i. Co-production of knowledge – indigenous and scientific collaboration and the creation of hybrid knowledge systems for science-policy assessment**

Learning objectives:

After going through this module, you will develop a better understanding of the nature of traditional knowledge, how it differs from science, and how it can be applied, either alone or together with science, for research, monitoring and assessment. You will also understand the importance of working closely together with communities, why issues related to

[3] https://www.cbd.int/traditional/code/ethicalconduct-brochure-en.pdf

ownership of knowledge are important, the need for Prior Informed Consent, available methodologies for documenting traditional knowledge, and how co-production of knowledge might work in practice.

'A'ohe pau ka 'ike i ka halau ho'okahi

A Native Hawaiian proverb (Translation: All knowledge is not taught in the same school)

a. What is traditional knowledge?

There is no universally accepted definition of traditional knowledge, nor does the CBD attempt to define it in simple terms. In fact, there are a variety of definitions, arising from slightly different perspectives or purposes, and terminology including "traditional knowledge", "traditional ecological knowledge", "traditional knowledge and wisdom", "local and traditional knowledge", and "indigenous knowledge". Various combinations of these words and their acronyms are among those that have been used. All definitions have similarities, but also subtle differences.

In this manual we will adhere to the term used by the CBD, which is "traditional knowledge". In this context it should be kept in mind that **"traditional" does not only relate to the past, but that all knowledge evolves and develops over time**, and thus can have a real impact on today's environmental, social and cultural problems.

A description of what is meant by traditional knowledge can be found in the box below.

What is traditional knowledge?

Traditional knowledge refers to the knowledge, innovations and practices of indigenous peoples and local communities around the world. Developed from experience gained over the centuries and adapted to the local culture and environment, traditional knowledge is transmitted orally from generation to generation. It tends to be collectively owned and takes the form of stories, songs, folklore, proverbs, cultural values, beliefs, rituals, community laws, local language, and agricultural practices, including the development of plant species and animal breeds. Sometimes it is referred to as an oral tradition for it is practiced, sung, danced, painted, carved, chanted and performed down through millennia. Traditional knowledge is mainly of a practical nature, particularly in such fields as agriculture, fisheries, health, horticulture, forestry and environmental management in general.

From: http://www.cbd.int/traditional/intro.shtml

Definitions aside, it can be said that traditional knowledge in the sense considered here (and referring specifically to ecological knowledge) represents multiple bodies of knowledge accumulated through many generations of close interactions between people and the natural world (Drew, 2005). It consists of knowledge, know-how, skills and practices, and forms part of the cultural and spiritual identity of a community.

Traditional knowledge is acquired through extensive observation of an area and/or species. This may include knowledge passed down in an oral tradition, or shared among users of a resource. Traditional knowledge has an empirical basis and is used to understand and predict environmental events upon which the livelihood or even survival of the individual or the group depends (Huntington, 2000).

Many definitions can be found in literature. For example, Berkes et al., 2000, provides the following, often cited as definition for traditional ecological knowledge: "*Traditional ecological knowledge is 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 beings (including humans) with one another and their environment*" (Berkes et al., 2000).

Traditional knowledge is different from **local knowledge** in that local knowledge does not necessarily imply that the information was accumulated through many generations, only that it was acquired through close association with a particular environment. Both traditional knowledge and local knowledge are site-specific and generally accumulated through trial and error over many years (Drew, 2005).

The following is a summary of the characteristics of traditional knowledge (paraphrased from De Guchteneire, Krukkert and von Liebenstein, 2002):

Traditional knowledge is:

- Generated within communities
- Location and culture specific
- The basis for decision making and survival strategies
- Not systematically documented
- Concerned with critical issues of human and animal life: primary production, human and animal life, natural resource management
- Dynamic and based on innovation, adaptation and experimentation
- Oral and rural in nature

The box below contains an excerpt from a training module developed by the University of the Arctic on traditional knowledge[4]. It contains an important discussion of two crucial aspects of traditional knowledge: the spiritual and the practical. The discussion is from an Inuit perspective, but aspects of it would likely apply to other cultures as well.

Spiritual and practical aspects of traditional knowledge

Traditional knowledge can be seen to be comprised of two aspects. The first is its practical base. Traditional explanations of environmental phenomena, winds or water currents for example, are based on cumulative collective experience, tested over centuries, by people who had a sophisticated and practical knowledge of the land on which they depended for every aspect of life.

Children learned directly from their parents, aunts, uncles, grandparents and other elders. Instruction was always rooted in practice. Children learned by observing their elders and imitating their behaviour, and were guided and gently directed by their elders. A sense of

[4] *uarctic.org/Module_4_4fU4I.pdf.file*

competence and encouragement was built into the process because children defined what they were ready to learn by demonstrating approximate emulation of adult behaviour. Mastery of a particular task followed a dynamic process of repeated progressive attempts by the learner interspersed with guidance and direction as required to achieve that mastery.

> *When we talk about the hunting territory, the person never just thinks of himself. He thinks also of his children and his grandchildren. He thinks about how he will leave this land and what state it will be in when his children and grandchildren get it.* (John Mathews in McDonald, Arragutainaq, and Novalinga 1997)

People could then supplement, refine, and innovate an ever-expanding circle of mastery of tasks and practices through ongoing instruction from elders. Yet the emphasis remained on those practices which had withstood the test of time and which were most effective and efficient.

Learning how to do things crucial to survival was not the only aspect of traditional knowledge. While learning how to do a particular task, children were taught ideas and values that existed within their particular society. These ideas and values could be expressed in stories, in comments, or in corrections of behaviour. Generally, children did not ask elders to instruct them, but the elders took the initiative in preparing and advising them whenever they thought it appropriate. In fact, the great respect in which elders were held often meant that young people were reluctant to pose questions to elders unless they were invited to do so.

> *It was Inuit law not to abuse or play with animals and, even today, I'm really afraid to break those laws. I've taught my children and grandchildren not to abuse them either. Also, we are taught not to wound an animal if we aren't going to eat it. . . . My father told me if I wound an animal I shouldn't make it suffer because it also hurts inside when in pain* (Matilda Sulurayok in McDonald, Arragutainaq, and Novalinga 1997)

> *The land was always shared with the animals, and our Ancestors understood their movements very well. . . . Our people knew where the caribou would winter and where they would stop. It's the same thing for migrating birds. Our people had a special place for them to eat. They understood the kind of land they needed, and that the birds would give us a food supply. . . All the hunters and young hunters-to-be told where to hunt, and where not to hunt. The birds knew where they had a priority, and where they could eat properly and be healthy. Only when the right season did the people hunt them*. (Louis Bird in McDonald, Arragutainaq, and Novalinga 1997)

Thus the second aspect of traditional knowledge, the spiritual aspect, is integral to the ethical beliefs and world views of Indigenous peoples. It may be virtually impossible to measure scientifically the validity or truth value of the spiritual aspects of traditional knowledge, but its social existence and transmission can be witnessed, and the effects of that spiritual aspect on the environment can be seen measured (e.g., conservation of resources).

A general characteristic of traditional knowledge is the understanding that all parts of the environment—plant, animal, rocks, water, human beings—have a life force. And human life is not considered superior to other parts of creation: in fact, some indigenous traditions see human beings as the last to be placed on earth by the Creator (thus the least experienced and knowledgeable) and to be perhaps the weakest creature on earth and thus in need of help from the rest of Creation.

A fundamental principle arising from these beliefs, reinforced by stories and teachings, is that human beings can use the land and its bounty but do not have the right to control or exploit the animate or inanimate elements of the environment.

Quoted from the University of the Arctic training module (Module 4) on traditional knowledge. Written by Gord Bruyere and Einar Bergland. Online at uarctic.org/Module_4_4fU4I.pdf.file It is reproduced here unedited.

b. Traditional knowledge and science

"*Just because an idea is true does not mean it can be proved. And just because an idea can be proved does not mean it is true.*"

The New Yorker

"Unlike indigenous knowledge, conventional science works best when dealing with what is observable and measurable. But accepting the role of indigenous knowledge is essential so that we do not mislead ourselves into believing that only what is measurable is real, and only what is controllable is valuable."

The Millennium Ecosystem Assessment

As the Millennium Ecosystem Assessment stated, "Knowledge is a construction of a group's perceived reality, which the group members use to guide behavior toward each other and the world around them". Thus, all knowledge systems have a social context, and are dependent on social norms, values, belief systems, institutions, and ecological conditions that provide the basis of a ''place'' where knowledge is applied (Woodley 2005).

It could be said that all knowledge is both partial and specific to its particular context. One knowledge system should never be treated nor understood as inherently superior to another, nor is there a hierarchy in terms of the validity of different knowledge systems. With these premises, it is possible to consistently look at highly diverse knowledge systems, and to try to understand why people have different yet equally valid explanations for what they observe in the world around them.

Science strives to be objective, though it could be argued that it, too, comes with embedded assumptions that are socially derived. Scientific objectivity comes from the process of science that includes peer review and testing of the validity of specific hypotheses by many scientists. ''Objectivity is closely bound up with the social aspect of the scientific method, with the fact that science and scientific objectivity do not result from the attempts of individual scientists to be 'objective,' but from the cooperation of many scientists''(Popper 1950).

The Millennium Ecosystem Assessment (2005) provides us with the following definition of science:

What is science?

Science can be defined as systematized knowledge that can be replicated and is validated through a process of academic peer review by an established community of recognized experts in formal research institutions. Scientists use a series of logical and empirical methods of systematic observation in order to understand the world. The scientific method includes making empirical observations, proposing hypotheses to explain those observations, and testing those hypotheses in consistent ways. In essence, scientific methods are impersonal and any one scientist should be able to duplicate what another scientist has done. The validation of experimental results, hypothesis confirmation, and the acceptance of theories by the broader scientific community, through a process of peer review, are viewed as critically important to the maintenance of scientific standards and the quality of research.

From: http://www.maweb.org/documents/document.343.aspx.pdf

While the world can benefit from the strengths of all knowledge systems, there are some important differences between traditional knowledge and science that should be kept in mind when attempting to integrate the two:

- Traditional knowledge is qualitative, while science is quantitative.
- Traditional knowledge is holistic, while science is reductionist.
- Traditional knowledge has a moral and spiritual component, while science is supposedly value-free.
- Traditional knowledge systems evolve as values, beliefs, customs and ceremonies based on an understanding of nature and the universe. Science formulates principles and theories that describe nature.
- Traditional knowledge puts emphasis on experience and practice, and is based on empirical observation. Science relies on conceptualization, empirical experimentation and interpretation to generate and share knowledge.
- Traditional knowledge is generated by the users themselves, while science is generated by specialists.
- Traditional knowledge creates long time series that are specific to one location. Science more often uses shorter time series over a larger spatial area.
- For traditional knowledge to co-exist meaningfully with science, it has to be empowered through various means.

Interdisciplinary research, assessment and monitoring projects have to overcome the barriers to understanding that arise when knowledge derived from different processes is exchanged. These barriers may take the form of dismissing the arguments of an unfamiliar discipline, questioning the validity of data analysis, or, more simply, finding it too difficult to work within a foreign construct/worldview because the logic does not make sense.

Yet, a plurality of knowledge systems may provide a better foundation for understanding complex biological and ecological questions. As we learn in the next section, traditional knowledge has successfully contributed to a number of scientific studies, though its potential has not yet been fully explored in this context.

c. How is traditional knowledge used together with science in research, monitoring and assessment?

"The world is too big for scientists to sample intensively, and the knowledge of local people is necessary for identifying areas of special concern."
Drew, 2005

"The transmission of TEK/IK begins with stories as the base units of knowledge, then proceeds to knowledge as an integration of the values and processes described in the stories, and culminating in wisdom, an experiential distillation of knowledge dissemination."
Smylie, Martin et al. 2004

Traditional knowledge can, in particular, strengthen research by supplying information that is locality-specific, including environmental linkages occurring in those localities (Drew, 2005). It can be particularly important in areas where formally recorded data are lacking (Johannes, 1981) and where indigenous cultures are still largely extant (Drew, 2005; Hickey and Johannes, 2002). In many countries traditional knowledge represents the only detailed area-specific knowledge on the environment.

In many modern management contexts, including modern fisheries, traditional knowledge may work best when blended with science. However, solid examples of the blending of knowledge systems for successful management are relatively few, although they do exist.

The lack of examples may have to do with continued inertia in favour of established scientific practices, and the need to describe traditional knowledge in scientific terms. It may also be due to the difficulty of accessing traditional knowledge, which is rarely written down and must in most cases be documented as a project on its own prior to its incorporation into another scientific undertaking. This obstacle is exacerbated by the need to use social science methods to gather biological data, so that traditional knowledge research and application becomes a multidisciplinary undertaking (Huntington, 2000).

Drew (2005) provides three major advantages for integrating traditional knowledge into research programmes:

1. **Location-specific knowledge**. In remote or poorly studied areas, traditional and local knowledge may be the only source of biological information, and can provide detail about species and interactions not recorded in the scientific literature. Traditional knowledge can also be used to validate global models of species distribution or climate change and is particularly useful in the marine environment for providing information about species presence and distribution, specific areas such as juvenile habitats or spawning aggregations, as well as information about climate-related phenomena.
2. **Increased knowledge of environmental linkages**. Many indigenous peoples view their environment in a holistic fashion and may thus be aware of linkages between various ecological processes, multiple species and abiotic factors that influence species biology. Examples include knowledge of trophic structures and migration movements of fishes and other marine species, as well as the behaviour of species, which have been accumulated due to a long association with a particular place.
3. **Local capacity-building and power sharing**. For cultural reasons, the discourse of scientific research is predominantly a one-way transfer of knowledge and power from the scientists to the community. Developing local capacity through training, education and cultural empowerment can help reduce these inequities. Creating a research programme where indigenous peoples and/or community members are equal partners with scientists

is critical to the overall intellectual development within the host country, and results in a feeling of ownership of the research project by the community.

From the perspective of applying the CBD EBSA criteria using a combination of science and traditional knowledge, there are a number of related and relevant examples that can be drawn upon. These uses of traditional knowledge include, but are not limited to:

- The collection of **information about habitats used by migratory species** (for example, Stacey et al., 2007), including beluga and other whales (Huntington, 2000; Hay, 2000), polar bears (van de Velde et al., 2003) and sea turtles (Jit, 2007).
- The collection of information about the **location of spawning aggregation**s, some of which have subsequently gained protected area status in countries such as Belize (Heyman et al., 2001; Sala et al., 2001), Palau (Johannes et al., 1999) and the Solomon Islands (Aswani and Hamilton, 2004).
- Ecological knowledge possessed by Inuit communities contributed to a study of **marine birds** in the Arctic and provided information relevant to their conservation and management (Gilchrist et al., 2005).

The case study below, from India, demonstrates how the knowledge of fishers is being used to create a biodiversity registry of the sea.

Using fishers' traditional knowledge to assess and understand marine biodiversity

In an innovative attempt, researchers in India have roped in traditional fishers to help them prepare a biodiversity register of the sea.

The south Indian State of Kerala has about 38,828 sq km of land and 13,000 sq km of sea (up to 22 km) under its jurisdiction. As early as two centuries ago, studies have been done on the specific characteristics of this area and the natural resources in it.

Although minute details are available of the types of land in Kerala, that is not the case with the sea. There are many difficulties involved in doing a detailed study of the sea.

However, generations of traditional fishers, who earn their livelihood from the sea, know the environmental specificities of each nook and corner of the sea because of their work experience. This knowledge has been transferred down the generations not in any written form, but orally.

Realizing the importance of this, the first step taken in India to document biodiversity of the sea on the basis of the traditional knowledge of fishers was initiated in Kerala.

A sea area of around 440 sq km, along a 20-km-long coastline from Puthukurichy to Valiyathura in Thiruvananthapuram District, waschosen for the pilot study.

Protsahan, a community-based research initiative, undertook the work at the request of the Kerala State Biodiversity Board (KSBB).

The study had three major objectives:

1. To prepare a register of the ecology and biodiversity of the sea based on fishers'

traditional knowledge;

2. To identify and prepare, with the help of fishers, location maps of the natural reefs in the seabed, which are the natural dwelling areas of marine living organisms, and enhance the sea's productivity; and
3. To collect information on the living organisms in the area, classify them with the help of experts and prepare a register of them. Apart from these, information would also be collected on coastal vegetation, beach-based living organisms, shore-line changes, sea birds, estuaries, sea pollution and so on.

