Conducting and Communicating Ethnobotanical Research

A METHODS MANUAL
MedPlant: Phylogenetic Exploration of Medicinal Plant Diversity is a 4-year Marie Curie Initial Training Network (ITN) supporting a new generation of science researchers in biodiversity driven drug lead discovery. It is funded by the European Union under the Seventh Framework Programme and coordinated by the University of Copenhagen. Please visit medplant.eu for more information.

This Methods Manual was developed as part of the 1st MedPlant Summer School on Conducting and Communicating Ethnobotanical Research, which took place in Kasbah Angour, Tahanaout and surrounding areas of the High Atlas Mountains in Morocco, 9-17 September 2014.

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Acknowledgements

This Methods Manual was created for the MedPlant Project with funding from the European Union’s Seventh Framework Programme for research, technological development and demonstration, grant agreement no. 606895.

Morocco, February 2015
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List of Acronyms

BRAHMS  Botanical Research and Herbarium Management System
CBD  Convention on Biological Diversity
CITES  Convention on the International Trade of Endangered Species
FPIC  Free, Prior and Informed Consent
IGC  Intergovernmental Committee on Intellectual Property and Genetic Resources, Traditional Knowledge and Folklore
ILO  International Labour Organisation
ISE  International Society for Ethnobiology
IUCN  World Conservation Union
SIS  IUCN Species Information System
SSC  IUCN Species Survival Commission
WIPO  World Intellectual Property Organisation
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Introduction

Ethnobotany\(^1\), the study of the relationship between people and plants, straddles a significant divide in the realm of scientific inquiry. It lies – epistemologically, theoretically, and methodologically – between the social and the natural sciences, and draws upon qualitative and quantitative research methods. Given their need to understand both social and natural worlds, and their inter-relationships, ethnobotanists are often found at the forefront of a growing trend in academia aiming to overcome these arid, yet enduring, disciplinary divisions.

In this manual you will find both social and natural scientific approaches, each presenting qualitative and quantitative methods, to help you deepen your research approach. In chapter two, you will learn how to gather data on local knowledge about plant species’ ecology, properties and uses, and on how people think about, classify, and transmit knowledge of plants. You will also learn how to carry out ethnographic research, participatory mapping, and market-based ethnobotanical research, amongst others. In chapter three, you will learn how to collect plant specimens in the field, access and use important plant specimen databases, and assess the conservation status of the species of plants you are interested in. The methods presented in these chapters are drawn from a diversity of disciplines and approaches, and you are encouraged to pick and choose the methods and tools that most suit your research purpose and your personal preferences.

As true all-rounders, ethnobotanists must also learn how to master at least two non-academic arts. The first is how to engage ethically and legally with the communities with which they work. This includes learning how to navigate the complex maze of international agreements surrounding traditional knowledge and genetic resources, ethics and best practice, rights and permits. The first chapter of this manual outlines the key principles for ethical work with communities as well as the key international agreements that ethnobotanists must adhere to in their work.

The second important art ethnobotanists will learn in this manual is that of communicating their research and its results effectively and engagingly. Too often, the important work of scientists remains invisible to the greater public – or even to their fellow scientists – simply because it is ineffectively communicated. In the last chapter of this manual we present some ideas for powerfully communicating your scientific output to a broad public, including using innovative features of Web 2.0.

One of the main aims of this manual is to put those interested in implementing ethnobotanical research at ease with the large and diverse methodological toolbox at their disposal. It is designed to make its readers comfortable implementing any kind of method, no matter their disciplinary background. We hope that it will be of use and we look forward to hearing from you about how we could improve the manual. If you do have comments, please contact Emily Caruso (Emily@global-diversity.org) or Gary Martin (gary@global-diversity.org).

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\(^1\) Note that in this manual, we keep the specialism ethnobotany given that we are speaking very specifically of research on plants. However, most of the manual’s guidance is relevant to students of ethnobiology writ large.
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The relationship between people and plants is a knotty interweaving of spiritual, emotional, political, social, cultural and biological strands. Ethnobotanical research focuses the lens on those intricate interrelationships. This is sensitive work: navigating the ethical and practical complexities requires training, mindfulness, patience and understanding. In this chapter we provide some of the basic guidelines, rules and tools for you to practice research according to the highest ethical standards and in line with current international and national agreements, laws and practice.

Ethnobotanists were not always so concerned with ethics, as Eugene Hunn (2007) describes in his article on the phases of ethnobiology. Until the 1950s, ethnobiology was essentially a utilitarian science – it focused primarily on finding plants or other natural resources that might be of use to the Western scientist, even if early ethnobiologists also took careful note of the ritual, aesthetic and other aspects of peoples' relationships with plants. The following 30 years saw ethnobiology concentrate on the cognitive and linguistic aspects of the people-plant relationship and on the link between Traditional Ecological Knowledge and management practices. In the late 1980s, ethnobiology was increasingly accused of facilitating the exploitation of indigenous peoples – and especially their knowledge and resources – by multinational corporations and governments. Under the intellectual leadership of scholars such as Darrell A. Posey, the founder of the International Society for Ethnobiology (ISE) and father of its Code of Ethics, ethnobiology began a period of internal transformation, starting with the Declaration of Belém in 1988 and proposals for an ethnobiology that is done by and for communities.

The Declaration of Belém was crafted at the first Congress of the International Society for Ethnobiology, held in Belém, Brazil in 1988. It calls for ethnobiologists to consult with indigenous peoples prior to carrying out research that affects their knowledge and resources, to respond to communities’ needs, to respect their rights and to support their own endogenous processes for protecting and maintaining their knowledge and resources. The Declaration’s resolutions were then reworked by the ISE’s Ethics Committee, emerging as the core Principles of the current ISE Code of Ethics (see Box 1). These are some of the highest standards for engaging in research with indigenous peoples and the sine qua non of ethnobiologists’ code of conduct.

**BOX 1: The International Society for Ethnobiology’s Code of Ethics**

The International Society for Ethnobiology (ISE) has developed some of the highest standards in research ethics in the form of its Code of Ethics. It is available from the website (http://ethnobiology.net/code-of-ethics/) in several languages, and is in a constant process of amelioration. All social researchers, whether they use qualitative or quantitative approaches, are encouraged to adhere to these standards, which were co-drafted with members of communities that
have historical experience of “being researched.” The Code of Ethics proposes that all ethnobiological research should be ‘collaborative’; it establishes a community-centred approach, and calls for all research to strengthen community goals.