The methodology of the study was to collect data directly by travelling together with traditional fishers to their specific working spots in the sea, while also interviewing them en route. The research team members, who are also from the coastal fishing community of the study area and could thus understand the many colloquial terms and local names that fishermen use to describe what they see, sought the active collaboration of skilled fishers with deep knowledge of the hidden artefacts of the sea. Oral documentation of the traditional knowledge related to the bio-ecosystem of the seabed was done.

The study team undertook many sea voyages with fishers. Data was collected on the shoreline changes and the different species of fish caught in various seasons at different depths and areas. Data on beach creatures, vegetation and seabirds were also collected. The KSBB Chairman, Oommen V Oommen, the Head of the Department of Aquatic Biology of Kerala University, Biju Kumar, and Protsahan members also came along on some trips.

The study revealed the deep knowledge that traditional fishers have about the different ecosystems of the seabed area of the coast. For example, it was possible to classify, on the basis of specific features, the seabed into 'sandy seabed' (locally called *madakal*), 'clayish seabed' (*chenikal*), 'hard floor seabed' (*tharapparukal*) and 'high-surface areas' (*parukal*). The Marine Biodiversity Register (MBR) that resulted from the study also incorporated visual documentation, including paintings and pictures.

Perhaps the most interesting traditional knowledge of fishers in the area is their navigation skills that help them seek out the exact locations of various reefs without the aid of any sophisticated devices. This traditional knowledge is called '*kanicham*' (triangulation method). The study area, which has 13 important reefs with unique features, was documented using Global Positioning System (GPS). The results are so vivid that even a layman can understand the features of the hidden seabed and also locate them.

Floor reefs are flat, hard grounds in certain specific areas of the seabed that form the habitat of diverse vegetation and small living organisms as well as varieties of medium- and large-sized fish species. On the basis of the fishers' traditional knowledge of the sea, floor reefs can be considered an important habitat for many types of marine species.

During the period of the study, around 50 floor reefs were identified, of which 15 were studied in detail and used as specific locations for collection of materials. Twelve species of black corals and soft corals and 10 types of sea fans were identified.
Nearly 100 molluscs, 30 to 35 crabs, mandy shrimps, star fishes, murray (locally called *vlanku*), eels, sea snakes, 30 *manthals* (*Crossorhombus azureus*), *kadanthal (Choridactylus multibarbus*, *Thysanichthys* sp., *Pterois russelli*) and *petha* (*Antinnariusnummifer* sp.) were also identified, apart from many common fishes. All these species were classified with the help of the Department of Aquatic Biology, University of Kerala.

Perhaps the most important outcome of the study was the identification of six new marine species (five of which were found for the first time in Kerala and one for the first time in India). About 15 species were submitted to the University of Kerala for further study and analysis. Apart from some endangered fishes, other rare species of fish, sea birds, sea snakes, beach crabs and soft corals were also identified.

On the whole, the study reconfirms the value of the traditional knowledge of fishers. Our traditional fishing communities, just like forest-dwelling tribals, are a rich storehouse of traditional knowledge acquired over eons and passed down through generations. They, and their precious knowledge, need to be preserved.

This case study was supplied by the International Collective in Support of Fishworkers. It was written by Robert Panipilla and Aneesha Ani Benedict, members of the Protsahan study team. It was originally published in Samudra Issue No. 67, and is online at http://www.icsf.net/en/samudra/article/EN/67-3987-The-Sea-Around-.html. It is reproduced here unedited.

d. **Traditional knowledge and sustainable management**

The above has shown that traditional knowledge can provide vital information for improving management of ecosystems and species. In many places, traditional management systems that are adaptive and holistic have evolved and continue to this day to provide for community livelihoods and the sustainable use and stewardship of resources.

But are traditional management systems always sustainable? And does the use of traditional knowledge automatically lead to sustainable use of resources?

Traditional ecological knowledge is acquired through trial and error, and actions that have allowed for optimal completion of a task are passed from generation to generation. For example, techniques and fishing grounds that were fruitful would become part of the body of knowledge and passed along, perhaps through centuries, while those that were not would fade from memory.

While it is possible for holders of traditional knowledge to engage in unsustainable practices, the idea that resources are finite has long provided the basis for traditional tenure and management systems in places such as the Pacific Islands. This is likely due to the trial and error nature of traditional knowledge, which would have provided for learning from cases where resources were exploited to excess, creating with it an understanding of sustainable limits to harvesting.

In the Pacific Islands, traditional conservation measures, when applied judiciously, serve the purposes for which they were designed (Johannes, 1978). However, where traditional conservation rules have been either weakened or forcibly abolished, marine resources have been subsequently overexploited.

Today, it is likely that community support for conservation and management measures that incorporate their traditional knowledge practices tends to be greater than for those that are based only on scientific methodologies (Drew, 2005). Communities are generally more comfortable and trusting in their own knowledge, which is contextualised within their own belief systems. The application of traditional knowledge has also been found to assist in empowering communities with their own knowledge systems, promoting ownership of resource management initiatives and, as a result, these approaches are found to be more sustainable in the long-term. These approaches also provide concrete biodiversity benefits, as described in the case study from Fiji below.

Fiji Locally Managed Marine Area (LMMA) network

The community of Ucunivanua on the eastern coast of Fiji's largest island was the site of the first locally managed marine area (LMMA) in Fiji in 1997. Scientists from the University of the South Pacific supported environmentalists and local villagers in declaring a ban on harvesting within a stretch of inshore waters for three years, building on the tradition of taboo prohibitions for certain species. After seven years of local management, the clam populations had rebounded and village incomes had risen significantly with increased harvests.

The success of the Ucunivanua LMMA spread rapidly, and a support network – the Fiji Locally Managed Marine Area Network – grew from this. By 2009, the network had increased to include some 250 LMMAs, covering some 10,745 square kilometres of coastal fisheries, or more than 25% of Fiji's inshore area. The network has also inspired replication in countries across the Pacific.

Excerpt from United Nations Development Programme. 2012. Fiji Locally-Managed Marine Area Network, Fiji. Equator Initiative Case Study Series. New York, NY. Online at https://www.cbd.int/undb/countries/un/undb-undp-eqi-fiji.pdf

e. Issues related to collecting and documenting traditional knowledge

Successful efforts to document traditional knowledge are typically built on trust and mutual understanding. It takes time for knowledge holders to feel comfortable sharing what they know, for researchers to be able to understand and interpret what they see and hear, and for both groups to understand how indigenous knowledge is represented and for what purpose.

At the same time, knowledge holders often have a strong motivation to use and document traditional knowledge. If their traditional knowledge is not used, documented, or otherwise encouraged, it will soon become an artifact of the past. Elders are passing away, and much of their knowledge is not being transmitted to younger generations.

Scientists who undertake traditional knowledge research and work with communities need to adhere to certain important ethical considerations, including ensuring that:

- Indigenous peoples and local communities obtain a fair and equitable share of benefits from the use and application of their traditional knowledge
- Private and public institutions, as well as individual scientists, interested in using traditional knowledge obtain the prior, informed approval of indigenous peoples and local communities.

In this context, it is vital to ensure that the wishes of knowledge holders about where and how traditional knowledge should be used are protected. Traditional knowledge research, which asks knowledge holders to give their knowledge to outsiders who will then publish this information in documents or on cartographic maps has the potentially dangerous outcome of shifting the authority over knowledge from elders to outsiders and documents.

The World Intellectual Property Organization (WIPO) has put together a checklist for researchers to apply prior to undertaking projects documenting traditional knowledge.

The World Intellectual Property Organization : Checklist to apply before documenting traditional knowledge

- Plan carefully.
- Consult as widely as possible among indigenous peoples, local communities and key stakeholders at an early stage.
- Consider and clarify the role of the different stakeholders involved (researchers, government agencies, communities, etc.).
- Ponder on indigenous peoples and local communities expectations and how best to respond to and reflect them.
- Identify customary laws applicable to sharing, collection and documentation of TK, as well as related to decision-making within indigenous peoples and local communities.
- Consider how to effectively apply prior informed consent (PIC) principles – take note of 'shared TK' issues.
- Set out documentation objectives, including intellectual property (IP) objectives and develop an IP strategy if and when needed.
- Consider the widest possible range of options to meet these objectives.
- Develop a monitoring and verification plan to provide assurances that documented TK will be used as determined in the documentation process.
- Consider that legal issues may arise in the contexts of existing access to genetic and biological resources policies, and legal frameworks and regulations (ABS).
- Distinguish between non-confidential TK and TK which may be secret (due perhaps to its sacredness) and which may require additional conditions and securities (if it were to be documented).

Article 8(j) of the CBD requires that each contracting Party shall, as far as possible and as appropriate, subject to its national legislation, respect, preserve and maintain knowledge, innovations and practices of indigenous and local communities embodying traditional lifestyles relevant for the conservation and sustainable use of biological diversity and promote their wider application with the approval and involvement of the holders of such knowledge, innovations and practices and encourage the equitable sharing of the benefits arising from the utilization of such knowledge, innovations and practices. Thus, access to traditional knowledge is subject to the prior informed consent of the holders of such knowledge

What is prior informed consent (PIC)?

Prior informed consent (PIC) is an established and well-defined term in law and medicine. It means that before being exposed to a risk, in particular a risk of bodily harm, a person is entitled to be fully informed of that risk in advance so as to make an informed decision about whether to undergo the treatment in question. For a long time, at the international level, this principle was mainly applied in the context of the export of chemicals.

Prior informed consent was then also prescribed by the Convention on Biological Diversity for the access to and utilization of genetic resources: the competent national authority of the providing country must be informed of the planned research as part of the application process. The user seeking access needs to provide all of the relevant information and ensure that the government or other responsible authority obtains this information.

The prior informed consent of the competent agency is a necessary prerequisite for access to biological resources. Under national legislation it may also be necessary to include stakeholders involved in various intermediate levels in the prior informed consent process, e.g. indigenous peoples and local communities (often farmers' communities) in the case of seeking access to genetic resources for food and agriculture. (Biber Klemm and Martinez, 2006). The Nagoya Protocol extends this obligation to indigenous peoples and local communities holding traditional knowledge associated with genetic resources.

From: http://www.wageningenur.nl

The CBD has produced two important guidance documents on how to take into account traditional knowledge, innovations and practices:

- **The Tkarihwaié:ri Code of Ethical Conduct to Ensure Respect for the Cultural and Intellectual Heritage of Indigenous and Local Communities Relevant to the Conservation and Sustainable Use of Biological Diversity** (http://www.cbd.int/traditional/code/ethicalconduct-brochure-en.pdf). The code of conduct is described in the box below.
- **The Akwé:Kon Voluntary Guidelines for the Conduct of Cultural, Environmental and Social Impact Assessments regarding Developments Proposed to Take Place on, or which are Likely to Impact on, Sacred Sites and on Lands and Waters Traditionally Occupied or Used by Indigenous and Local Communities (**www.cbd.int/doc/publications/akwe-brochure-en.pdf). These guidelines provide information on paying due regard to the ownership of and the need for protection and safeguarding of traditional knowledge, innovations and practices. For example, in the event of disclosure of secret or sacred knowledge, prior informed consent and proper protection measures should be ensured. Use of knowledge should be undertaken on mutually agreed terms.

The Tkarihwaié:ri Code of Ethical Conduct to Ensure Respect for the Cultural and Intellectual Heritage of Indigenous and Local Communities Relevant to the Conservation and Sustainable Use of Biological Diversity

The Code of Ethical Conduct was named by a Mohawk term meaning 'the proper way', so as to emphasize the ethical standards embodied in this instrument. Indeed, the code is intended to provide a collaborative framework ensuring the effective participation and prior informed consent or involvement and approval of indigenous and local communities in activities, including research proposed, on their knowledge, territories and related resources.

By its ethical nature, the Code establishes a new paradigm for researchers and others working with Indigenous and Local Communities and /or on their lands and waters. The code embodies both equal partnership and capacity building for Indigenous and Local Communities and those working with them. It is a tangible tool in keeping with the greater emphasis now placed by Parties to the Convention on practical results based on the identification and pursuit of outcome-oriented targets with a view to achieving, by 2020, the revised Strategic Plan and the Aichi Biodiversity Targets.

The Code of Ethical Conduct will provide guidance to Parties, Governments and others on procedures and principles to consider when working with indigenous and local communities.

In adopting the Code, the 193 Parties to the Convention:

Recognized that respect for traditional knowledge requires that it is valued equally with and complementary to scientific knowledge, and that this is fundamental in order to promote full respect for the cultural and intellectual heritage of indigenous and local communities relevant to the conservation and sustainable use of biological diversity.

The following provides an excerpt from the "methods" section of the Code:

METHODS

Negotiations in good faith

Those employing the elements of this code are encouraged to interact, and to commit formally to a process of negotiation in good faith.

Subsidiarity and decision-making

All decisions regarding activities/interactions with indigenous and local communities related to the objectives of the Convention should be developed and elaborated at the appropriate level to ensure indigenous and local community empowerment and effective participation, bearing in mind that such activities/interactions should respect indigenous and local community decision-making structures.

Partnership and cooperation

Partnership and cooperation should guide all activities/interactions in pursuit of the elements of the code of ethical conduct, in order to support, maintain and ensure the sustainable use of biodiversity and traditional knowledge.

Gender considerations

Methodologies should take into account the vital role that indigenous and local community women play in the conservation and sustainable use of biological diversity, affirming the need for the full and effective participation of women at all levels of policy-making and implementation for biological diversity conservation, as appropriate

Full and effective participation/participatory approach

This principle recognizes the crucial importance of indigenous and local communities fully and effectively participating in activities/interactions related to biological diversity and conservation that may impact on them, and of respecting their decision-making processes and time frames for such decision-making. Ethical conduct should acknowledge that there are some legitimate circumstances for indigenous and local communities to restrict access to their traditional knowledge.

Confidentiality

Confidentiality of information should be respected, subject to national law. Information imparted by the indigenous and local communities should not be used or disclosed for purposes other than those for which it was consented to, and cannot be passed on to a third party without the consent of the indigenous and local community. In particular, confidentiality ought to be applied to sacred and/or secret information. Those working with indigenous and local communities should be aware that concepts such as "the public domain" may not adequately reflect the cultural parameters of many indigenous and local communities.

Reciprocity

Information obtained from activities/interactions with indigenous and local communities should be shared with them in understandable and culturally appropriate formats, with a view to promoting intercultural exchanges, knowledge and technology transfer, synergies and complementarity.

The entire code is online at: http://www.cbd.int/traditional/code/ethicalconduct-brochure-en.pdf

Finally, it is important to note that **indigenous peoples are considered to be rights-holders with a special status that goes beyond that of a stakeholder**. This is recognized in the United Nations Declaration on the Rights of Indigenous Peoples, which also recognizes that “respect for indigenous knowledge, cultures and practices contributes to sustainable and equitable development and proper management of the environment”. Making this distinction is important, and is often crucial for the success of a research or conservation project that involved indigenous peoples, as demonstrated in the case study below.

Working with indigenous peoples, local communities, and traditional knowledge

There is widespread recognition among scholars of environmental governance of the need for the incorporation of indigenous peoples (Memon and Kirk 2012; Hill et al. 2012), and traditional knowledge into environmental decision-making (Turner et al. 2000). This recognition of the importance of indigenous peoples and traditional knowledge is driven by the need for multiple knowledges to solve complex environmental problems (Weatherhead, et al.. 2010) and to provide better data for environmental management (Watson 2013). However, the importance of *how* to engage indigenous peoples and to collect and utilize traditional knowledge data appropriately is frequently overlooked. This section discusses a case study of the engagement of indigenous peoples in British Columbia (BC), Canada in the sphere of freshwater governance. The outcomes from this research include practical recommendations for researchers engaging with indigenous peoples and/or traditional knowledge.