The fundamental value underlying the ISE’s Code of Ethics is the concept of mindfulness, which signifies “a continual willingness to evaluate one’s own understandings, actions, and responsibilities to others.” This value reflects the recent transformations in ethnographic practice, which require the researcher to be highly self-reflexive, flexible and politically engaged. Beyond mindfulness, the most important principles of any ethnographic research are the following (these points summarise and expand on some of the principles of the ISE Code):

1. Recognition of rights: This includes communities’ and peoples’ inalienable rights to their territories and resources, to self-determination, to their customary laws and practices, to the protection of their cultural and spiritual values, to their intellectual property and associated biological and genetic resources, and to respect as knowledge-holders and landowners. Communities are therefore the ultimate decision-makers regarding any research carried out on their lands or among their people, and their own modes of decision-making must be respected at all times.

2. Free, prior and informed consent: Prior to starting any research activity, communities that are likely to be involved must be fully informed of the activities proposed and have the right to refuse the proposed activity. Should they accept the proposed research, they have the right to be involved in decision-making throughout the research cycle, and they must be active participants in any research programme. See also Box 4 on the free, prior and informed consent process.

3. Active participation, and beyond: People involved in the research should not only be active participants in any research activity carried out in their lands and communities (in its design, implementation and analysis), but ideally should be key actors in the development of research ideas. Researchers should prioritise the research needs and ideas of the communities they seek to work with, and seek to shift away from leadership of research programmes towards becoming advisors or facilitators for community-led research programmes.

4. Trust and disclosure: The communities participating in the research must fully understand the ultimate goal of the research and how it will be used, therefore the latter must be presented in ways that community members can understand and transmit information among themselves. Much like with Free, Prior and Informed Consent, researchers must discuss any change in the research, how data is being analysed, used and presented throughout the project cycle, and community members have the right to disagree, request changes throughout the process, or even call a halt to it in extreme circumstances.

5. Privacy, confidentiality, and anonymity: In the context of ethnography, these elements are particularly important. Researchers must always be mindful of issues of individual privacy in the context of the group: e.g. they should never report people’s interview responses without the latter’s specific consent. They must also always respect group confidentiality, which means that communities have the ultimate say regarding what information can be published or not. When publishing articles, books or reports, researchers must respect individuals’ and communities’ rights to remain anonymous, and if necessary, must create pseudonyms or writing styles that protect peoples’ and communities’ identities.

6. Reciprocity, equitable benefit-sharing, and active support: Social researchers increasingly seek to embrace the principle of ‘do no harm’ and go beyond it, aiming instead for positive and useful outcomes for their research among the communities with whom they work. Any
benefits from the research must be properly shared in a way that respects community customs and decision-making processes. While always acknowledging the support and participation of community members in research processes, researchers must find ways of ensuring that they give something back to the communities and individuals they have worked with, in a form chosen by community members according to their customary decision-making processes.

**Intellectual property rights and indigenous peoples**

Indigenous knowledge, language, inventions and traditions have a long history of being utilized for commercial, medical, or artistic ends. In the context of ethnobotanical research, bioprospecting – the process of ‘discovering’ biological compounds for the preparation of products for commercial use – is well known. In some cases, bioprospecting has transformed into biopiracy, where indigenous knowledge and associated genetic resources are taken without the knowledge-holder’s permission for commercial purposes (see Box 2). Such acts of biopiracy have often relied on ethnobotanical leads to gain access, putting ethnobiologists in the spotlight (Posey and Dutfield 1996; Kloppenburg 1991).

**BOX 2: The Hoodia case**

The case of Hoodia is a well-known example of how bioprospecting can take on the disagreeable mantle of biopiracy. The San indigenous people of Southern Africa have, arguably for millennia, used the succulent plant *Hoodia gordonii* as a natural appetite and thirst suppressant used during prolonged drought (Chennells 2012). Ethnobotanical information on the San peoples’ use of this plant led the South African Council for Scientific and Industrial Research (CSIR) to carry out research on it without seeking prior informed consent from the San.

After almost 30 years of confidential research, in 1995, the CSIR applied for a patent on the active (appetite-suppressing) components of the plant, and shortly thereafter signed a licensing agreement with a British pharmaceutical company (Phytopharma) for further development of Hoodia for the diet/anti-obesity market, sub-licensing the patent to Pfizer and then Unilever. In 2001, the San actively challenged the patent, claiming that the molecular components had been discovered thanks to their traditional knowledge yet this had been taken without their free, prior and informed consent. Rather than demand a revocation of the patent, the San – through their representative organisations – entered into negotiations with CSIR followed by a benefit-sharing agreement whereby they would receive 6-8% of royalties for the sale of Hoodia products. In 2010 Unilever/Phytopharma relinquished patent rights to Hoodia given potentially problematic side effects of the compound. Currently the CSIR holds the patent and is seeking to develop commercial products themselves.

Further reading: Vermeylen 2010; Foster 2011; Chennells 2012

Over the course of the past 30 years, indigenous organisations and lawyers have increasingly challenged the liberties taken with their intangible and collective biocultural heritage and intellectual property rights. At the international level, the two principal fora for discussion and negotiation surrounding Indigenous intellectual property are the Convention on Biological Diversity (CBD) – specifically the work programmes on Article 8(j) and Access and Benefit-sharing – and the World

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2 Wikipedia has quite an exhaustive page detailing the various declarations made by indigenous groups on the topic of indigenous peoples’ intellectual property rights ([http://en.wikipedia.org/wiki/Indigenous_intellectual_property](http://en.wikipedia.org/wiki/Indigenous_intellectual_property)).
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The Intellectual Property Organisation (WIPO), which since 2001 has hosted the Intergovernmental Committee on Intellectual Property and Genetic Resources, Traditional Knowledge and Folklore (IGC), to discuss these issues.

One of the principal difficulties arising at the intersection of indigenous knowledge and intellectual property law is the latter’s rooting in European ontologies, epistemologies and legal frameworks. Indigenous peoples claim that their knowledge, traditions, artistic expressions, and associated practices are indivisible, and that this body of collective biocultural heritage is connected to all aspects – spiritual, intellectual, physical, emotional, cultural, social, economic, political, etc. – of their individual and collective lives. Furthermore, this intangible cultural heritage cannot be understood as ‘owned’ or ‘invented’ by a particular person or group, as indigenous peoples often define themselves as custodians of knowledge and resources that have been bestowed upon them through spiritual means.