In BC, there is a growing interest in collaborative or multi-actor approaches to environmental problems such as watershed management. Similarly, researchers and organizations worldwide recognize the importance of working with indigenous peoples as a part of collaborative approaches. Case study research was conducted on four organizations in BC that were collaborating, or attempting to collaborate with First Nations (indigenous) peoples in the context of freshwater management (von der Porten and de Loë 2013). This research showed that three of the four organizations attempting to collaborate with First Nations had little success, primarily because of their approach. The organizations tended to treat First Nations as one of many stakeholders or interest groups, rather than as self-determining indigenous nations who have both legal and *sui generis* rights to make decisions about their traditional homelands. Because First Nations tended to be treated as one of many roughly equal actors in a decision- making process, their willingness to engage was low. However, one of the four cases resulted in excellent engagement with both indigenous peoples and the applications of their traditional knowledge. In this case, the environmental organization deferred to the First Nation as the primary decision-maker of their traditional homelands and regarded them as a self-determining indigenous nation with unrelinquished rights to their lands. This organization began by building a strong relationship with the First Nation and consistently supported its environmental governance goals. This in turn furthered the environmental goals of the organization for the protection of surrounding lands and waters.

The following five recommendations stem from this case study research and are for researchers, organizations and practitioners interested in engagement with indigenous peoples and/or traditional knowledge:

Relationship-building
Building respectful and meaningful relationships with indigenous peoples is central to engagement and to understanding the context for traditional knowledge application. The importance of relationship-building with indigenous peoples has been well-established by scholars (e.g., Booth and Skelton 2011; Cullen 2010). However, the approach to creating opportunities for relationship building-between indigenous peoples and practitioners depends on the context. The case study research in BC demonstrated that practitioners had success where the non-indigenous organization had built relationships and trust well ahead of the proposed research or environmental decision-making processes. Relationship-building creates an opportunity to understand how indigenous peoples want to be treated (e.g., as a nation), what research or decision-making processes they already have underway, and to gauge how or if the community/nation would like to engage in the use of their traditional knowledge.

Nations not stakeholders
It is crucial that researchers or practitioners involve indigenous peoples as self-determining peoples (and in some cases as self-determining nations) rather than as one of many collaborative stakeholders or actors in a process. The "right to self-determination" by indigenous peoples has been affirmed by the *UN Declaration on the Rights of Indigenous Peoples* (UNGA 2007, p.4). Further, indigenous scholars have asserted the inherent (*sui generis*) rights that indigenous peoples hold in decision-making about their traditional homelands (Alfred 2009; Coulthard 2008; Turner 2006). The importance of indigenous nationhood and assertions of rights is highlighted in contexts such as in BC where the majority of First Nations have not signed treaties with the Government of Canada, putting the status of their traditional homelands into question. Because similar ongoing tensions exist between indigenous peoples and colonial governments worldwide, it is important that indigenous peoples are respected by researchers, practitioners or others as rights-holders or nations, rather than as an interest group or stakeholder that ought to also be included in a process or research.

Understand existing agendas
Researchers or practitioners approaching indigenous nations or peoples for decision-making or research must spend time to thoroughly understand their goals. This contrasts with approaching with a pre-set decision-making or research agenda. Understanding existing protocols, political goals, and/or environmental processes of indigenous nations will help researchers determine if they share the same goals. The understanding of these goals comes primarily from relationship building, but can also be supported through document analysis. For example, the Simpcw First Nation has a Water Declaration (2010) that outlines their rights to and responsibilities for water in their traditional homelands. A major benefit of this approach is creating opportunities to find

synergies between the goals of the ndigenous peoples and the researcher.

Venues and processes

Particularly in the colonized context, the dominance of non-indigenous (e.g., Eurocentric) venues and processes, can make engagement in non-indigenous research or decision-making difficult for indigenous peoples. Scholars have documented the predominance of Eurocentric over indigenous ideologies (Gibbs 2010; Youngblood Henderson 2000) and practices (Ellis 2005). The BC case study research has demonstrated that there is an opportunity for practitioners and researchers to select venues and/or processes of decision-making that are indigenous-centric. For example, some indigenous elders may prefer to discuss decision-making matters while hunting or traditional knowledge while collecting seaweed. In other cases, choosing indigenous protocols for meetings or processes of decision-making creates opportunities for more appropriate engagement and creative solutions.

Provide Resources

Many indigenous communities, particularly those who have been disenfranchised or have been deprived of their traditional homelands and resources, have limited resources with which to engage in non-indigenous research and/or processes. In the BC case study, some First Nations focused entirely on trying to provide basic health, education and social support to their nation's members. As a result, engaging in research or asking traditional knowledge-holders to volunteer their time for research was not feasible. Researchers and/or practitioners should provide resources to indigenous peoples to even out the capacity for decision-making or participation in research. Resources may take the form of compensation for their time or other resources requested by the indigenous nation.

This case study was written by Suzanne von der Porten, Hakai Network for Coastal Peoples, Ecosystems and Management, Simon Fraser University

f. Methodologies for documenting traditional knowledge[5]

Initial considerations

When designing a research project that will document traditional knowledge and selecting methods for gathering data, it is especially important to consider the cultural context in which the interactions take place. It is equally important to ensure that appropriate ethical and legal principles, such as prior informed consent, are followed, and that that community and individual rights are respected. More information about these principles was provided in the previous section.

Social science methods, which may not be familiar to natural scientists, are generally used for documenting traditional knowledge. Thus, research teams that work with communities to document traditional knowledge may prefer to engage a social scientist to conduct the actual research.

All of the methods used have their strengths and weaknesses for promoting substantive interchange between local experts and outside scientists. The most common methods are as follows:

1. Semi-directive interview
2. Questionnaire
3. Analytical workshop

[5] This section has been adapted from Huntington, 2000

4. Collaborative fieldwork

These methods will be described in more detail in the section following the next one.

Selection of community participants for documenting traditional knowledge

Members of a given community will have differing amounts of knowledge depending on their age, status and/or the fishing, hunting and other activities in which they engage. Thus selection of the right participants in research relating to traditional knowledge is important.

In the absence of personal experience with the pool of potential participants in a community or an area, the most practical option is **peer selection**. In nearly all cases of traditional knowledge research, the researcher will want to identify key informants rather than select a random sampling of the community. If appropriate, the community council can be asked to help select the most knowledgeable persons.

Chain referrals, with each participant suggesting the name or names of further experts, are also a useful technique and allow the researcher to evaluate the completeness of the selections since eventually few or no new names will come up.

While evaluations of the reliability of a particular participant will depend in part on the judgment of the researcher, **group reviews and other sources of local feedback** can help minimize the role of the researcher in resolving conflicting statements from different participants.

Methods in more detail

(a) Semi-directive interview

In this method (see Nakashima and Murray 1988, Nakashima 1990, Huntington 1998), participants are guided in the discussions by the interviewer, but the direction and scope of the interview are allowed to follow the participants' train of thought. There is neither a fixed questionnaire, nor a preset limit on the time for discussions or the topics to be covered. The interviewer may have a list of topics to discuss, which can be useful for prompting further discussions when there is a lull, but the interviewer must also be prepared for unanticipated associations made by the participants.

The semi-directive interview is more a conversation than a question-and-answer session. This is especially useful in cases where the participants are not comfortable with direct questions, or in which the researcher cannot be sure that the questions are understood as intended. Even simple questions often include assumptions that may not be universally valid, such as equating ‘‘north’’ with ‘‘up,’’ or that do not take into account local idioms. In a conversation about herring, one might ask the question, ‘‘Where do the fish enter the bay?’’ In the local idiom, ‘‘fish’’ may mean ‘‘salmon’’ rather than ‘‘herring,’’ and so the answer may appear valid but actually be referring to a different species than the researcher believes.

(b) Questionnaire

This method is useful when the interviewer knows in advance what he or she is seeking, and also simplifies comparisons between respondents. Quantification, if desired and appropriate, is often simpler with a well-designed questionnaire. Depending on the cultural context, this may be more comfortable to some respondents than the more free-form semi-directive interview. When quantification is not necessary for all responses, some questions can be left open-ended, giving the respondent a chance to add more detail or make associations beyond those anticipated in the questions. While this is unlikely to produce as thorough a discussion as the semi-directive interview, it can be useful in providing new ideas and insights beyond the scope of the initial inquiry.

Because of cultural differences in perception and value systems, questionnaires should be developed or co-developed by a member of the indigenous and local community using local terminology and addressing issues from a local perspective.

(c) Analytical workshop

In some cases, collecting additional data is not as desirable as trying to interpret what is already known. Just as a workshop among scientists can help spur new ideas and challenge old assumptions, a workshop that brings together scientists and the holders of traditional knowledge can allow both groups to better understand the other's perspective, and to offer fresh insights. By cooperating in the analysis of data, the two groups may also find common understanding and jointly develop priorities for management and future research.

(d) Collaborative field work

Applying traditional knowledge to scientific research need not take place exclusively in an interview or meeting room. Collaborative field work offers an excellent means of interacting for an extended period. As shown by the examples below, traditional knowledge has often been used to locate study sites, obtain specimens and interpret field results. Locally hired field assistants have often contributed far more to research than mere logistical support, though this contribution is often not acknowledged.

The case study below, from the North American Arctic, highlights some of the methods discussed in this chapter. In addition, it also provides an example of a study that was undertaken by and for indigenous people, giving them full control of the study and its results, while protecting confidential aspects of the work.

g. Validation of traditional knowledge

Traditional knowledge, like other forms of knowledge (including science), is sometimes wrong. Such errors may be due to misinterpretations made both by observers (e.g., informants) or by collectors of information (e.g., managers and researchers).

Scientific research is checked and verified through a peer review process. Traditional knowledge can also be similarly checked through conversations and interviews with a number of knowledgeable informants either individually or through community workshops. Traditional knowledge has its own internal systems for achieving empirical and social legitimacy of knowledge and hence its validation. These may include experimental and empirical as well as experiential validation based on cultural norms and historical experiences through experiments, expert peer-review, and collective procedures for evaluating and cross-examining knowledge including mechanisms for intergenerational transmission of knowledge

As with science, traditional knowledge should be promoted on its merits, scrutinized as other information is scrutinized, and applied in those instances where it makes a difference in the quality of research, the effectiveness of management, and the involvement of resource users in decisions that affect them. On this basis, there is ample evidence of the utility of traditional knowledge. Thus, it is important to validate each knowledge system on its own terms, rather than apply the methods of one system to another.

Documenting Wildlife Harvest in the Gwich'in Settlement Area, Northwest Territories, Canada

a. The Gwich'in

The Gwich'in are an Aboriginal people living in Arctic and sub-Arctic regions of North America, including the Mackenzie River Valley in the Northwest Territories (NWT), Yukon and into Alaska. Gwich'in number approximately 10,000 people, resident in 15 communities. Four Gwich'in bands reside in the NWT: Ehdiitat Gwich'in in Aklavik, Teetl'it Gwich'in in Fort McPherson, Nihtat Gwich'in in Inuvik, and Gwichya Gwich'in in Tsiigehtchic (Figure 1). The Gwich'in population in these four bands is approximately 2,440, of whom about 1,400 actually live in the region.

b. The Gwich'in Agreement

On April 22, 1992, the Gwich'in Tribal Council, the Government of the Northwest Territories, and the Government of Canada signed the Gwich'in Comprehensive Land Claim Agreement—a modern treaty—and an accompanying Implementation Plan. The Agreement took effect on December 22, 1992. The Gwich'in Settlement Area is 56,935 square kilometres. Under the Agreement, the Gwich'in received fee simple title to 22,422 square kilometres of land in the NWT, including 6,158 square kilometres to the subsurface, and 1,554 square kilometres in Yukon Territory.

Under this modern treaty, Gwich'in have access to land throughout their settlement area, including land owned by the Crown, to gather, hunt, trap and fish, enabling them to continue their traditional harvesting and wildlife management customs.

c. The Harvest Study and Customary Use

The Gwich'in Agreement required a harvest study to generate data to calculate the Gwich'in Minimum Need Level—the minimum amount of wildlife needed to be harvested to sustain the Gwich'in wildlife-based economy, and to ensure effective management of wildlife by the Gwich'in Renewable Resources Board (GRRB) set up by the Agreement. The Gwich'in Harvest Study (GHS) was conducted from September 1995 to July 2004 and counted the number of animals, fish and birds harvested by Gwich'in, harvest locations and biological information on harvested animals.

The GHS was conducted by and for the Gwich'in people in the communities of Aklavik, Fort McPherson, Inuvik and Tsiigehtchic with Gwich'in "hunters" – community members who hunted, fished, or trapped at least once a year. The GHS was designed by the Gwich'in people to ensure they have full control of the study and its results without compromising the accuracy of collected information, while protecting hunters' confidentiality. Community consultations were recognized as critical for maximizing participation in the study, collecting accurate data, communicating the study rationale, and ultimately for making the study meaningful to participants. Posters, radio announcements, prizes, presentations and calendars were produced to increase awareness of the GHS.

The GHS staff met with the four communities to determine names of hunters to be interviewed. Persons on the hunter list were interviewed once a month and a data report was made available each of the five years of the Study. The GHS attempted to contact all of the hunters to conduct interviews, asking to recall their hunting, fishing or trapping activities for the previous month, or longer, if interviews for previous time periods had been missed. If the interviewees reported a harvest, they were asked questions about the species, number of animals, the location and, for some species (moose, Dall's sheep, caribou, bears, beluga whales and muskoxen) the age class and sex of the animals that were harvested. Any additional comments made by the hunter were also recorded. English was the official language of the GHS, because it is commonly used in the Gwich'in Settlement Area, and the Gwich'in names of animals likely to be reported to the study were determined before the study began to allow for accurate translations. A computer database was developed to assist with managing, reporting and analyzing the data by GRRB for the Gwich'in people.

A significant undertaking, the GHS provided a good summary of aboriginal harvest activity in the GSA as it attempted to interview all possible Gwich'in hunters. The GHS overall response rate by the Gwich'in hunters was close to 90 per cent.

The GHS identified 542 hunters whose activities were recorded in more than 56,000 interviews. Over 329,827 harvests were included in approximately 9,000 records, and 57 species and groups of animals were referenced in the study. The more frequently harvested animals included black duck and other duck species, char, muskrat, caribou from the Porcupine caribou herd, snowshoe hare and whitefish. Gwich'in harvest annually on average 1,500 caribou (*Rangifer tarandus*), four black bears (*Ursus americanus*), 43 moose (*Alces alces*), 78 Tundra Swans (*Cygnus columbianus*), and 26,500 White Fish (*Coregonus nasus*).

The successful Gwich'in Harvest Study became a useful tool for wildlife management as a source of good harvesting information that can be used when planning management activities and examining Gwich'in Minimum Needs Level. The GHS has promoted a greater understanding of wildlife population management to communities, land claim organizations, government agencies and the public, thereby benefitting present and future generations of hunters and wildlife managers alike.

Gwich'in Settlement Area

This case study was written by Gleb Raygorodetsky, United Nations University, Traditional Knowledge Initiative

h. Putting data collection and ownership in the hands of communities

An important consideration throughout traditional knowledge-related research is community control and ownership of their own data. The previous case study provided an example of indigenous peoples undertaking the research and retaining control of the databases that were created, including deciding on issues related to confidentiality and how and for what purpose data can be used.

Most research projects will be collaborations between scientists and traditional knowledge holders, and in these cases developing local capacity through training, education and cultural empowerment can be an important component of the project. In undertaking the research, indigenous peoples and/or community members should be treated as equal partners with scientists, providing for two-way learning and community ownership.

In many cases communities now have the tools to undertake their own assessment, research and monitoring, using a combination of modern technology and traditional knowledge. This section will provide brief examples of two such tools: Cybertracker (I-Tracker) and community-based mapping. These technologies allow the communities to design their own research according to their priorities, and undertake the data collection and analysis.

(a) CyberTracker software and other methods for communities to collect their own data and information

CyberTracker software provides an example of communities using modern technology to collect a combination of traditional knowledge and scientific information for purposes of monitoring, while respecting intellectual property and cultural protocols. CyberTracker started in Africa as a method for reviving the traditional tracking methods of the Kalahari Bushmen. It involved a handheld field computer with icon-based user-interface to accommodate trackers who were not able to read. Thus, it allowed data collection by traditional African trackers. Today, CyberTracker software is being used by several indigenous communities, including Indigenous Rangers in Australia and the Coastal Guardian Watchmen Network in British Columbia, Canada.

The case study below, from Northern Australia, describes how a version of CyberTracker (called I-Tracker for Indigenous Tracker) is being used by indigenous communities for sea turtle monitoring.

Combining traditional knowledge and science: new tools for monitoring marine turtles

Introduction

According to archaeological evidence, Australia has been occupied by indigenous peoples for some 50 000 years. Indigenous Australians hold that they have been 'present on country' (living on their traditional lands) since the creator beings formed the landscape, the people, and the law. Through this long custodianship, indigenous Australians have built a detailed body of Traditional Ecological Knowledge (TEK) and developed complex interconnected spiritual and cultural relationships with their land and sea estates. In contemporary times, indigenous Australians have come to refer to the reciprocal relationships that arise from their use and management of their estates and resources as 'Caring for Country'.

The Caring for Country movement is highly visible in the expanding and increasingly skilled workforce of indigenous rangers and the land and sea organizations from which they operate. Over 700 people are employed as rangers in government-funded programmes, and many more are employed through local community organizations or work voluntarily to manage Australia's land and seas. The 51 formally declared Indigenous Protected Areas, largely managed by community-based rangers, cover 36 million hectares and make up over a third of Australia's National Reserve System, but the area of Indigenous-managed land extends well beyond this. Indigenous rangers work across a wide range of land and seascapes and tackle a broad range of environmental issues, including fire, mining and commercial development, visitors, introduced plants and animals, and biodiversity conservation, including marine and migratory species. They are the only active management presence through much of north Australia, and regularly patrol hundreds of kilometres by boat, plane, vehicle and helicopter, often in very remote places. Ranger operations combine TEK with latest scientific knowledge and techniques. A major challenge is how to collect, manage, map and report the growing volume of data required to manage their estates.

I-Tracker, a program coordinated by the North Australian Indigenous Land and Sea Management Alliance Limited (NAILSMA), works with indigenous rangers and scientists to develop digital field-tough tools that match the data collection, mapping and analysis requirements of Caring for Country activities. Utilizing the renowned CyberTracker software (www.cybertracker.org) to create customized applications covering a wide range of land and sea management issues, I-Tracker provides training and technical support, brokers research partnerships to develop and test new methods and tools, and fosters a collaborative network joining on-ground practitioners with one another and relevant experts.

The I-Tracker marine turtle survey tool

Background

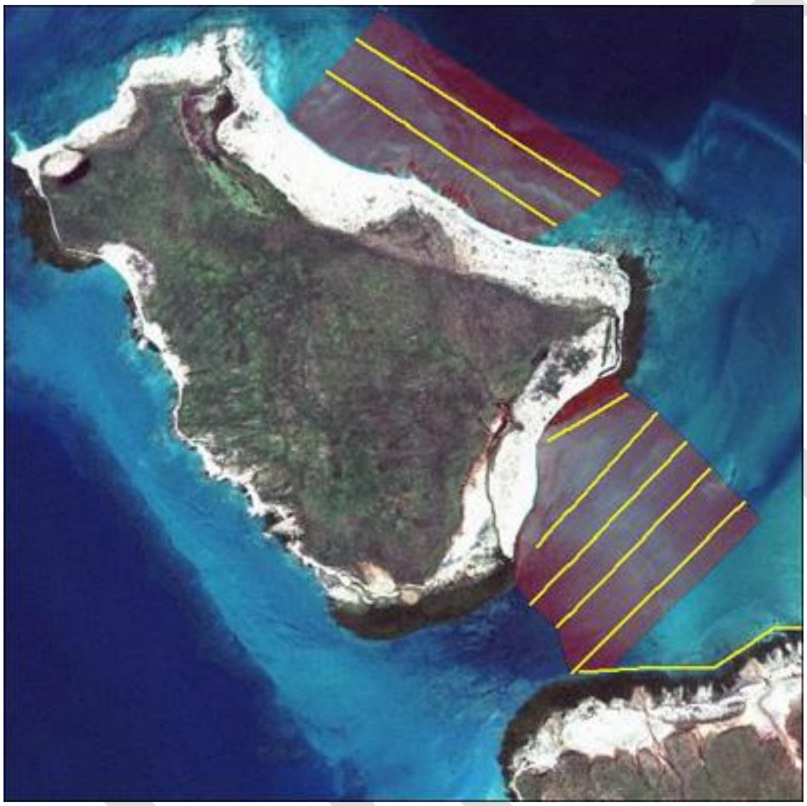
A partnership project with the Wunambal Gaambera Aboriginal Corporation and its Uunguu Rangers (based in the north Kimberley region of Western Australia) and the Commonwealth Scientific and Industrial Research Organisation (CSIRO,Australia's leading scientific agency) has led to the creation a new dedicated survey tool for boat-based surveys of marine turtle populations. The project is part of the Northern Australia Hub of the National Environmental Research Program.

Marine turtles are high priority species identified in a community-based management plan developed by the Indigenous Traditional Owners in the Wunambal Gaambera land area, as well as in national and international threatened species management strategies, for example the *Recovery plan for marine turtles in Australia*. Established monitoring methods such as aerial surveys and nesting beach turtle tagging programmes are logistically difficult or dangerous on the remote, crocodile-inhabited coasts of north Australia. In addition, high annual variation in turtle nesting activity requires decades of data to detect change. The new survey method presents an alternative way to monitor local populations. Community members and rangers use TEK and local knowledge about turtle habitats and seasonality to identify feeding grounds for marine turtles, and conduct surveys from their patrol boat using a customized I-Tracker data collection application (created using CyberTracker software). The survey data, which is mapped and housed locally in a free CyberTracker database, is used in community consultations about plan delivery. Other ranger programmes are also trialing and adopting the method. As a result, the survey data can also contribute to national and regional analyses of turtle distribution and abundance.

How does it work?

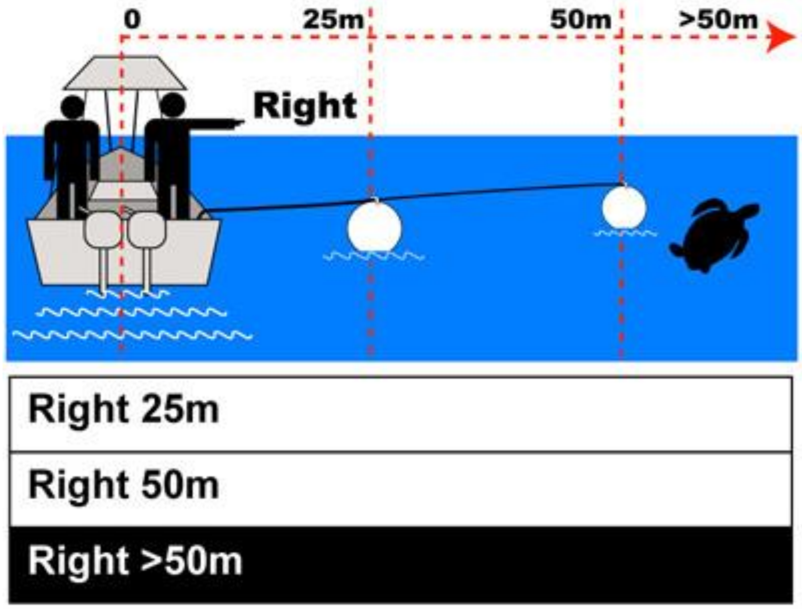
The new survey uses a transect-based survey method to generate estimates of local density and abundance.

Data are entered in response to questions or prompts on rugged touch-screen hand-held personal digital assistants (PDAs), which can also take photos and voice recordings linked to an observation. The survey involves one observer stationed on each side of the boat and a recorder using the PDA loaded with an I-Tracker application to record all sightings of turtles and dugongs called out by the observers. The boat travels slowly at ~5-6 knots along transects approximately 1.0 -2.5km long. Environmental conditions (which influence sightability and potentially turtle behaviour) are recorded at the beginning and end of each transect. The following map is an example of transects around Mary Island near Kalumburu, Western Australia, along which turtles are counted.



Whenever possible, turtles are recorded individually and a GPS point is taken after each turtle sighting. The following additional information is recorded for each turtle sighting: distance from the boat (this is recorded as a choice of three "bands" - see image below for an example of an I-Tracker help screen showing how to record a turtle in an appropriate distance band); species; size and behaviour.

Help screens that can be accessed at the time of sighting on the PDA are located throughout the application. Here is an example of a help screen.



Using CyberTracker also allows data on effort to be recorded with no extra work. As long as the data collection device is turned on at the beginning of the survey and turned off at the end of the survey, CyberTracker records the number of patrols completed; the distance covered during the day; total hours spent between the start and end of the patrol; and average speed.

What are the results and applications?

This survey method has now been used extensively by the Uunguu Rangers to complete marine turtle surveys, during which details on over a thousand turtle sightings have been recorded. The Dambimangari and Gumurr Marthakal Indigenous Ranger programmes have also trialed the method in other areas of northern Australia, and it could be adapted for use by additional land and sea managers operating where there are high densities of marine turtles regularly found on local feeding grounds.

It has now been shown that data collected by this method can be analysed using line transect models to generate density and abundance estimates of local turtle populations. The method could also be applied to high density dugong population areas.

Marine turtles and dugongs are globally iconic species and an important food source for many coastal peoples. Indigenous-led management, including the use of tools developed through the I-Tracker programme, will help ensure that Australia continues to host the most robust turtle and dugong populations on the planet and provide an important cultural and subsistence resource for indigenous Australians.

The Wunambal Gaambera Aboriginal Corporation's Uunguu Rangers, NAILSMA and CSIRO have partnered to develop and implement a new boat-based marine turtle survey method

This case study was written by Rod Kennett (Australian Institute for Aboriginal and Torres Strait Islander Studies), Micha Jackson (North Australian Indigenous Land and Sea Management Alliance), Peter Bayliss (CSIRO Marine and Atmospheric Research) and Tom Vigilante (Wunumbal Gaambera Aboriginal Corporation).

(b) Participatory and community-based mapping

Participatory and/or community-based mapping allows communities to generate their own maps of their lands and seas, the resources required for their subsistence, cultural sites and values and other issues of importance to them. Mapping can be a key tool for rendering complex, intangible and oral knowledge into a form where it can be used for research, monitoring, environmental decision-making and for communicating with governmental and international organizations (IPACC, 2008).

Importantly for many communities, mapping allows memory, knowledge, culture, values and practices to be captured on a landscape image that can be shared either with people in the community or with outsiders. Maps are a form of cultural inventory and help explain the relationship between natural landscapes and cultural systems (IPACC, 2008).

Mapping approaches range from hand-drawn sketches and group drawings to printed maps, GIS applications and 3D physical and computer models, which can be discussed in a group and used to gather data on local species, habitats and ecology. In all of these cases, mapping comprises not just a set of tools, but the participatory process of gathering spatial information and making maps. The ability to associate traditional knowledge with geographic features in a Geographic Information System is not unlike the way in which oral maps linked vast amounts of cultural information to culturally important spatial reference points, including events and sacred sites, important landmarks, and resource harvesting areas (Calamia, 1999)**.**

Some considerations

Indigenous peoples throughout the world have many ways of expressing spatial information and relationships between locations in their territories. Most often these would be orally or expressively transmitted (see some examples in box below), though examples of sketched maps also exist. Thus, indigenous communities are no strangers to geographic information, although the format of this information and its transfer may be very different from modern cartographic mapping.

Some examples of how indigenous peoples use geographic information

From the Kalahari Desert:

To this day, San communities in the Kalahari navigate at night using mental maps to navigate across the desert. Their maps include sand colours and textures, plant varieties and salinity, memories and stories of specific trees and a naming system for pans (desert indentations) related to mythology and practical information about the water quality, shape or biological diversity. Though this information is all stored orally, the principle of it being geospatial information is the same as physical maps (IPACC 2008).

From the Pacific Islands:

In historic times, Pacific Islanders created maps. The oral culture utilized and was dependent upon spatial references. Ancient Pacific Islander spatial knowledge was communicated through an oral process, and maps may have been used in conjunction with oral information. Tangible evidence of these ancient maps is difficult to find since most of them were probably relayed through chants based on known landmarks. It is also possible that directions were drawn on tapa or, in the Hawaiian case, presented in steps as part of the traditional hula. In expressive culture, such as the hula, movements are carried out which serve to embody experiences and events. Micronesians created stick charts that showed complex representations of ocean tides and currents (adapted from Calamia, 1999).

From Canada:

Spatial information has been used for understanding interrelationships between traditional human societies and ecological processes. In Manitoba, Canada, elders teach skills and maintain continuity and links to community resource areas by transferring highly detailed 'oral maps' and inventories of resource values and land use to their younger members. These individual and family maps also complement one another in such a way that they provide integrated knowledge of the ecosystems within the village's traditional resource area (Wavey, 1993:13 in Calamia, 1999).

The above examples demonstrate that different cultures represent space in different ways. These differences may be observed in the geometry and information content of their maps, as well as the way in which boundaries might be drawn. For example, boundaries of marine features may vary on maps depending on tidal stages, currents, seasonality, and other natural phenomena. The importance of a particular geographic feature to the purpose of the map, and/or its cultural importance, might determine the size to which it is drawn. For example, the size of a lake on an Ojibway birch bark map was not determined by the actual size of the lake; rather, the size of the lake depicted on the map was based upon the importance of the lake for the purpose of the map. Given these cultural differences, indigenous and local communities may find it more useful to develop maps from their own spatial reference points that may reflect their own perspectives and values of space, usage, and land and marine tenure (Calamia, 1999)**.**

Another issue to consider is the need to use local names for species and features. A comparison of local names with the scientific names could reveal differences in geographic perceptions that may be a reflection of cultural variation in the boundaries of these marine features, as well as the values and meanings placed on them. Thus it may be useful to create a dictionary or reference of local names and their meanings.

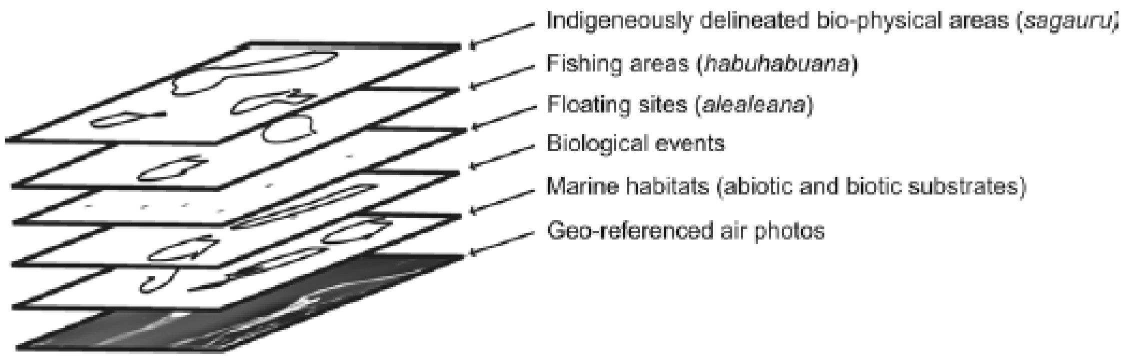
One of the most effective methods for mapping marine features (such as coral reefs, fish spawning areas, polynyas, etc) from an indigenous or local perspective is by mapping traditional marine use. Traditional marine-use activities are usually subsistence-related and include fishing and marine-related resource gathering activities, and result in extensive knowledge of the marine environment. As demonstrated in the case study below, the knowledge of indigenous fishers, which covers a multitude of phenomena, features, species and ecological relationships, can be represented as layers in a GIS.

Incorporating the knowledge of fishers into a GIS database in the Solomon Islands

A project in Roviana and Vonavona Lagoons, New Georgia, Solomon Islands shows how a geographical information system (GIS) database can be used to incorporate sociospatial information, such as indigenous knowledge and artisanal fishing data, along with biophysical and other information to assist in the design of marine protected areas. The researchers found that converting peoples' knowledge and socioecological behaviour into geo-spatial data allows researchers to formulate hypotheses regarding human responses to inter- and intra-habitat variability, along with other marine ecological processes, and help in the designing and implementation of resource management strategies in a cost-effective and participatory way, bridging the gap between indigenous and Western cognitions of seascapes.