Take the example of Ayahuasca, the hallucinatory beverage made from the vine Banisteriopsis caapi, usually mixed with a species of the genus Psychotria that contains dimethyltryptamine (DMT) in order to obtain the hallucinogenic effect. Ayahuasca is taken all over the Amazon region in Latin America: no one indigenous group can claim to be the ‘inventor’ of the brew or the origin of knowledge pertaining to the plants (in fact, most Amazonian peoples claim the plant itself is the source of knowledge about its use). Amongst indigenous peoples, Ayahuasca is almost always taken in a ritual context, i.e., plant knowledge is inseparable from cultural, spiritual, and even artistic practices. Moreover, knowledge and use of Ayahuasca is also fundamentally rooted in specific (and ethnically distinct) social and political organisations.

How would European intellectual property law, structurally dependent on functional compartmentalization and reduction to the smallest possible part, ever engage with the protection of indigenous knowledge relating to Ayahuasca? Interestingly, a US entrepreneur obtained a patent on the vine in 1986, which was vigorously contested by Amazonian indigenous groups; eventually the patent expired in 2003. Often plants and knowledge of ethnopharmacological interest are embedded in similarly complex and overlapping social, political and cultural systems, and it is important for ethnobiologists to be aware of the knotty landscape of intellectual property rights if they are to carry out research on indigenous peoples’ knowledge and associated plant genetic resources.

The consequence of these complexities is currently inadequate protection for indigenous knowledge at national and international levels. Some of the ongoing issues, as listed by Anderson (2010) are:

- Developing definitions and descriptions of what needs to be protected;
- Identifying owners, custodians and/or other parties responsible for the management of indigenous knowledge;
- What the nature of the protection should entail;

http://www.ciel.org/Bio/ayahuascapatentcase.html
• What the scope of the rights should be;
• What the duration of any protection should be;
• What role, if any, would government agencies or other authorities have;
• What the relationship with the conventional intellectual property system should be;
• Whether protection should be retro-active and what transitional measures would need to be developed;
• The relationship between international and national protection; and,
• How foreign rights holders and other beneficiaries are to be recognized.

Indigenous peoples are increasingly present at the negotiating table at WIPO and the CBD, and even though they have no vote in decisions, they have been gradually gaining influence in discussions surrounding intellectual property. A great deal of reflection has gone in to the development of appropriate instruments for the protection of indigenous intellectual property, although there exists no single conclusive approach for protecting indigenous peoples’ intellectual property. (See Anderson 2010 for a comprehensive review of all currently used approaches to protecting indigenous peoples knowledge and genetic resources, as well as future directions.)

Ultimately, each community or indigenous group must choose an approach that best suits their needs and aspirations, whether it is found within the current IPR framework, has been developed according to private law frameworks or is entirely their own system. The ethnobotanist will either have to respect each community’s decision (see Box 6) regarding the protection of their knowledge and resources or, in the case that no such framework is in place, should work with community members and authorities to devise an approach that is acceptable to the community in the context of the research proposed.

International agreements surrounding traditional knowledge, genetic resources, and indigenous peoples’ rights

In this section we provide background on some of the principal international agreements that provide standards for best practice in ethnobotanical research and for engaging with indigenous peoples and local communities.

United Nations Convention on Biological Diversity

The world’s biodiversity is concentrated in the tropics. For researchers in the northern hemisphere in particular, this may mean that the ecosystems or organisms of interest are found at some considerable distance from their home institute. Since many of the world’s most biodiverse regions are also the most threatened (‘hotspots), conservation concerns also often apply. There are various ethical and legal considerations for obtaining plant material for research, both at home and in other countries. The Convention on Biological Diversity is the major international legal framework for biologists.
The Convention on Biological Diversity (CBD, cbd.int) addresses the importance of the world’s biological resources for development, and the need for these resources to be harnessed in a sustainable way that allows development without threatening or compromising biodiversity, or the Earth. The CBD was developed by the United Nations Environment Programme (UNEP) and came into effect in 1993. It is a legally binding agreement among 194 party countries; the main objectives are the conservation and sustainable use of biodiversity, and fair and equitable sharing of benefits arising from the use of biological resources. Under the CBD, countries have sovereign rights to their biological resources and are obliged to implement measures for the conservation and sustainable use of biodiversity, as well as being entitled to fair benefits from its use. In this way, the CBD recognises the historical imbalance between entities (nations, corporations) that have benefited from the extraction and use of biological resources and the places of origin of these resources. The CBD acknowledges that many countries with rich biological resources may be economically poor and possibly vulnerable to exploitation, and advocates natural capital as a means to reducing poverty.

Member parties implement the CBD in different ways to meet its objectives. The most recent update to the CBD, the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization (henceforth Nagoya Protocol), came into effect in October 2014. It seeks to help Parties comply with the objectives of the CBD by introducing new requirements for the legal use of biological resources. For researchers studying biodiversity, translating the CBD into practice means working in ways that contribute to the objectives of the CBD.

The two main focus points of the Nagoya Protocol are procedures for obtaining ‘prior informed consent’ and agreeing ‘mutually beneficial terms’ before starting any research activity, which involves biodiversity. In addition, it emphasises the importance of observing national and international conservation laws, applying best practice to fieldwork and avoiding any negative impacts to biodiversity. As a rule, researchers are obliged to work in the spirit, as well as the letter, of the CBD.

‘Prior informed consent’

Obtaining permissions before accessing or using biological resources is essential for CBD compliance. In a research context, prior informed consent is usually obtained as permits from various regulatory authorities to undertake research, collect plant material, take photographs, record data, etc. Multiple permits may be required to cover all these activities, particularly if species are of conservation concern or a geographical region is specially protected.

Threat status influences levels of conservation protection and permissions required to access or collect plant material. Besides national conservation priorities and agendas, the IUCN Red List (redlist.org) is a useful global tool for understanding threat status, while the Convention on International Trade in Endangered Species (CITES, cites.org) affords additional protection to endangered species. CITES is implemented by national CITES authorities, and permits are required to move any species listed on the CITES Appendices across international borders, and the level of restrictions to plant parts and volumes of material allowed to be moved across borders is influenced...
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by the CITES Appendix on which a species is listed. Additional permissions, such as phytosanitary certificates and material transfer agreements, may also be required before starting a research project.

‘Mutually agreed terms’

Mutually agreed terms ensure that a study benefits both the researcher and local stakeholders fairly, in ways agreed to beforehand. A stakeholder analysis will reveal the institutes and individuals who are likely to benefit from proposed field studies, such as local herbaria or botanic gardens and conservation bodies, as well as local scientists, students, curators, and conservation officials. Discussions with these stakeholders will reveal realistically deliverable benefits from the proposed research. For example, a visiting researcher may share data, give a seminar, teach and participate in other opportunities for knowledge exchange, deliver training or coaching in specific methods or approaches, and offer co-authorship or acknowledgements in publications arising from the study. Working collaboratively with local experts is arguably the most effective way to secure reciprocal benefits that meet the requirements of the CBD and achieve proposed scientific results.

Because the Nagoya Protocol is mainly concerned with benefit sharing between states, ‘prior informed consent’ and ‘mutually agreed terms’ tend to focus on outside actors’ relationships with government authorities rather than knowledge-holding communities. The Nagoya Protocol does engage with the obligation to obtain prior informed consent and to establish mutually agreed terms with communities whose traditional knowledge or genetic resources are of interest (see Box 3 for an in-depth examination of indigenous peoples’ right to free prior and informed consent). It does so principally through its support for community protocols (Jonas et al. 2010). However, any rights indigenous and local communities may have under the Nagoya Protocol are first and foremost subject to national legislation, which rarely reaches the level of protection afforded indigenous peoples by other international treaties and agreements such as the United Nations Declaration on the Rights of Indigenous Peoples.
In addition to the Nagoya Protocol, Article 8(j) of the Convention is an important landmark in the landscape of ethical research. This article provides that each party "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”. Article 8(j) therefore advocates for engaging in a process of free prior and informed consent with indigenous and local communities when carrying out research on traditional knowledge (see below). *Free prior and informed consent* in this context is not quite the same as the ‘prior informed consent’ (PIC) that the Nagoya Protocol requires. Effectively, PIC in the latter case refers first and foremost to the *nation-state* where the genetic resource and associated knowledge is found, rather than the original indigenous/community owners of the genetic resource or knowledge-holders. Ethical best practice requires free, prior and informed consent from indigenous or community-based knowledge holders and resource owners, as well as PIC from the nation-state.

Under the aegis of the work programme on Article 8(j), the *Tkarihwaé:ri code of ethical conduct to ensure respect for the cultural and intellectual heritage of indigenous and local communities* was established. The Tkarihwaé:ri code of conduct was adopted at the Tenth Conference of the Parties to the CBD (October 2010). The Tkarihwaé:ri code has a sister instrument prepared under the work programme on Article 8(j) *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* or – more simply – the Akwé-kon Guidelines. These two sets of guidelines complement each other, and can be read and applied in conjunction. It is important to note that these two instruments do not represent the very best practice, given that the standards of the ISE’s Code of Ethics are much higher.

*United Nations Declaration on the Rights of Indigenous Peoples*

The United Nations Declaration on the Rights of Indigenous Peoples (2007) is another important milestone in the path towards ethical research practice. While not legally binding, UNDRIP represents “the dynamic development of international legal norms and reflect the commitment of states to move in certain directions”. It also constitutes a very important standard for the treatment of indigenous peoples, one that is increasingly used by diverse actors to call for eliminating human rights violations and combating discrimination and marginalization of indigenous peoples. Given that it is the culmination of an “extraordinary process that fundamentally transformed the status of indigenous peoples under international law”, it has been argued that the non-legally binding status of the Declaration does not reduce its value or its ability to generate conformity by States (Barelli 2009: 957).

Article 31 of the Declaration is perhaps the most important article in the context of ethnobotanical research as it pertains to protection for indigenous peoples knowledge and practices.

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Article 31. Indigenous peoples have the right to maintain, control, protect and develop their cultural heritage, traditional knowledge and traditional cultural expressions, as well as the manifestations of their sciences, technologies and cultures, including human and genetic resources, seeds, medicines, knowledge of the properties of fauna and flora, oral traditions, literatures, designs, sports and traditional games and visual and performing arts. They also have the right to maintain, control, protect and develop their intellectual property over such cultural heritage, traditional knowledge, and traditional cultural expressions.

The following articles are also fundamental for ethnobotanists carrying out research with indigenous peoples to be aware of:

Article 3. Indigenous peoples have the right to self-determination. By virtue of that right they freely determine their political status and freely pursue their economic, social and cultural development.

Article 4. Indigenous peoples, in exercising their right to self-determination, have the right to autonomy or self-government in matters relating to their internal and local affairs (…).

Article 18. Indigenous peoples have the right to participate in decision-making in matters which would affect their rights, through representatives chosen by themselves in accordance with their own procedures, as well as to maintain and develop their own indigenous decision-making institutions.

These articles establish the ground rules for engaging with indigenous communities. Self-determination is a fundamental right, and it means that indigenous communities are entitled to collectively and autonomously decide exactly what happens in their communities and territories. Researchers are therefore not to interfere with local decision-making processes, or attempt to coerce or force decisions in any way. By virtue of their right to self-determination, indigenous peoples are also entitled to give or withhold their consent to any proposal made for activities or research to be carried out in their communities or territories, and to provide (or not) this consent following appropriate processes and respecting customary law (see Box 4 on Free, Prior and Informed Consent).

Article 25 Indigenous peoples have the right to maintain and strengthen their distinctive spiritual relationship with their traditionally owned or otherwise occupied and used lands, territories, waters and coastal seas and other resources and to uphold their responsibilities to future generations in this regard.

Ethnobotanists should be aware of this right when engaging in research that may call for, for example, the disclosure of spiritual relationships between people and plants. In respect of this right, ethnobotanists should refrain from probing or seeking to uncover information and knowledge that is held sacred by communities. Notably, if some community members are willing to disclose sacred information while others are not, the ethnobotanist is ethically required to refuse the information or at the very least not utilize it in their research.

Finally, article 26 is essential; specifically:
Indigenous peoples have the right to the lands, territories and resources which they have traditionally owned, occupied, or otherwise used or acquired.