Roviana people partition the ocean into named sites that represent biophysical resource extraction areas, features that allow people to, or obstruct them from, navigating, and cultural and historical markers that define the seascapes (*sagauru* used as a generic for "reef"). Next, fishers identified a number of fishing grounds (*habuhabuana*) that are nested within or border on the larger indigenously named and demarcated sites. Fishing grounds, in turn, are composed of one or more areas or floating spots (*alealeana*) in which people actually fish (e.g., a reef outcrop). Finally, underlying these areas are one or more of the locally recognized benthic habitats (and associated biological events) that exist in the lagoons. Visualization of indigenously demarcated areas and associated habitats (illustrated as layers in the GIS) afforded a better understanding of the Roviana people's spatial cognition of the sea.

The figure below shows the indigenous cognition of the seascape as represented by layers (or themes) in the GIS.



This case study is extracted from Aswani, S and Lauer, M (2005) Incorporating Fishermen's Local Knowledge and Behavior into Geographical Information Systems (GIS) for Designing Marine Protected Areas in Oceania. Human Organization, Vol. 65, No. 1, 2006

Participatory 3D Modelling (P3DM) is a relatively new communicative facilitation method conceived to support collaborative processes related mainly to resource use and tenure and aimed at facilitating grassroots participation in problem analysis and decision-making.

P3DM integrates people's knowledge and spatial information (contour lines) to produce stand-alone scale relief models that have proved to be user-friendly and relatively accurate data storage and analysis devices and at the same time excellent communication media. Participatory 3D models are manufactured at village level based on the merger of traditional spatial information (elevation contours) and peoples' spatial knowledge, as described in the case study below.

Use of participatory 3D modeling by Indigenous Peoples in Africa

In cooperation with the EU-ACP Technical Centre for Agricultural and Rural Cooperation (CTA), African indigenous peoples are experimenting with geospatial technologies such as participatory 3D modeling (P3DM), and low-tech, participatory methodologies such as eco-cultural mapping. These detailed and geo-referenced models provide a bridge between oral cultures and information technology or other media for understanding indigenous and local knowledge of landscape, seascapes and governance models. The methodologies can be applied for education, planning, heritage management, migratory information, conflict resolution and planning for climate change impacts and resilience building.

P3DM is a relatively inexpensive methodology that can be easily integrated into GIS systems for further usage. The participatory approach ensures that local knowledge and values drive the mapping / modeling, while the application is relevant at different scales of governance and decision-making. Geo-referencing allows the modeling to be recognizable to a wide range of different users, from non-literate expert knowledge holders to government officials, parks managers and landscape planners.

Participatory methodologies are empowering to local communities. They recognize the complexity and sophistication of their knowledge, even if they may otherwise feel they have low educational backgrounds. Outsiders, notably government officials and conservationists see the detail and sophistication of the knowledge systems which helps address historic biases and marginalization. The maps are physical and can be used for a wide range of applications, including new challenges around climate impacts. If applied properly, the P3DM can also offset gender-biases in knowledge management and decision-making.

Written by Friedrich Alpers, Integrated Rural Development and Nature Conservation (IRDNC) in Namibia and Alfred Chedau, Kyaramacan Peoples' Association

As with all traditional knowledge-related data, security of maps and databases is important because they are the valuable intellectual property of the indigenous peoples and local community in question. Maps may also contain sacred knowledge, which the community does not want to reveal to outsiders. In all cases, it is important that the community is able to determine who has access to the data, and particularly sensitive data layers may need to remain the sole property of the community user group. Access could be licensed to designated groups or individuals involved in using traditional knowledge to enhance resource management (Calamia, 1999).

Some mapping resources for indigenous peoples and local communities

Aboriginal mapping network: http://www.nativemaps.org

Open Forum on Participatory Geographic Information Systems and Technologies: http://www.ppgis.net

IAPAD - Participatory 3D Modelling: http://www.iapad.org

Training Kit on Participatory Spatial Information Management and Communication: http://pgis-tk.cta.int

Blog dealing with participatory mapping: http://participatorygis.blogspot.ca

EBM tools: http://www.ebmtools.org/participatory-gis.html

i. Co-production of knowledge – indigenous and scientific collaboration and the creation of hybrid knowledge systems for science-policy assessments

Today's complex problems require approaches that reach across disciplines of inquiry in order to develop a more holistic understanding than would be possible through a single discipline alone. **Hybrid knowledge systems** refer to knowledge types that have in some way been integrated. Integration between fields of study and knowledge systems can occur to varying degrees and at different stages of the process.

- In **multidisciplinary research,** separate studies from different disciplines are undertaken, with knowledge exchange or integration taking place after results of the separate studies become apparent. Each discipline stays within its boundaries while the studies are completed.

- In **interdisciplinary research,** approaches and methods across disciplines are more fully integrated from the outset. “Interdisciplinarity” analyzes, synthesizes and harmonizes links between disciplines into a coordinated and coherent whole.
- In **trans-disciplinary research**, studies span across knowledge systems, connecting science with other societal partners. In the present case, scientific research and traditional knowledge are combined to inform policy and/or to address a specific problem. Trans-disciplinary research is based on a suite of approaches from more than one knowledge system, and aims to transcend traditional boundaries in order to create new knowledge in ways that are not possible through less integrative methods.

When trans-disciplinary research involves representatives of different knowledge systems jointly analyzing a situation, negotiating goals, and developing problem-solving measures, it becomes knowledge co-production. **Knowledge co-production** refers to “the collaborative process of bringing a plurality of knowledge sources and types together to address a defined problem and build an integrated or systems-oriented understanding of that problem” (Armitage et al., 2011). This problem may, for example, relate to environmental research or assessment for a specific purpose, such as improving the understanding of the causes of environmental degradation and developing effective management and policy-responses to address those causes. The case study below provides an example of a project aimed at knowledge co-production in order to better understand and adapt to climate change in the Arctic.

Bridging Indigenous and Scientific Knowledge about global change in the Arctic (BRISK) project

'BRidging Indigenous and Scientific Knowledge about global change in the Arctic' (BRISK) is a three-year project to elaborate cutting-edge interdisciplinary and transdisciplinary methodologies and tools to build synergies between scientific and indigenous knowledge on climate and global changes in the region.

The objective is to carry out innovative assessments of impacts, vulnerabilities and adaptive strategies about global change in the Arctic, encompassing environmental, economic, political and social dimensions. BRISK employs a transdisciplinary approach (associating indigenous knowledge holders, climatologists, geographers, ecologists and anthropologists) and contributes to bridging the gaps between natural and social sciences, between science and indigenous knowledge, and between the indigenous community, the research community and policy-makers. The project combines micro- and macro-scale approaches through its engagement with partners at international, national, regional and local levels.

The BRISK project employs two approaches to build synergies between scientific and indigenous knowledge on climate and global changes in the Arctic:

1. **Transdisciplinary observatories among reindeer herders (Sami and Siberia)** bring together indigenous and scientific knowledge for the observation of global change (climatic, environmental, industrial, social). Community-based observing systems are jointly conceived by scientists (natural and social) and indigenous peoples.
2. **Knowledge co-production network** will advance innovative tools and methods, and

engage in activities that bridge across knowledge systems, disciplines, actors, networks and institutions. The work will be undertaken through a series of international expert meetings and an ad hoc and open-ended group involving circumpolar indigenous peoples and natural and social scientists.

Adapted from the BRISK Project website at http://www.arcticbrisk.org

When melded together, traditional knowledge and science can produce a resource management approach that is stronger than either can provide alone. At its best, integrating different knowledge systems opens the doors to a richness of understanding about environmental complexities that is not possible using only one system of knowledge. For example, integrating the two knowledge systems may produce expanded spatial and temporal scales of knowledge on species of interest, such as marine mammals or fish, or an improved understanding of the complex interactions between humans and natural systems.

While increased integration is desirable in theory, it is challenging to undertake in practice. Each knowledge system is a product of a specific worldview, different methods and ways of knowing, with their associated values, institutions and management systems. Knowledge integration requires that participants develop an understanding about the areas of divergence between their knowledge systems as well as the common ground. Effective integration will also require acknowledging and addressing power imbalances between practitioners of the two knowledge systems, in order to prevent one system from dominating the other.

There has been a tendency in the past by the scientific community to consider traditional knowledge as mere "data" to be lifted out of context and integrated into scientific assessment or environmental management. This approach may devalue traditional knowledge and the culture from which it came, and would, at its worst, represent a misappropriation of knowledge providing no benefits to the knowledge holder. As discussed in the earlier sections, traditional knowledge consists not only of ecological knowledge, but also of spirituality, values, normative rules and cultural practices, and is based on a different understanding of the world than science. Thus, attempts to harmonize disparate worldview will need to be based on an explicit discussion about the premises and worldviews on which each is based.

Instead of considering traditional knowledge as "data" to be integrated into science and resource management, the more successful approach is to instead consider **how to integrate knowledge holders into these processes**. This will also require a discussion about the sharing of power in science and resource management, including addressing questions such as: Who sets the goals? Who decides on rules of the game? Who benefits from the outcomes? Ideally, the co-production of knowledge can provide both empowerment for local peoples and improvement of the knowledge base for decision making.

Where traditional knowledge holders become equal partners in collaborative research efforts, there is a greater potential to meaningfully and equitably undertake co-production of traditional knowledge and science. **This approach will require a shift from developing knowledge integration products to developing knowledge integration processes enabling multiple views and multiple methods.**

While there are a number of examples of collaborative research, as was demonstrated in the previous sections, there are fewer examples of cases where this has been done in the context of international science-policy assessments, such as the EBSA process. The Millennium Ecosystem Assessment and the Arctic Climate Impact Assessment made an effort to incorporate traditional knowledge, but in the case of the former this was done in the context of selected local assessments rather than global ones, and in the case of the latter, there was a separate chapter for traditional knowledge that did not include integration. Thus, new assessment processes, such as the EBSA process, and on a larger scale, the Intergovernmental Science-Policy Platform for Biodiversity (IPBES) provide an opportunity to pioneer new approaches for integration.

A recent (2012) dialogue workshop on Knowledge for the 21st Century, in Guna Yala, Panama, considered how and to what degree knowledge integration might be undertaken in the context of IPBES. The following two approaches were discussed:

- **Integration of one knowledge system into another** through a validation process based on the latter system. For example, through scientific validation of traditional knowledge. This approach has potential negatives consequences, including that validation measures of one knowledge system may not be appropriate for another; exclusion of relevant and locally legitimate knowledge; and disempowerment of local communities.
- **Parallel approach**: A parallel approach emphasizes complementarities, with each system of knowledge pursued separately but in parallel, each enriching the other as needed. This approach emphasizess that each system of knowledge is legitimate in its own right, within its own context.

The workshop supported the idea of knowledge co-production through indigenous-scientific formulation of novel research questions, collaborative methods for data gathering, flexible arrangements for interaction, complementary data sets, and mutual respect for approaches, worldviews and knowledge systems.

The workshop concluded that a parallel approach held the most promise of being successful in the context of IPBES, and that diverse knowledge systems need to be included on equal terms. In order to provide for both a parallel approach and knowledge co-production, the workshop proposed a “Multiple Evidence Base” approach as a way forward for integrating science and traditional knowledge in the context of assessments such as IPBES.

The Multiple Evidence Base approach emphasizes that knowledge systems can complement each other and that it is important to let each knowledge system speak for itself within its own context, without assigning one system the dominant role of validating the other ones. The aim of the approach is to promote connections between knowledge systems in a respectful and equal manner for the benefit of more sustainable governance of social-ecological systems. The Multiple Evidence Base focuses on creating a process of collaboration between those involved, and this focus on the process can help to balance the power dynamics and maintain the integrity of knowledge systems. Key to the approach, and to developing synergies between knowledge systems, is a continuous dialogue and reciprocity in the exchange between those involved throughout the process.

There are three phases of the multiple evidence base approach, as described by Tengö et al. (2014):

Phase 1 involves defining problems and goals in a collaborative manner that recognizes cross-scale interactions of drivers and local responses and sets the stage for maintaining ongoing dialogue. This includes establishing partnerships between relevant communities, organizations and networks as appropriate and needed at different levels; investigating common interests and concerns, including power relations among actors; recognizing differences in experiences, methods, and goals across actors.

Phase 2 involves bringing together knowledge on an equal platform, using parallel systems of valuing and questions and domains. This includes acknowledging and recognizing the spatial and temporal context of knowledge and implications for scalability; acknowledging and addressing power issues among knowledge systems and holders; consideration of different areas of strength and contribution of different knowledge systems and their overlaps; and acknowledging converging and diverging evidence and perspectives across knowledge systems.

Phase 3: involves joint analysis and evaluation of knowledge and insights to generate multi-level synthesis and identify and catalyze processes for generating new knowledge. This includes identifying continuing knowledge gaps, new hypothesis, and potential areas for new collaborations across knowledge systems. To enable these processes, there is a need to develop new tools and approaches for combining and relating multiple data, qualitative as well as quantitative.

Throughout each of the three phases, the Multiple Evidence Base approach emphasizes continuous dialogue between traditional knowledge holders and scientists. Three distinctive features separate a dialogue from a conversation: a dialogue is characterized by (1) equality and absence of coercion, (2) that parties listen with empathy, and (3) that assumptions held are brought out into the open.

The Multiple Evidence Base approach is unique in that it explicitly addresses power relationships between different participants. Such power imbalances may become a substantial obstacle for the participation of traditional knowledge holders in science-policy fora. In many workshops the debate is dominated by scientific experts from developed countries; without special attention being paid to groups that are disadvantaged or not part of the mainstream culture, they will be unlikely to contribute in an equitable manner.

Tengö et al. (2014) compiled case studies, reproduced in the table below, which illustrate a parallel approach to connecting knowledge systems. These examples highlight research that has, to varying degrees, used parallel approaches to provide new discoveries and insights.

Examples of case studies using a parallel approach to connect knowledge systems

Issue investigated	Multiple evidence base	Reflections on scale and complementarity
Relationship between Arctic sea ice and climate change (Laidler 2006)	Literature review assessing current research presenting Inuit knowledge or observations of sea ice, along with scientific knowledge or observations of sea ice	Inuit knowledge at local (*mainly at fine scales*) and regional scales, spanning living memory to the past, through historical recall. Scientific knowledge at local, regional, and global scales (*mainly at coarse scales*), and short time depth
Monitoring for sustainable	Data sharing and calibrating	Local knowledge: add long

customary wildlife harvests in Canada and New Zealand (Moller et al.. 2004)	traditional monitoring methods against scientific abundance measures. Interviews and collaborations with hunters	time periods, larger samples, extreme events and adaptive strategies, and sometimes multivariate cross-checks for environmental change; Scientific knowledge: better tests of potential causes of change on larger spatial change, precise quantification, and evaluation without harvesting
Land use and land cover change and underlying drivers, Wild Coast, Eastern Cape, South Africa (Chalmers and Fabricius 2007)	Comparing local and scientific understanding based on interviews with local experts and other local representatives, and reviewing scientific literature on forest-savannah dynamics	Local experts added detailed understanding of ultimate causes of change, how drivers interact, and added historical perspectives interacting at multiple temporal and spatial scales; Scientific knowledge was more coarse grained and added perspectives of causal mechanisms and an ability to study and predict obscure processes such as the impact of atmospheric change on vegetation
Fish population spatial dynamics, British Columbia, Canada (Mackinson 2001)	Combining knowledge of fish behaviour and distribution. Interviews with fishery scientists, fishery managers, and local fishers	Local fishers provided in-depth and detailed information from observation, but were generally reluctant to interpret or rank the data. In combining the three sources, there were no instances in which knowledge opposed another or diverged from that found in scientific literature
Ecology of Arctic Fox and Snow Goose in Nunavut, Canada (Gagnon and Berteaux 2009)	Investigating the complementarity of Inuit TEK and scientific knowledge across spatial and temporal scales. Workshops, interviews, mapping for collecting TEK, review of scientific information	Complementarity in temporal (e.g., winter feeding ecology) and spatial (e.g., feeding ranges) scales in understanding across traditional ecological knowledge and scientific knowledge, more expressed for Arctic fox than snow goose
Agroforestry intensification in the Amazon estuary (Brondizio 2008)	Investigation involved learning from and doing experiments with estuarine small farmers on the management techniques used	Local farmers demonstrated techniques of forest management and agroforestry intensification in different parts of the landscape.

	to intensify food production (acai palm fruit) without deforestation. Historical remote sensing and quantitative data complements ethnography and participant observation, ethnobotany and household surveys	Historically considered as passive extractivists of forests, collaboration has allowed to demonstrate the sophistication of local food production systems in forest areas, to question established misconceptions of native farmers as backward and irrelevant to the regional economy, and to show how local knowledge has allowed the acai palm fruit to become a global product without causing local deforestation
The effect of free-ranging domestic reindeer grazing on biodiversity and vice versa in Northern Sweden (Tunón and Sjaggo 2012)	Combining scientific knowledge of the impact of reindeer herding on biodiversity with reindeer herders' perspectives on the role of biodiversity for reindeer management and landscape change	Herders' knowledge adding landscape-level insights on time depth, the role of additional biotopes for herding, and the management perspective connecting different biotopes in time and space. Scientific knowledge focused on high-resolution, small scale studies with a short time depth

While the Multiple Evidence Base approach is being proposed for IPBES, it could also be considered for the EBSA process. This would require identification and involvement of knowledge holders whose lives and livelihoods depend on the ecosystems and resources being discussed, and putting in place a dialogue-based and collaborative process based on diverse knowledge systems that can assist the identification of EBSAs in each region. Since both the EBSA process and IPBES rely predominantly on regional assessments, there is a need to provide for cross-scale interactions from local to regional and global. Assessments such as the EBSA process may need to find ways to aggregate, synthetize and evaluate knowledge from the local scale so that it can inform national and regional scales, possible through a nested approach.