Indigenous peoples have the right to own, use, develop and control the lands, territories and resources that they possess by reason of traditional ownership or other traditional occupation or use, as well as those that they have otherwise acquired.

While the ethnobotanist has no de facto role in ensuring indigenous peoples are formally granted rights to their territories by the governments of the nation-states they live in (although they can provide appropriate and respectful advocacy and support for indigenous demands if they choose to do so), they are required not to contravene these rights through their research. In other words, you may be granted access to lands and resources for research by government agencies, but you must always also consult with the local communities who use those lands and resources and consider them their own. This can be tricky in the context of protected areas, which in many cases in the developing world are formally state-controlled lands, yet often are traditionally occupied and used by indigenous peoples.

**BOX 4: Best practice in ethnobiological research: the importance of Free, Prior and Informed Consent**

Indigenous peoples benefit from the collective right to Free, Prior and Informed Consent (FPIC), which is enshrined in international legal instruments. This right enables indigenous communities to give or withhold their permission for activities due to take place within their communities or territories, or to engage with their knowledge and resources.

Consent signifies that the community agrees to a given plan, which may have been reworked by the community in order to respect its members’ aspirations. Consent is only considered acceptable if (a) all community members have been consulted, according to customary processes and (b) all problems or queries raised have been fully addressed and acceptably dealt with. The application of FPIC requires consent to be:

- **Free**: this means that it is free of pressure, manipulation, intimidation or coercion; communities are allowed to take the time they need, follow their own procedures, use their own language, and implement their own norms to carry out the process.

- **Prior**: the decision-making process necessarily must take place prior to the launch of the activity, and ample time must be given for the community to make a concerted decision.

- **Informed**: all community members must receive full information of all aspects of the proposed plan (information can not be withheld), and outside actors should be ready to disclose and produce any item of information that the community might need to make the decision.

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5 The principal international instruments that explicitly recognise indigenous communities’ rights to FPIC are: the United Nations Declaration on the Rights of Indigenous Peoples (2007), ILO Convention 169 (1989), General Recommendation XXIII of the United Nations Committee for the Elimination of Racial Discrimination (CERD), Decisions from the Conference of the Parties of the Convention on Biological Diversity (CBD), the Interamerican Commission for Human Rights, as well as supportive documents from numerous multilateral institutions, banks, funding agencies, etc.
The process of engaging with a community must respect these four elements integrally. For example if the community withholds consent, or demands that the plan be amended in order to give their consent, it is imperative that this wish is respected – regardless of the consequences for the outside actor (e.g. in the case that donors may retain funding for this actor if the research or intervention is unsuccessful).

In the context of ethnobiological research, the practical application of this right does not simply mean to ask the community whether they accept a given research project or not: it involves a series of steps and constant mindfulness. FPIC is as much a process as a right, with far-reaching implications. As a decision-making process, FPIC is iterative: it starts with community consent and then continues throughout the implementation of the project, until the moment of its conclusion. The overall procedure for the FPIC process will depend on local norms and practices for community decision-making. Below are a few recommendations to help outside actors as they engage in this process with communities:

1. Initial meetings
   At the start of the FPIC process, it is recommended that researchers carry out informational meetings with community authorities or decision-making bodies. During these meetings all available information on the project is shared, for the community members to reflect and deliberate on, usually without the researchers present.

2. Information-sharing
   The information to be shared – both orally and in written form – must include:
   - The project and/or research aims and objectives;
   - The proposed project time frame (which should be flexible to community needs)
   - Details of the activities proposed, including where they may take place and whom they may involve;
   - The participatory decision-making processes proposed;
   - Presentation of all those involved in the research;
   - Reasonably predictable project consequences or outcomes (including benefits or disadvantages)
   - Potential predictable risks that may emerge and how they would be addressed.

   This information must be given in a language and format that is easily understandable for the community. It is important that the full technical proposal be shared with the community, although a translation may also be necessary to ensure full intelligibility.

3. Decision-making
   Then, using customary decision-making processes, the community decides whether or not they agree with the project, or whether they would like to suggest changes to the proposed activities, sites, use of results, etc. Community processes for celebrating an agreement are to be respected.

4. Collaboration agreement
   Some communities may require a collaboration agreement, which contains in writing all of the important elements of the relationship between the researcher and the community, including any restrictions the community wishes to place on the scope or activities of the project, and any expectations community members have regarding reciprocity, research processes, authorship, and so on.
5. The ongoing FPIC process

The FPIC process continues throughout the project cycle; this means that every decision, change or innovation made within the project context has to be consented upon by the community following the above procedure. Project facilitators should also regularly and actively ‘check in’ with community members regarding project progress in order to ensure that any emerging query, problem or shortcoming is dealt with appropriately.

The principles for good FPIC processes have been given a great deal of thought by indigenous intellectuals, community activists and ethically-oriented policy-makers. As such, these principles, when applied thoroughly and mindfully, provide an excellent foundation for ethical engagement with communities in co-enquiry research processes.

So what can we do (or not)?

Each research situation must be navigated according to local customs, research requirements, and the national, regional and local socio-political conditions and legislation, always in consideration of applicable international regulations. However, there are some ground rules that can help all ethnobotanists as they begin the research process.

The first step should be to analyse who are the relevant parties – stakeholders and rightsholders – that need to be contacted and consulted prior to carrying out the research. It is important here that you use your ethical acumen to find out whom exactly you should consult. Government agents may not require you to consult with local or indigenous communities if the plants you are interested in are found in state-controlled lands. However, very often in developing countries biodiversity-rich lands are contested: indigenous peoples and other local communities may claim prior occupancy and ownership. It is important to refer to the United Nations Declaration on the Rights of Indigenous Peoples and the ISE Code of Ethics to engage ethically with any community who may have a claim on resources you are interested in. Obtaining prior informed consent from local governments and national government institutes is usually relatively straightforward if the correct procedures are followed and political conflicts over your work do not exist. However, gaining access to communities is more complicated.