More information about the Multiple Evidence Base approach is available in the following publications:

Tengö M. and Malmer P. (eds), Borraz P, Cariño C, Cariño J, Gonzales T, Ishizawa J, Kvarnström M, Masardule O, Morales A, Nobrega M, Schultz M, Soto Martinez R, Vizin a Y. 2012. Dialogue workshop on Knowledge for the 21st Century: Indigenous knowledge , traditional knowledge, science and connecting diverse knowledge systems. Usdub, Guna Yala, Panama, 10 -13 April 2012. Workshop Report. Stockholm Resilience Centre. Online at http://www.dialogueseminars.net/resources/Panama/Reports/Panama-report_Enlish_small.pdf

Tengö, M., Brondizio, E.S., Elmqvist, T., Malmer, P. and Spierenburg, M. (2014) Connecting Diverse Knowledge Systems for Enhanced Ecosystem Governance: The Multiple Evidence Base Approach. Ambio 1-13. Online at http://link.springer.com/article/10.1007/s13280-014-0501-

3/fulltext.html#Sec6

Community-based monitoring and information systems (CBMIS), described in the box below, provides a bottom-up approach to develop indicators that make sense on a local scale and jointly explore the potentials to scale up on a regional and even global scale. It may be possible to use lessons learned from CBMIS and similar processes to further facilitate the integration of traditional knowledge and science in ways that are relevant to, and benefit, both communities and regional and global assessment processes.

Community-based monitoring and information systems (CBMIS)

An on-going knowledge platform that uses a Multiple Evidence Base approach is the Community-based monitoring and information systems (CBMIS), a bottom-up process for mobilizing indigenous and local knowledge for monitoring of biodiversity, ecosystems, and human well-being. CBMIS refers to the bundle of monitoring approaches related to biodiversity, ecosystems, land and waters, and other resources, as well as human well-being, used by indigenous peoples and local communities as tools for their management and documentation of their resources. CBMIS is a joint initiative among a global network of indigenous peoples and local communities, which seeks to combine the monitoring needs of communities with need for detailed data as a base for joint action related to territories and resources.

The initiative emerged in cooperation with the CBD Secretariat and the UN Permanent Forum on Indigenous Issues. Initially, regional and thematic workshops were organized to identify indicators relevant for indigenous peoples, towards monitoring local to global progress in achieving internationally agreed environment and development goals, such as the indicators related to traditional knowledge for the Aichi Biodiversity Targets. The network is now advancing in developing tools and methods for a common set of instruments that can be used by communities.

Adapted from:http://www.stockholmresilience.org/download/18.3110ee8c1495db744321641/1415346253123/meb+fact+sheet+140916.pdf.

Check for understanding:

You can check your understanding by answering the following questions, the answers to which can be found in the text above:

1. What are the main features of traditional knowledge, and how does it differ from science?
2. What is meant by Prior Informed Consent?
3. What are the aims of the Tkarihwaié:ri Code of Ethical Conduct to Ensure Respect for the Cultural and Intellectual Heritage of Indigenous and Local Communities Relevant to the Conservation and Sustainable Use of Biological Diversity? What are some of the methods it promotes?
4. What common methodologies are used for documenting traditional knowledge?
5. Describe some of the ways in which communities are collecting their own data. Why is community control and ownership of data important?
6. Describe the main features of the Multiple Evidence Base approach.

MODULE 3: INTEGRATION OF TRADITIONAL KNOWLEDGE INTO THE EBSA PROCESS

Objectives of this module:

This module will concentrate on ways to enhance the integration of traditional knowledge into the CBD EBSA description process. The module will first examine the significance of EBSAs and EBSA criteria to indigenous peoples and local communities and how these concepts might best be made relevant to communities. The module will then discuss the different stages of the EBSA process, including prior, during and after regional workshops, and consider how traditional knowledge might be incorporated at each of those stages. Case studies will examine how indigenous peoples and local communities might compile scientific information related to potential areas meeting the EBSA criteria as inputs to the CBD regional EBSA workshops or national process on EBSA description, as well as how traditional knowledge holders and scientists might work together during the workshop. Updating available information after the regional workshops will also be discussed.

We anticipate that this section will be most useful for indigenous peoples and organizations working with them.

This module consists of the following sections:

a. **Relevance of EBSAs to indigenous peoples and local communities**
b. **Traditional knowledge in the description of EBSAs**
c. **The steps involved in the CBD EBSA description process, and potential contributions by indigenous peoples and local communities**
d. **Preparation and synthesis of knowledge at the national level**
e. **Working with scientists and other participants during a regional EBSA workshop**
f. **Some final considerations related to the CBD EBSA process**

Learning objectives:

After going through this module, you will gain appreciation about how the concept of EBSAs and the EBSA criteria might be understood by communities. You will also be able to use the information in this module to plan how traditional knowledge might be incorporated into the EBSA process in your country, through the full and effective participation of indigenous peoples and local communities.

a. Relevance of EBSAs to indigenous peoples and local communities

Indigenous societies generally view people, their cultures, belief systems and the environment as being interconnected. In many places, humans and their natural environment have co-evolved for a long time, creating biocultural landscapes and seascapes, where humans are an integral part of ecosystems rather than intruders on them. Humans are the custodians of the ecosystems they live in and use, with a responsibility for future generations. Use of resources is often governed by spiritual and cultural rules that provide for sustainable use. Some sites may have special spiritual significance to communities in accordance to their traditions or belief systems. Such sacred natural sites are found all around the world, and exist in almost every country. In addition to their cultural values, many such sites have high biodiversity values.

The holistic view held by many indigenous communities is significantly different from the purely scientific structure of the CBD EBSA criteria, which consider species and habitats apart from their human uses and values. How relevant is the concept of EBSAs, as well as the related scientific criteria, to indigenous peoples and local communities and their way of viewing the world?

The concept of ecologically or biologically significant marine areas (EBSAs) may not necessarily resonate with indigenous peoples and local communities. "Significance" or the similar term "importance", implies a value judgment that may not translate well to all cultures. This was found to be the case in a study to identify "Important Ecological Areas" in the Bering Strait in Alaska. As expressed by Kawerak, an organization working with indigenous peoples in the Arctic, which participated in the study:

"Many traditional knowledge holders are uncomfortable ranking areas in terms of importance, and local experts, as well as other residents of the region, have repeatedly noted that 'Everywhere is important'".

While everywhere is important, life is not evenly distributed in the ocean, and fishers do not randomly search the ocean for their catch. Instead, they often pay attention to specific environmental conditions, habitats, seasonal changes, etc. Some areas of the ocean support more life than other areas, with greater frequency (Oceana and Kawerak, 2014). These areas could be considered to be the equivalent of ecologically or biologically significant areas.

One way to make the concept of EBSAs more relevant, then, would be to think about them as areas of high abundance, or areas that support more of a certain species than other areas. They could also be thought of as areas that culturally important migratory species, such as belugas or bowhead whales, humpback whales, sea turtles, dugongs, salmon, or other important species use seasonally as part of their migrations.

It should also be noted that coastal indigenous peoples and local communities often live, hunt and fish in areas where fish, marine mammals and other biodiversity are abundant. Monitoring of the status of a resource is a common practice amongst many groups of traditional resource users. The proximity and regular contact that the resource user has with the resource brings with it an ability to observe day-to-day changes, not only in the target species, but in the ecosystem. This knowledge in its entirety is important for describing EBSAs.

b. Traditional knowledge in the description of EBSAs

Traditional knowledge can be considered in the EBSA description process either on its own, for example as observations of conditions and trends in areas and populations, or as information about environmental linkages. It can also be used to add value to existing scientific information, including as part of integration processes, such as the Multiple Evidence Base approach discussed in the previous chapter.

While much traditional knowledge is focused on coastal areas, indigenous peoples and local communities often have strong cultural, social, spiritual and economic connections to the open-ocean and deep-sea beyond the immediate coastal zone. For example, in the Pacific Islands, ocean voyaging is a long tradition, which originally brought settlers to the islands of the area, and where the ocean continues to connect and nourish the peoples and cultures of the islands. Coastal

First Nations in British Columbia (Canada) and Washington State (USA), as well as the Ainu in Japan, also traditionally used canoes for travel, including, in some cases, for trade and whaling activities. Some of these canoes were able to travel long distances through rough offshore waters and participated in offshore fisheries.

Migratory species, such as cetaceans (whales, dolphins and porpoises), sharks and seabirds have special cultural values for many indigenous peoples. In the Pacific, whales and dolphins are considered sacred. In Polynesian culture, whales and dolphins are thought to possess *mana*, and have supernatural power of influence and ability to carry luck with them[6]. They are associated with identity, lifestyle and well-being. There is considered to be a universal bond between humans and cetaceans in Polynesian culture. Migrations of whales are used as an environmental cue on some islands, and ceremonies and ritual surround cetaceans across the Pacific region. Given these cultural values, the conservation of culturally important migratory species, as well as the ocean ecosystem they depend on, would be of paramount importance for many indigenous peoples in the Pacific and other oceanic regions.

While the EBSA criteria as such may not be directly useful for communities and their way of life, they still provide a starting point for discussion. Further interpretation may be needed to explain the criteria for communities, and some criteria may be more relevant than others. For example, a productive area may mean different things in the Arctic (where polyanas and the ice edge would provide examples of productive environments) and the tropics (where coral reefs might provide a good example).

The table below contains the CBD EBSA criteria and their scientific definitions. These criteria were adopted by the Conference of the Parties to the CBD in 2008 (annex I, decision IX/20)[7] Those working with communities may need to provide a further rationale or explanation that contains the types of descriptions that might resonate with a specific community. The table below provides an example of a generic "community rationale", explaining in slightly simpler terms some of the issues contained in the scientific definition. However, such "community rationales" are extremely context-specific, and will need to be customized for each community, using local language and terminology. Local terms for animals, plants, environmental features and phenomena will need to be included, and anyone putting together a "community rationale" of EBSA criteria will need to understand the stories, knowledge and context associated with the terms, and which are basis for each culture. As stated in the Marovo Lagoon (Solomon Islands) Environmental Wiki[8]:

"Those who cannot name the good things of sea and land, cannot find them, and therefore cannot eat or otherwise benefit from them, nor will they know how to look after them well"

The following table provides a generic example of a "community rationale" for each scientific criterion, which would need to be customized for each community.

CRITERIA	SCIENTIFIC DEFINITION	COMMUNITY RATIONALE
Uniqueness or Rarity	Area contains either (i) unique ("the only one of its kind"), rare (occurs only in few	Animals, plants and places that are rare (almost never observed) or that are one of a

[6] www.pacificvoyagers.org

[7] For more details on the EBSA criteria, please see: cbd.int/doc/meetings/mar/ebsaws-2014-01/other/ebsaws-2014-01-azores-brochure-en.pdf

[8] http://en.marovo.org/index.php?title=About

	locations) or endemic species, populations or communities, and/or (ii) unique, rare or distinct, habitats or ecosystems; and/or (iii) unique or unusual geomorphological or oceanographic features	kind.
Special importance for life history stages of species	Areas that are required for a population to survive and thrive	Areas where animals breed, spawn, lay their eggs, give birth, nurse their young and feed.
Importance for threatened, endangered or declining species and/or habitats	Area containing habitat for the survival and recovery of endangered, threatened, declining species or area with significant assemblages of such species	Areas where animals whose numbers are declining breed, spawn, lay their eggs, give birth, nurse their young and feed.
Vulnerability, Fragility, Sensitivity, or Slow recovery	Areas that contain a relatively high proportion of sensitive habitats, biotopes or species that are functionally fragile (highly susceptible to degradation or depletion by human activity or by natural events) or with slow recovery.	Areas or species that may not recover if disturbed.
Biological Productivity	Area containing species, populations or communities with comparatively higher natural biological productivity.	Areas with plankton blooms; Areas with polynyas or coral reefs, or where fishing is particularly good.
Biological Diversity	Area contains comparatively higher diversity of ecosystems, habitats, communities, or species, or has higher genetic diversity.	Areas with many different types of environments, plants and animals.
Naturalness	Area with a comparatively higher degree of naturalness as a result of the lack of or low level of human-induced disturbance or degradation.	Areas where few people go, and/or where there is little or no hunting or fishing.

A starting point for work to integrate traditional knowledge into EBSA identification might then be a community meeting or a community workshop to discuss EBSAs and EBSA criteria. It is important to have recognized traditional knowledge holders participating in such a workshop. These knowledge holders may be expert fishers or elders recognized as such in their community. Because knowledge is often gendered, it is also important to consider women as key participants.

A community workshop may provide a good venue to discuss what an EBSA means for that particular community, and what the relevant "community rationale" might be for each of the EBSA criteria, including how the rationale would be expressed in the language of that community. Some criteria may not be relevant for a given community, and can be left out if deemed so. A community workshop is also a good venue to start identifying EBSA areas, including through map-based approaches where community members might, for example, outline the areas where they frequently observe a certain species.

Another related approach would be to identify areas that are used by communities for fishing, gathering of marine resources and hunting. It is unlikely that a fisher would attempt to fish in an area that is not productive, and thus a focus on traditional use areas will likely provide information about areas that may also meet EBSA criteria. Different species will be fished at different times of the year, and fishers often travel great distances, making observations about patterns of movement, the ecosystem and its condition, and other associated species. The case study below provides insight to a fishing community's knowledge of the sea.

A fishing community's understanding of the marine environment

Traditional fishing communities constantly track and understand the marine and coastal ecosystems, the weather and the interactions between abiotic and biotic factors as these are fundamental to success at fishing. Fishers also require exceptional navigational skills considering that there are few, if any, landmarks out on the water. Therefore, certain features, such as elevated reefs that are just under water, become important for navigation and for fishing as well.

To understand the fishers' world and perspective, it is essential for the non-fisher to recognize that the fishers' vocabulary and understanding of the sea is different from that of the non-fisher. For example, when talking of *paaru*, fishers mean only rocks on the seabed. However, non-fishers usually translate this to mean reef. But reef is commonly understood as coral reefs. For fishers, coral reefs may not be an important area where they can see the direct value to their livelihood. Similarly, when talking of locations, winds, currents, etc, there is a difference in understanding. This has to be kept in mind.

Different oceanographic factors have greatly influenced the diverse ecosystems in the sea and also those who depend on them for their livelihood. Even today, winds are relied on for navigation at sea while sea currents are viewed as an important element determining fish availability. The clear waters in the sea may suddenly become muddy when the currents change direction. Certain currents increase or decrease the water temperature. The fishers' experience teaches them which sea currents helps fish come near the islands. They continue to use the traditional names for these winds and the currents according to the direction that each of them take.

The platform reefs are sensitive areas of great ecological importance. The fishers say that the lower parts of the reefs are breeding grounds of many species. The platforms reefs are also where the seaweed grow and the women collect seaweed here. The seagrass areas are also of importance as they act as breeding grounds and nursery for some species. This area is also frequented by fish from deeper waters which come through the canals. Hence the seagrass areas are good fishing grounds. The live coral areas, which have colourful fish, are not used by the fishers. The broken dead coral reef area is rich in crabs and so crab nets/traps are deployed here. However, it is not as important as the seagrass areas.

Excerpt from The communities of Chinnapalam and Bharathi Nagar, Ramanathapuram district, Tamil Nadu, India, Panipilla, R and Marirajan, T. (2014) A Participatory Study of the Traditional Knowledge of Fishing Communities in the Gulf of Mannar, India. Samudra Monograph. Online at http://www.icsf.net/images/monographs/pdf/english/issue_141/141_GOM_Robert_study_ALL.pdf

Archaeological, historical and sacred sites also have the potential to be of great interest in the EBSA process, both for their important cultural merits, but also because they often contain considerable biodiversity. While there currently are no accepted social and cultural criteria that can be used to identify EBSAs, the CBD Conference of the Parties has noted that socially and culturally significant marine areas may require enhanced conservation and management measures, and that criteria for the identification of areas relevant to the conservation and sustainable use of biodiversity in need of such enhanced measures due to their social, cultural and other significance may need to be developed, with appropriate scientific and technical rationales. Please refer to section *g* of this module for more discussion on the topic of social and cultural criteria.

c. The steps involved in the CBD EBSA description process, and potential contributions by indigenous peoples and local communities

The CBD EBSA process has thus far consisted of several steps that take place at the national and regional levels, and that are part of an effort to collect and collate scientific information to describe areas meeting the EBSA criteria at each of these levels. All of these steps provide opportunities for contribution by indigenous peoples and local communities, but traditional knowledge is likely best included at the national level and prepared well in advance. Ideally, governments and organizations working closely with indigenous peoples and local communities need to facilitate full and effective participation for each step. A final step on the global level will have the EBSAs described by regional workshops considered by the Conference of the Parties for inclusion in the global EBSA repository.

The box below provides a summary of the steps.

STEP	WHAT CAN BE DONE TO FACILITATE PARTICIPATION AND INCLUSION OF TK
National preparatory process to compile scientific information on potential areas meeting the EBSA criteria, as inputs to CBD regional workshops or national processes on the EBSA description	The compilation of information that will support EBSA description in the context of the CBD starts through the national preparatory process, where national governments put in place a process to collect and collate relevant scientific information and traditional knowledge to identify potential areas that meet the EBSA criteria. The national preparatory process will likely take substantial time, particularly if new TK is collected. Thus the national process should start early, and may consist, depending on national circumstances, of the following steps: (i) Working with communities to ensure prior informed consent and full and effective participation, which might include compilation of existing TK and new TK through community workshops or other means; and (ii) a national preparatory meeting, or series of meetings to bring together traditional knowledge holders and scientists. As an end result, national compilation of information on potential areas meeting the EBSA criteria is prepared and provided as inputs to CBD regional workshops or its own national process for EBSA description.

CBD regional EBSA workshops	Indigenous peoples and local communities will need to nominate an expert to participate in the regional workshop. This nomination will need to be sent to the Secretariat by the specified deadline, and can be done either by an indigenous organization, government, or non-governmental organization. The selection of participants will be based on the relevant experiences and expertise, and also depend on available financial resources. If translation is needed, this should be arranged in advance. At the workshop, the chair and participants can work to facilitate the meaningful participation of the indigenous participant, encourage consideration of TK, and ensure that all important information is considered in each EBSA description, as appropriate and possible.

The following section will look at each of these steps in further detail.

d. Preparation and synthesis of knowledge on the national level

The best way to ensure the integration of traditional knowledge into the EBSA process is to develop a strategy for its inclusion at the national level. This strategy will need to incorporate the necessary time to consult with indigenous peoples and local communities, ensure prior informed consent, and undertake the collection of the information with full and effective community participation. Time will also need to arrange for a participatory process for integration of traditional knowledge with science.

The work can be facilitated by a government department, a non-governmental organization, or a community organization, but it should be noted that national authorities have a responsibility to engage with indigenous peoples and local communities in an effective and meaningful way as part of their national EBSA preparatory processes.

The preparatory process of compiling traditional knowledge will have its best chance of success if all of the entities involved communicate with each other early in the process, and agree on common goals for EBSA descriptions. While there is no one correct model for integrating traditional knowledge into EBSA description at the national level, the following options exist:

- Synthesis of all published traditional knowledge relating to specific areas
- Collaborative research with indigenous peoples and local communities in collecting new information about areas of specific interest
- Holding workshops with traditional knowledge holders and scientific experts at the local (community) level and, possibly together with scientific experts, at the national level to consolidate existing information.

Some countries have already gone through the process of integrating traditional knowledge into their national processes for the description of EBSAs. There is much we can learn from these early experiences. For example, the case study below describes how the Government of Canada went about taking into account traditional knowledge in the EBSA process for their national waters. Note that they combined a number of different methods.

Integrating traditional knowledge into the Canadian EBSA process

In all of the EBSA processes undertaken in Canada's waters (four in total), Canada used several means to include traditional ecological knowledge (TEK) in the identification of EBSAs. As the working draft EBSA document and supporting data layers were gathered, all pertinent published TEK papers and reports (e.g., community conservation plans such as: http://www.eirb.ca/pdf/ccp/Inuvik_CCP.pdf) were reviewed and used as valid data in the same manner that published scientific literature was reviewed (Paulic et al., 2009). In some cases, further TEK data was gathered from community experts/knowledge holders to create additional data layers for review (Paulic et al., 2009, Hartwig 2009). In one case (Foxe Basin) EBSAs were finalized following a two-stage review process under the Canadian Science Advisory Secretariat (CSAS); the first gathered scientific data to propose EBSAs and the second built on these layers and incorporated TEK gathered at a formal workshop to finalize the identification and selection of EBSAs (DFO 2010). Therefore, both published TEK data and knowledge derived directly from the holders of TEK are included in the EBSA process as data layers. The recent process to identify EBSAs in Nunavut used published TEK data and did not hold separate workshops to gather additional layers (Cobb 2011, DFO 2011a). The process to finalize the selection of EBSAs included Inuit representatives, however it was noted that additional detailed knowledge was held by Inuit and would add to further refining boundaries of areas meeting the EBSA criteria. Once EBSAs were published as part of the formal CSAS process, they were presented to all communities for comment.

This case study was extracted from the final report of the CBD Arctic EBSA workshop (http://www.cbd.int/doc/meetings/mar/ebsaws-2014-01/official/ebsaws-2014-01-05-en.pdf)

Another case study, extracted from an EBSA description by the Inuit Circumpolar Council, describes a preparatory workshop that brought together traditional knowledge holders and scientists to work on an EBSA description.

Preparation of the Inuit Circumpolar Council submission to the CBD EBSA regional workshop for the Arctic

The North Water polynya is one of the largest polynyas in the Northern Hemisphere; it is also one of the most biologically productive regions north of the Arctic Circle.
The Pikialarsorsuaq/North Water Polynya Cooperation Workshop took place in Nuuk, Greenland in September 2013, with participation of hunters and scientists..
On 24 and 25 September 2013, more than 20 participants, including regional Canadian and Greenlandic representatives from communities that surround Pikialarsorsuaq/the North Water Polynya, and science community representatives, met at Inuit Circumpolar Council – Greenland's (ICC-Greenland) office in Nuuk to discuss the importance of this region. The goal was to identify common visions for the conservation of the area, which is important for biological productivity and hence for the indigenous communities around the area.
Hunters from the northwestern parts of Greenland and the northern parts of Baffin Island and Grise Fiord described observed changes in sea ice, snow conditions, and distribution and behaviour of the marine mammals. In addition, new species or subspecies have been recognized around the North Water during recent years.
The mixing of different water masses originating from the Atlantic and the Pacific, and their transformation along the journey in Arctic conditions, are contributing to the area's

extraordinarily high biological productivity. Water masses originating from the Pacific Ocean are driven through the Bering strait, around the Polar Sea with the polar gyre and through the Fram Strait to Pikialasorsuaq as surface water (<200m depth). Water masses from the Atlantic Ocean are driven in the deep layers through the Davis Strait along the west coast of Greenland, north towards Pikialasorsuaq. This mixing together of water masses, along with ice conditions makes the area up to ten times more biologically productive as other areas in the Arctic.

The high biological productivity is highly dependent on the formation of an ice bridge in Kane Basin. The ice bridge is a major determinant for the opening of the polynya, as the ice bridge and the predominant northerly wind are preventing ice floes from moving south over Pikialasorsuaq, leaving it open for light to reach the water and fuel the primary production. When the ice bridge is absent the productivity is much lower. Over the past two decades, the polynya occurrence and timing has changed significantly, affecting the timing, the localization and the intensity of the spring bloom.

For the North Water, several recent years show a decrease in periods of monthly mean sea ice coverage or earlier timing of ice breakup. As ice conditions are highly variable from year to year, overall trends are mostly noticeable when expressed as 10-year averages or when looking at adjacent areas in Kane Basin and Baffin Bay. While leading polar scientists have focused on the North Water in recent decades, the region has been recognized by Inuit for generations as a critical habitat. Indeed, Inuit use and occupation of Northeast Canada and Greenland is linked to the North Water and the abundance of marine life it supports.

Because both Inuit and scientists recognize the critical importance of the North Water Polynya, a compilation of information on potential areas meeting the EBSA criteria was prepared and provided as inputs to the CBD Arctic Regional Workshop to Facilitate the Description of Ecologically or Biologically Significant Marine Areas (3 to 7 March 2014).

This text has been adapted from the Inuit Circumpolar Council' submission of information to the CBD Arctic Regional Workshop. The submission is online in the report of the Arctic Regional Workshop to Facilitate the Description of Ecologically or Biologically Significant Marine Areas (3 to 7 March 2014)*, at https://www.cbd.int/doc/meetings/mar/ebsaws-2014-01/official/ebsaws-2014-01-05-en.pdf, page 37.*

e. Working with scientists and other participants during a regional EBSA workshop

Prior to each regional EBSA workshop, the CBD Secretariat issues a notification requesting relevant scientific information in support of the objectives of the workshop. The notification indicates that relevant scientific information can be submitted in two ways: (1) by using the EBSA information template provided with the notification, or (2) through another appropriate format, such as scientific articles, documents, datasets, maps or visual and audio information. Information should contribute to the description of ecologically or biologically significant marine areas through application of the EBSA criteria or other relevant criteria .

Submissions of proposals for specific sites described as EBSAs are meant to be submitted using the template provided by the Secretariat, which contains a table where the area is scored against the CBD EBSA criteria (see module 3 section b). At the present time, the template does not contain a specific location where information related to traditional knowledge could be incorporated. However, this information could be fit into the current format, or the template could be amended by the Secretariat in the future.

Annex 1 contains a copy of the template, with specific suggestions about places where TK could be incorporated.Participants in regional EBSA workshops consist mainly of scientists nominated by CBD National Focal Points or relevant organizations, and thus it is helpful for indigenous peoples and local community participants to have some scientific training, as well as experience in international policy settings and/or scientific workshops. Where this is not the case, it is a good idea to inform the chair of the workshop, as well as the CBD Secretariat, to ensure that special consideration is provided for the indigenous and local community participant to be able to make their comments. The chair will have to be considerate of the special needs of indigenous participants and make sure that they will have a chance to participate on an equal footing with the rest of the workshop. If translation is an issue, it is a good idea to arrange "whispering" translation well ahead of time. In addition, where special assistance is needed, it may be a good idea to partner the indigenous participant with a scientist that is familiar with the area and traditional knowledge issues to help with the transmission of information.

It will also be useful if the scientists participating in EBSA workshops are trained ahead of time on how to deal with traditional knowledge. This will eliminate some questions and confusion arising from cultural differences, and will make scientist more receptive to the integration of different types of knowledge.

f. Some final considerations related to the CBD EBSA process

The CBD EBSA description process is continuously evolving, with regional workshops identifying areas that meet the EBSA criteria, and with the CBD Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) and Conference of the Parties (COP) subsequently reviewing and considering the described areas. Thus it is likely the process will be refined in the future to further improve both the process and the informational content.

Some issues of particular importance to indigenous peoples and local communities are briefly discussed below. These are topics where future refinement by the CBD Conference of the Parties would likely be welcomed by communities.

Transboundary EBSAs

Considering EBSA descriptions that straddle the jurisdictions of several countries is currently difficult in workshops where countries wish to exclude their national EEZs from discussion. This issue is particularly problematic for indigenous peoples and local communities, whose traditional territories span national borders, and who therefore are further challenged in providing meaningful input. It is possible that the issue of improved consideration of transboundary areas at CBD workshops will be addressed by the CBD Parties at future SBSTTAs and COPs, and that, with Parties willing, a suitable solution can be found.

EBSA criteria and socio-economic information

Similarly, the issue of incorporating socio-cultural information may receive more attention in the future. At the present time, descriptions of areas meeting the EBSA criteria are evaluated against the CBD EBSA scientific criteria. In paragraph 25 of decision XI/17 the Conference of the Parties noted that criteria for the identification of areas in need of enhanced management measures due to their social and/or cultural significance may need to be developed, with appropriate scientific and technical rationales.

The lack of adopted social and cultural criteria presents a limitation to considering the human dimension of ecosystems, in accordance with the guidance of the Conference of the Parties on the ecosystem approach. It also limits the consideration of the implications for biodiversity related to cultural and spiritual practices and traditional management systems. Reciprocally, it also limits consideration of the impacts on cultural and spiritual practices by other uses of biodiversity and institutional management systems. Establishing a linkage between culture and biodiversity is important, given that healthy and productive marine and terrestrial ecosystems are the foundation of indigenous cultures, traditions and identities.

For example, the lack of socio-cultural criteria prevented participants at the Arctic EBSA workshop from considering available information on several types of areas that are of importance to indigenous peoples, such as customary use areas, areas of social and economic importance, cultural heritage sites, subsistence use areas and sacred sites.

There may be a need for two distinct categories of significant areas: one for socially and culturally significant areas and one for EBSAs. Further exploration is needed as to whether different processes and approaches would be needed to apply the two sets of criteria. Furthermore, since some areas will be significant according to both types of criteria, there is also a need, at some stage, to consider areas holistically, particularly when planning conservation and management measures.

Check for understanding

- Given your experience, how do you think EBSAs and the EBSA criteria would best be explained at the community level?
- If you were an indigenous and local community representative wanting to describe a specific area as an EBSA criteria using traditional knowledge, how would you go about it?

g. RELATED READING MATERIALS

Guidance relating to traditional knowledge:

WIPO Traditional Knowledge Documentation ToolKit:
http://www.wipo.int/export/sites/www/tk/en/resources/pdf/tk_toolkit_draft.pdf

University of the Arctic training module (Module 4) on traditional knowledge. Written by Gord Bruyere and Einar Bergland. Online at uarctic.org/Module_4_4fU4I.pdf.file

De Guchteneire, P., I. Krukkert, and G. von Liebenstein, eds. (2002) Best Practices on Indigenous Knowledge. UNESCO. Management of Social Transformations Programme (MOST) and the Centre for International Research and Advisory Networks (CIRAN)
http://www.unesco.org/most/bpikpub.htm

References used in this document:

ACIA (2005) Arctic climate impact assessment. Cambridge University Press. 1042 p. www.acia.uaf.edu

Alexander, C., Bynum, N., Johnson, E., King, U., Mustonen, T., Neofotis, P., Oettlé, N., Rosenzweig, C., Sakakibara, C., Shadrin, V., Vicarelli, M., Waterhouse, J. and Weeks, B. (2010). Linking indigenous and scientific knowledge of climate change. BioScience, 61(6): 477–84

Alfred, T. (2009). Peace, Power, Righteousness: An Indigenous Manifesto, 2nd edition. Don Mills: Oxford University Press.