First the ethnobotanist must find out whether the community(ies) in question have one or more legally representative organizations, as their consent to the research project – and their practical support – is invaluable. In many cases, it is through representative organisations that researchers are able to first contact the community(ies) that they wish to work with. This step should take place prior to the finalization of the project or research proposal, as these initial discussions will allow major issues or challenges to emerge, permitting the ethnobotanist to carry out a first ethical audit/edit of their project proposal. Following this, and with the consent of the authorities and/or representatives the ethnobotanist can present their research project to the communities, presenting all available information to community members for consideration (see Box 4). Then, the researcher must wait for the community to provide their consent or amendments to the proposal prior to beginning research. Once research has begun, the researcher is called upon to reflect on the ethical ramifications of their
actions at every step of the research and to be constantly mindful of how their research is being discussed or engaged in by community members. Sincere mindfulness will allow the ethnobotanist to ensure that their research does not breach any ethical standards or any local codes of conduct.

Having said that, even the most conscientious ethnobotanist will come across ethical conundrums during their research. According to Hardison and Bannister, an ethical dilemma “occurs when it is not clear what we ought to do in a given situation, such as when negative consequences result from seemingly ethical actions; when actions are inconsistent with one’s moral or religious beliefs; or when there is a sense of conflicting obligations to do the right thing” (2011:29). Not all ethnobiologists will come across ethical dilemmas, however, most will.

You might be heartened to know that insights about your research can – and often do – emerge during moments of uncertainty and frustration surrounding ethical issues. In the face of ethical dilemmas when working with communities, often the soundest route is to establish research collaborations with them (in fact, you may be able to obviate ethical problems by launching collaborative research approaches from the start). This means investing time and resources in training community researchers and disclosing project objectives and methods; it also often means transforming the research project so that it also responds to community needs (key principles in the ISE’s Code of Ethics). Collaborative research produces innovations, encourages the researcher to adopt new perspectives, and generates original results. At its best, collaborative research is about more than research: it is about politics and power, and about supporting communities as they empower themselves and take control of their futures. From the decolonisation of research practice, co-enquiry becomes a path towards self-determination for communities (see Smith 1999).

The lessons learned by researchers as they face ethical dilemmas go beyond the boundaries of their discipline and of academia. Very often, they are lessons in life. Preston Hardison and Kelly Bannister’s (2011:46) concluding words are worth bearing in mind:

“As applied scientists, ethnobiologists straddle the worlds of scientific understanding and social justice, according the priorities and lenses of science, and seeking equity for the peoples with whom they work. To sit astride this divide requires great skill, sensitivity and diplomacy. Indigenous worldviews and political struggles may use narratives that do not always fit comfortably with scientific models and evidence. Even where there may be a general fit, there are conflicts in the details. (…)

When faced with [ethical] dilemmas, ethnobiologists should keep in mind the aphorism, primum non nocere (Latin: ‘first, do no harm’—origin uncertain but often ascribed to Hippocrates). In part, this requires developing a working understanding of the larger ethical, legal, and political picture in which research is embedded. It also involves gaining a level of cultural competency at the local level, understanding community research protocols and governance structures, enabling meaningful community participation, and being mindful not to impose external assumptions about…

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For information on how to implement collaborative research with communities, see the Resources section.
what constitutes ‘help’ on Indigenous and local peoples who will speak for themselves if the rest of us listen.”

**BOX 5: Ethical conundrums – a MedPlant scenario**

In order to provide a real-life illustration of some of the complexities of implementing an ethical approach in ethnobiological research, one of the young researchers of the MedPlant network shared her ethical conundrum with other participants at the 2014 MedPlant Summer School in Morocco.

This researcher works with an indigenous group in Latin America with whom she will carry out fieldwork in order to gather information about medicinal plants used for the treatment of a chronic disease. She wishes to abide by the ISE Code of Ethics, and knows that Free, Prior and Informed Consent is a fundamental condition for working with indigenous peoples.

Her first dilemma concerned which entity to engage with first as part of the prior informed consent process: the community authorities or the representative organization of the community? What to do if there is disagreement between the community authorities and the representative organization? These are legitimate concerns as it is not unusual for there to be disagreements between communities and their organizations. In these cases, it is worth organizing meetings with both parties and seeking to reach consensus. If that is not possible, it may be necessary to find another community to work with, where such disagreements with the representative organization do not exist.

Another dilemma arising concerned the amount of information to provide to informants prior to beginning the research. In effect, in order to avoid bias in their answers, the researcher did not wish to name the chronic disease she was researching and to disclose the details of the project only once the interview had been carried out. This was because the symptoms of this disease tend to manifest decades after the first infection, and she wished to understand local perceptions and knowledge about the disease. This contravenes two of the fundamental principles of Free, Prior and Informed Consent – that it is informed, and that this informed consent is given prior to the research activities. In this case, the solution may be found in working with one or two community members, including the leader, to whom the details of the project are disclosed and to collaborate with them to develop approaches that are both scientifically relevant and culturally and ethically appropriate.

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7 See [http://consensusdecisionmaking.org/](http://consensusdecisionmaking.org/) to learn about consensus decision making, including cultural barriers.
Anthropological Methods: documenting knowledge and practice of medicinal plant use in a socio-ecological context

By Rajindra Puri, Emily Caruso and Gary Martin

Having rooted your study in an ethical approach, you may now be interested in learning what methods are at your disposal for carrying out your research. In this chapter, we present a diversity of social science methods for you to choose from, although you will probably use most or all of them in combination in your research and throughout your career. Some methods proposed here are quantitative, requiring some basic knowledge of statistics while others are exclusively qualitative. When engaging in social science research it is advisable to explore multiple methodological approaches and to seek to integrate their insights as much as possible.

Cultural Domain Analysis

The first step in any study is to obtain a clear understanding of the definition and boundaries of what is being studied – defining the subject matter or domain that needs to be studied. Cultural Domain Analysis (CDA) provides the tools to do so. It is used to study the categories – or domains – used by different cultures or communities to organize the world, the criteria according to which they are organized, and to understand how domains and their items are valued. In CDA, domains refer to what people know rather than what they do. For example, the domain ‘edible plants’ will include or exclude different species of plant depending on the culture; and some of these may be more or less important to differing groups of people within that culture. Given the fundamental role of categories in perception of and interaction with one's surroundings, the tools of CDA are a useful means for ethnobiologists to document and analyse local environmental knowledge.