Altman JC, Kerins S (2012) People on country: vital landscapes, indigenous futures. The Federation Press, Annandale

Armitage, D., Berkes, F., Dale, A., Kocho-Schellenberg, E. and Patton, E. (2011).

Co-management and the co-production of knowledge: learning to adapt in Canada's Arctic. Global Environmental Change, 21: 995–1004.

Aswani, S. and Hamilton, R.J. (2004) Integration indigenous ecological knowledge and customary sea tenure with marine and social science for conservation of bumphead parrotfish (*Bolbometopon muricatum*) in the Roviana Lagoon, Solomon Islands. Environmental Conservation 31: 69-83

Berkes, F., J. Colding, and C. Folke. (2000). Rediscovery of traditional ecological knowledge as adaptive management. Ecological Applications 10 : 1251–1262.
Berkes, F. (2012). Sacred Ecology, Third Edition. New York, Routledge

Booth, A. L. and Skelton, N. W. 2011. Improving First Nations' participation in environmental assessment processes: recommendations from the field. Impact Assessment and Project Appraisal 29(1): 49-58.

Brondizio, E.S. (2008). *Amazonian Caboclo and the Acai Palm: Forest farmers in the global market*. New York: The New York Botanical Garden Press.

Calamia, M.A. (1999) A methodology for incorporating traditional ecological knowledge with geographic information systems for marine resource management in the Pacific. SPC Traditional Marine Resource Management and Knowledge Information Bulletin #10 – February 1999. Online at http://www.spc.int/DigitalLibrary/Doc/FAME/InfoBull/TRAD/10/TRAD10_02_Calamia.pdf

Chalmers, N., and C. Fabricius. (2007). Expert and generalist local knowledge about land-cover change on South Africa's wild coast: Can local ecological knowledge add value to science? *Ecology and Society* 12: 10.

Coulthard, G. 2008. Beyond recognition: Indigenous self-determination as prefigurative practice, Chapter in Lighting the Eighth Fire: The Liberation, Resurgence, and Protection of Indigenous Nations, ed. L. Simpson, 187-204. Winnipeg: Arbeiter Ring Publishing.

Cullen, D., McGee, G., Gunton, T. I., and Day, J. C. 2010. Collaborative planning in complex stakeholder environments: An evaluation of a two-tiered collaborative planning model. Society and Natural Resources 23: 332-350.

Drew, J.A. (2005) Use of traditional knowledge in marine conservation. Conservation Biology 19(4): 1286-1293.

Ellis, S.C. (2005) Meaningful consideration? A review of traditional knowledge in environmental decision-making. Arctic 58 (1): 66-77. Online at http://arctic.journalhosting.ucalgary.ca/arctic/index.php/arctic/article/viewFile/390/422

Ericksen, P., Woodley, E. (2005) Using Multiple Knowledge Systems: Benefits and

Challenges. Chapter 5 of the Millennium Ecosystem Assessment. Online at http://www.maweb.org/documents/document.343.aspx.pdf

Gagnon, C.A., and D. Berteaux. (2009). Integrating traditional ecological knowledge and ecological science: A question of scale. *Ecology and Society* 14: 19.

Gibbs, L. M. (2010). ``A beautiful soaking rain'': environmental value and water beyond Eurocentrism. Environment and Planning D: Society and Space 28: 363-378.

Gilchrist, G., Mallory, M. and Merkel, F. (2005) Can local ecological knowledge contribute to wildlife management? Case studies of migratory birds. Ecology and Society, 10(1): 20.

Hay, K. (2000) Final report of the Inuit bowhead knowledge study. Nunavut Wildlife Management Board, Iqaluit, Nunavut, Northwest Territories, Canada.

Heaslip, R. (2008). Monitoring salmon aquaculture waste: the contribution of First Nations' rights, knowledge, and practices in British Columbia, Canada. Marine Policy 32: 988–96.

Heyman, W.D, Graham, R.T., Kjerfve, B. and Johannes, R.E. (2001) Whale sharks *Rhinocodon typus* aggregate to feed on fish spawn in Belize. Marine Ecology Progress Series 215: 275-282.

Hickey, F.R. and Johannes, R.E. (2002) Recent evolution of village-based marine resource management in Vanuatu. *SPC Traditional Marine Resource Management and Knowledge Information Bulletin*, No. 14, pp. 8–21. Available online at www.spc.int/coastfish/News/Trad/trad.htm

Hill, R., Grant, C., George, M., Robinson, C., Jackson, S., and Abel, N. 2012. A typology of Indigenous engagement in Australian environmental management: Implications for knowledge integration and socialecological system sustainability. Ecology and Society 17(1): [online].

Huntington, H. P. (1989) The Alaska Eskimo Whaling Commission: effective local management of a subsistence resource. Thesis. Scott Polar Research Institute, University of Cambridge, UK

Huntington, H.P. (2000) using traditional ecological knowledge in science: methods and applications. Ecological Applications, 10(5), 2000, pp. 1270–1274. Online at http://www.web.uvic.ca/~darimont/wp-content/uploads/2012/12/Huntington-2000-TEK-and-SCI.pdf

IPACC (2008) African Indigenous Peoples Workshop on effective use of Information Communication Technology (ICTs) in environmental advocacy. Windhoek, Nambia, 26-28 August 2008. Online at http://www.ipacc.org.za/uploads/docs/Windhoek_English_Second_Edition_Web.pdf

Jit, J.N. (2007) Status of sea turtle conservation in Fiji: An assessment of the international, regional and national focus. A supervised research project presented in partial fulfilment of the degree of Master in Arts (Marine Studies). School of Marine Studies, University of South Pacific.

Johannes, R.E. (1978) Traditional marine conservation methods in Oceania and their demise. Annual Review of Ecology and Systematics 9: 349-64.

Johannes, R.E. (1981) Working with fishermen to improve coastal tropical fisheries and resource management. Bulletin of Marine Science 31: 673-680.

Johannes, R.E., Squire, L, Granam, T., Sadovy, Y. and Renguul, H. (1999) Spawning aggregations of groupers (Serranidae) in Palau. The Nature Conservancy, Brisbane, Australia

Johannes, R.E. and Neis, B. (2007). The value of anecdote. In: N. Haggan, B. Neis and I.G. Baird (eds.) Fishers' Knowledge in Fisheries Science and Management. Paris, UNESCO Publishing, pp. 41–58

Laidler, G.J. (2006). Inuit and scientific perspectives on the relationship between sea ice and climate change: The ideal complement? *Climatic Change* 78: 407–444.

Mackinson, S. (2001). Integrating local and scientific knowledge: An example in fisheries science. *Environmental Management* 27: 533–545.

Maynard, N.G., Yurchak, B.S., Sleptsov, Y.A., Turi, J.M. and Mathiesen, S.D. 2005. Space Technologies for Enhancing the Resilience and Sustainability of Indigenous Reindeer Husbandry in the Russian Arctic, Proceedings of the 31st International Symposium on Remote Sensing of Environment, Global Monitoring for Sustainability and Security. 20–24 June 2005. St. Petersburg, Russia

Memon, P. A. and N. Kirk. 2012. Role of indigenous Maori people in collaborative water governance in Aotearoa/New Zealand. Journal of Environmental Planning and Management 55(7): 941-959

MEA (2005) The Millennium Ecosystem Assessment. Online at http://www.maweb.org/en/index.aspx

Moller, H., Berkes, F., Lyver, P.O. and Kislalioglu, M. 2004. Combining science and traditional ecological knowledge: monitoring populations for co-management.

Ecology and Society, 9(3): 2, www.ecologyandsociety.org/vol9/iss3/art2

Nakashima, D. J. (1990) Application of native knowledge in EIA: Inuit, eiders, and Hudson Bay oil. Canadian Environmental Assessment Research Council, Ottawa, Ontario, Canada

Nakashima, D. J., and D. J. Murray (1988) The common eider (Somateria mollissima sedentaris) of Eastern Hudson Bay: a survey of nest colonies and Inuit ecological knowledge. Environmental Studies Revolving Fund, Report No. 102, Ottawa, Ontario, Canada

Newman, J. and Moller, H. (2005) Use of Matauranga (Maori Traditional Knowledge) and Science to Guide a Seabird Harvest: Getting the best of both worlds? Senri Ethnological Studies 67: 303-321. Online at http://camel.minpaku.ac.jp/dspace/bitstream/10502/1091/1/SES67_017.pdf

OCEANA and Kawerak (2014) Bering Strait – Marine life and subsistence use data synthesis. Online at http://oceana.org/sites/default/files/final_pdf_bering_strait_synthesis_july_30_2014_0.pdf

Raymond, C. M., Fazey, I., Reed, M. S., Stringer, L. C., Robinson, G. M., & Evely, A. C. (2010). Integrating local and scientific knowledge for environmental management. *Journal of environmental management 91*(8), 1766-1777.

Sala, E., Ballesteros, E. and Starr, R.M. (2001) Rapid decline of Nassau grouper spawning aggregations in Belize: fishery management and conservation needs. Fisheries 26: 23-30.

Simpcw First Nation. 2010. Simpcw Water Declaration, Signed August 16, 2010. Unpublished

Smylie, J., Martin, C., et al. (2004) Knowledge translation and indigenous knowledge. International Journal of Circumpolar Health. Vol. 63.

Stacey, N., Karam, J. Dwyer, D., Speed, C. and Meekan, M. (2007) Assessing traditional ecological knowledge of whale sharks (*Rhincodon typus*) in Eastern Indonesia: A pilot study with fishing communities in Nusa Tenggara Timur. Report prepared for the Department of the Environment, Water, Heritage and the Arts, Canberra, Australia.

Tawake, L., Thomsen, D., Carter, B., Hill, R. (2011) Indigenous Learning Approaches for/from Sea Country. Queensland Coastal Conference. 2011. Online at http://www.qldcoastalconference.org.au/2011/Tawake_et_a_057l.pdf

Tengö M. and Malmer P. (eds), Borraz P, Cariño C, Cariño J, Gonzales T, Ishizawa J, Kvarnström M, Masardule O, Morales A, Nobrega M, Schultz M, Soto Martinez R, Vizin a Y. 2012. Dialogue workshop on Knowledge for the 21st Century:

Indigenous knowledge, traditional knowledge, science and connecting diverse knowledge systems. Usdub, Guna Yala, Panama, 10-13 April 2012. Workshop Report. Stockholm Resilience Centre. Online at http://www.dialogueseminars.net/resources/Panama/Reports/Panama-report_Enlish_small.pdf

Tengö, M., Brondizio, E.S., Elmqvist, T., Malmer, P. and Spierenburg, M. (2014) Connecting Diverse Knowledge Systems for Enhanced Ecosystem Governance: The Multiple Evidence Base Approach. Ambio 1-13. Online at http://link.springer.com/article/10.1007/s13280-014-0501-3/fulltext.html#Sec6

Turner, D. 2006. *This Is Not a Peace Pipe: Towards a Critical Indigenous Philosophy*. Toronto: University of Toronto Press.

Turner, N. J., M. B. Ignace, and R. Ignace. 2000. Traditional ecological knowledge and wisdom of Aboriginal peoples in British Columbia. Ecological Applications 10(5): 1275-1287.

Van de Velde, R., Stirling, I. and Richardson, E. (2003) Polar bear (*Ursus maritimus*) dinning in the area of Simpson Peninsula, Nunavut. Arctic 56: 191-197.

von der Porten, S. and de Loë, R.C. 2013. Collaborative approaches to governance for water and Indigenous peoples: a case study from British Columbia, Canada. Geoforum, 50: p.149-160

Annex 1

SUGGESTIONS ON HOW TO INCORPORATE TRADITIONAL KNOWLEDGE INTO THE CBD EBSA TEMPLATE

Note that titles of information to be included in the template are in bolded, and explanations by the Secretariat are in italics. Proposals on how to incorporate traditional knowledge-related information are in underlined bolded italics.

Template for Submission of Scientific Information to Describe Ecologically or Biologically Significant Marine Areas

*Note: Please **DO NOT** embed tables, graphs, figures, photos, or other artwork within the text manuscript, but please send these as separate files. Captions for figures should be included at the end of the text file, however.*

Title/Name of the area:

Presented by (*names, affiliations, title, contact details)*

Abstract (*in less than 150 words)*

<u>The abstract can provide a summary of all information presented, including that related to traditional knowledge and science.</u>

Introduction

(To include: feature type(s) presented, geographic description, depth range, oceanography, general information data reported, availability of models)

<u>The introduction could provide an overview of indigenous peoples and local communities that live and depend on the area, and their views of the importance of the area or feature being described, as well as their observations about that feature.</u>

Location

(Indicate the geographic location of the area/feature. This should include a location map. It should state if the area is within or outside national jurisdiction, or straddling both. It should also state if the area is wholly or partly in an area that is subject to a submission to the Commission on the Limits of the Continental Shelf)

<u>The location information could also include information about how indigenous peoples view the area</u>.

Feature description of the proposed area

(This should include information about the characteristics of the feature to be proposed, e.g. in terms of physical description (water column feature, benthic feature, or both), biological communities, role in ecosystem function, and then refer to the data/information that is available to support the proposal and whether models are available in the absence of data. This needs to be supported where possible with maps, models, reference to analysis, or the level of research in the area)

This section could be based on a combination of science and traditional knowledge, including observations by indigenous peoples and local communities about status and trends of the species or ecosystem in question, habitat types, as well as ecological linkages.

Feature condition and future outlook of the proposed area

(Description of the current condition of the area – is this static, declining, improving, what are the particular vulnerabilities? Any planned research/programmes/investigations?)

In this section it would be particularly useful to include long-term indigenous observations about the area, including environmental changes observed.

Assessment of the area against CBD EBSA Criteria

(Discuss the area in relation to each of the CBD criteria and relate the best available science. Note that a candidate EBSA may qualify on the basis of one or more of the criteria, and that the boundaries of the EBSA need not be defined with exact precision. And modeling may be used to estimate the presence of EBSA attributes. Please note where there are significant information gaps)

This section could include rankings of features undertaken together with indigenous peoples and local communities and can include traditional knowledge in the "explanation" section.

CBD EBSA Criteria (Annex I to decision IX/20)	**Description** (Annex I to decision IX/20)	**Ranking of criterion relevance** (please mark one column with an X)			
		Don't Know	**Low**	**Medium**	**High**
Uniqueness or rarity	Area contains either (i) unique ("the only one of its kind"), rare (occurs only in few locations) or endemic species, populations or communities, and/or (ii) unique, rare or distinct, habitats or ecosystems; and/or (iii) unique or unusual geomorphological or oceanographic features.				
Explanation for ranking					
Special	Areas that are required for a population to				

importance for life-history stages of species	survive and thrive.				
Explanation for ranking					
Importance for threatened, endangered or declining species and/or habitats	Area containing habitat for the survival and recovery of endangered, threatened, declining species or area with significant assemblages of such species.				
Explanation for ranking					
Vulnerability, fragility, sensitivity, or slow recovery	Areas that contain a relatively high proportion of sensitive habitats, biotopes or species that are functionally				
Explanation for ranking					
Biological productivity	Area containing species, populations or communities with comparatively higher natural biological productivity.				
Explanation for ranking					
Biological diversity	Area contains comparatively higher diversity of ecosystems, habitats, communities, or species, or has higher genetic diversity.				
Explanation for ranking					
Naturalness	Area with a comparatively higher degree of naturalness as a result of the lack of or low level of human-induced disturbance or degradation.				
Explanation for ranking					

Sharing experiences and information applying other criteria (Optional)

Other Criteria	**Description**	**Ranking of criterion relevance** (please mark one column with an X)			
		Don't Know	**Low**	**Medium**	**High**
Add relevant criteria					
Explanation for ranking					

References

(e.g. relevant documents and publications, including URL where available; relevant data sets, including where these are located; information pertaining to relevant audio/visual material, video, models, etc.)

The references can include various traditional knowledge sources, including published papers, reports (either published or unpublished) and information collected through interviews.