CDA can be broken down into a series of steps, each of which deploys a specific method to elicit information. The methods are all based on the technique of ‘structured interviewing’, which involves interviewing informants according to a prescribed order of set questions. In this section we introduce these steps, associated methods and tools for analyzing the resulting data:

<table>
<thead>
<tr>
<th>Step</th>
<th>Structured Interview technique</th>
</tr>
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<tbody>
<tr>
<td>Identify the components of the domain</td>
<td>Freelisting, identification</td>
</tr>
<tr>
<td>Discover their arrangement</td>
<td>Triads, pilesorts</td>
</tr>
<tr>
<td>Identify the rules for arrangement</td>
<td>Paired comparisons, rating, ranking</td>
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<tr>
<td>Explore the associated values</td>
<td>Weighted ranking</td>
</tr>
<tr>
<td>Explore variability in a group</td>
<td>Consensus analysis</td>
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Identifying components of the domain: freelisting

The most useful general technique for isolating and defining a domain is the freelisting task. It helps (a) ensure that you are dealing with a culturally relevant domain, (b) delineate the boundaries of a domain (i.e., which items are included and which are not), (c) learn about informants’ cognitive structure and (d) study variation among informants (Weller and Romney 1988). Freelisting can also help you identify potential experts or knowledge-holders for your broader study.

In order to collect data for the freelist task, you will need about 20-30 informants from a culture/community. You will need to determine exactly what the domain is called in the language you are working in and whether it is a recognized and important domain for the people you are working with. You can test the wording used by carrying out a pre-test with one or two individuals.

The freelist, as its name implies, simply involves asking informants to freely list all of the items they can think of in a domain; for example “Please list all kinds of edible fruits you know”. It is important that you first ask people for what they know, rather than what they use; of course the latter question can be a follow up to the freelist, but try to define what’s possibly in the domain first, as people may know many more items than they currently use. You can do this in the format of a structured interview. Once you have obtained an initial list, encourage your informants to remember further items by repeating the list you already have and asking if there are any more that s/he can think of. You may want to limit the list to 10, 20 or 25 items depending on your purposes. Collect the responses verbatim in the order given and write them down clearly; if culturally appropriate tape record the interview for back up. It is very important that you do not edit the initial data! You should want to keep a spreadsheet of your informants and their attributes (name, age, sex, place of birth, etc.) to refer back to when examining the different freelists.

In order to process a freelist, you will prepare a matrix, exemplified here with vegetable names in German, from an exercise conducted in Austria (Puri 2010a):
As Puri (2010a) insists, one should never delete the raw data, as idiosyncratic answers may in fact prove to be interesting and important. For example, a long list of items mentioned by just one person may point to an expert with memory of past terms now lost to the majority of people in the community. Some domains are more commonly known, such as ‘fruits’, while others may only be fully known by specialists, such as ‘medicinal plants’. Similarly, never edit a list for spelling differences (grape v. grapefruit) or synonyms (pawpaw v. papaya) until you are sure that you know what people are referring to. Sometimes plurals are used for fruits in everyday language (e.g., grapes) while the name of the source plant may in fact be singular (grape). You may have to use identification exercises to finally discern the identity of items on a freelist (see below).

Once you have your matrix, you calculate the frequency and the average rank of each item as follows:
The more salient items – i.e. the ones that are more prototypical of the domain, better known, or important to the group – will occur more frequently among informants and will have higher average ranks, meaning that they occur earlier in the individual’s list. You can also detect salience by plotting \( f \) and \( r \) as follows:
If you want a more precise measure of salience, you can calculate it using Smith's Saliency test (known as Smith's S; Smith 1993). You can do this calculation by hand (see Puri 2010a), but we recommend ANTHROPAC software (Borgatti 1996b) to help you calculate saliency for larger lists.

**Identifying the components of a domain: specimen identification**

All of the above exercises can be done simply with lists – i.e. without knowing what the names of the individual items refer to. In order to progress with your analysis, you may want to find out what the items listed are. You can do this through identification exercises, which are a kind of a structured interview where respondents are shown various items of a cultural domain and asked to identify them with local names, followed by a number of follow-up questions.

There are many variations to this basic structure. Ethnobotanists may use photographs, collected plant voucher specimens (including fruit, seeds or flowers), objects made from plant materials, or show people plants *in situ* (e.g., in a homegarden (Boster 1986; Vogl et al. 2004), a permanent plot (Bernstein et al. 1997), or along a specified plant trail (Stross 1968; Puri and Vogl 2005). Ethnozoologists may use pictures or dead specimens or cultural objects produced from animal parts (Boster 1985, 1986). Berlin and Kay (1969) used colour chips from the Munsell Colour Chart to
identify colour terms in several languages. The type of analysis used, be it qualitative or quantitative, depends on the research questions being explored.

ID tests can generate tables of data on vernacular names, their meanings, how these vary according to respondent and the criteria used to identify them. Additionally, using props as an elicitation device is an excellent way to get people talking about the relationship between people and the domain in question. On the other hand the technique requires a concentrated effort on the part of respondents, not all items of a large domain can be used, and some people may choose not to participate in what they may perceive as a test of their competence. The data derived from this exercise can also be used to test hypotheses about variation and change in knowledge. Scores of informants can be correlated to age, sex, occupation, education and other factors. One can also examine which items, and which kinds of items, are less well known to informants. This exercise can also identify experts who might be interviewed at length at a later date or hired as field research assistants for other research projects (Sheil et al. 2003).

The basic objective of an ID test is to determine the “correct” answers for local names of items (more on this below) and then score respondents on how close they come to providing these answers. In some studies, you may choose to simply assess an answer as true or false. One can then infer an informants' knowledge of a domain from the results, as well as try and understand the pattern of “mistakes”, in terms of both informant and item characteristics. Using a consensus model programme such as in ANTHROPA (Borgatti 1996), you may choose to compare answers directly, assessing the pattern of agreement in answers rather than devising a score. Factors responsible for these patterns of agreement can then be hypothesized and discovered using other data collection and analytical tools.

Before you can begin the interviews for an ID test, you will need to determine which items are to be included in the test and who the respondents will be. Researchers are free to vary the number of items identified, informants interviewed, including accounting for more than one language, to fit local conditions. The number of items used usually depends on how many questions are to be asked and, ultimately, by how long informants have to participate and how long you can hold their attention. Experience suggests an uninterrupted hour is probably an ideal target, but with breaks you may be able to extend the interview. Availability of respondents is also a factor in the number that can be interviewed. Clearly the amount of time the research has available limits the number of interviews that can be conducted. One must also plan for a period of testing and fine-tuning of the interview protocol to fit local languages, customs and other conditions.

How to carry out an identification exercise (from Puri 2010a):

1. Locate or collect items to be identified.
2. Lay items out in a random order on tables; give each item a reference number.
3. Ask a sample of respondents, one by one, to identify the items and write the name(s) of each item on a sheet of paper together with the reference number of that item. Alternatively, accompany respondents and write down, or record, their answers for them. You must specify a language, or ask for all names in all languages known.
4. If you are accompanying them, then for each item you may also ask what criteria were used to make the identification.
5. Ask additional follow on questions about uses, value, origins, etc.
6. Score answers as correct or not according to an answer key, or analyze patterns of agreement across respondents.

**Discover their arrangement: classification**

After you have identified the elements of a domain, you may want to find out how a given community or culture tend to structure the domain and organize its elements. To this end, pile sorts and triads are the techniques used.

**Pile sorts**

Pile sorts are a relatively straightforward way of eliciting information on how individuals classify elements of a domain. Pile sorts are often carried out as group exercises as they generate lively discussion, revealing the criteria by which each respondent is grouping the elements.

![Image of pile sorts of dried legumes. On the left is an image of the piles made by a 'lumper', i.e., someone who chooses not to make too many distinctions; on the right is an image of a 'splitter's' piles, who tends to differentiate greatly. (Credit: Rajindra Puri)](image)

The basic format of a pile sort exercise is as follows (from Puri 2010a):

1. Put names of items onto scraps of paper, or paste photos or drawings onto stiff paper. You may use actual items if small enough, for example varieties of beans or cereals. Create a number code for each item and label the paper, card or item.
2. Ask respondents to make piles of similar items.
   a. Be careful how you translate “similar” and always pilot your question with several respondents. If they respond by asking, “What do you mean by ‘similar’?” Tell them that you are interested in what they think that means.
Conducting and Communicating Ethnobotanical Research

b. You can have a pile of one, but you can’t have each item in pile by itself or they would very likely not be part of the same domain.

3. For each pile made, ask if there is a name for that pile, and why the items are placed in that pile.

4. Record the number code of all items in each pile. Write down any names or sorting criteria mentioned and if you can, photograph or draw the sort as a whole so that you record how the piles were arranged.

Variations:
You may give slightly different instructions in order to produce different types of pile sort, as follows:

a. In unconstrained pile sorts, you give no instructions as to what criteria to use.
b. In constrained pile sorts, you ask informants to sort by some specified criterion such as use, morphology, habitat, and so on.
c. In successive pile sorts, respondents are asked to break down the piles from the initial sort into further sorts. Repeat until all items are left as single piles. Alternatively, ask respondents first to sort all items into piles and then ask them to group them into larger piles, until you end up with one pile.

In order to analyse pile sorts, create a proximity matrix, either for each informant or for the whole group. Both the horizontal and the vertical axes of the matrix will contain the names of the items. For each pair of items in the same pile, put a tick in the relevant matrix box. Divide the number of ticks in each box by the number of respondents multiplied by the number of sorts, giving you the similarity measure.

The following example, borrowed from Puri (2010a: 139) shows how pile sorts of 5 different kinds of fruit can be analysed.

Data:
Pile sort 1: AB C DE [based on origins: temperate, Mediterranean, tropical]
Pile sort 2: AB CDE [based on origins: temperate, tropical]
Pile sort 3: AB C DE [based on origins: temperate, Mediterranean, tropical]
Pile sort 4: AB CDE [based on origins: temperate, tropical]
Pile sort 5: AB C DE [based on origins: temperate, Mediterranean, tropical]

Aggregate Proximity Matrix

<table>
<thead>
<tr>
<th></th>
<th>Apple</th>
<th>Pear</th>
<th>Orange</th>
<th>Banana</th>
<th>Mango</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apple</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pear</td>
<td></td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Orange</td>
<td></td>
<td></td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Banana</td>
<td></td>
<td></td>
<td></td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Mango</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0</td>
</tr>
</tbody>
</table>
The proximity matrix shows how many times one fruit is found in a pile with the other (the top half of the matrix would mirror the bottom half). Using a clustering process, a tree diagram can be constructed showing these relationships graphically (see Puri 10a).

**Triads**

The basic concept of the triad technique is that items are grouped in combinations of threes and informants are asked to indicate which one of the three is most different. Triads should be used following the freelist exercise to understand how and why informants group items in a domain. A basic classification emerges from such exercises (which may or may not resemble a taxonomy), which can then be compared with other informants, or respondents from other social groups. For example, we can compare the way gardeners and consumers organize vegetable varieties, or the way men and women students perceive the similarities and differences among fruit. Triads are useful to analyse domains with less than 30 items, however for bigger domains use the pile sort exercise.

To carry out a triads exercise, you choose from the initial freelist a sample of items. A good shorthand is to pick all of those items that have been chosen by 50% or more of informants, or to pick the top ten in terms of salience. Write the names of these items on separate sheets of paper, use images or take actual samples of each. Organise the items into sets of three, either following a predetermined order or using a random numbers table. The total number of possible combinations is \( n! / 3!(n-3)! \) where \( n \) is the number of items. Randomise both the order in which the items are given and the order of the triads.

You should give the informant several examples, from a different domain, so they get an idea of how the exercise works. We recommend you do this exercise orally without any prompts or means of giving informants clues to particular features; this way it is a memory test. Ask each informant: "Choose the one that doesn't fit" or "Choose the two that are the same." If they respond with the question: "What do you mean by things being the same?" Tell them that you are interested in what they think that means. You may also, for each triad, ask the informant to explain their choice, and thus begin to get at some of the underlying criteria for their classification. Go through the whole list of combinations of items. If you use more than one triad for each set of three then you can get some check on consistency. Otherwise you might want to try the exercise again at a later date, or after some significant event.
In order to analyse the data from triads, you should create a proximity matrix, where all items are listed both as rows and as columns. Each time a pair is grouped together in a triad, they receive a tally in the appropriate box in the table. You can add up the number times items are paired together to get an idea of similarity and dissimilarity. In this exercise of 6 items and 20 triads, the maximum number of times a pair occurred together was 4. So all of these tallies could be converted to percentages of agreement (4 =100%, 3=75%, 2=50%, etc.). Each item appears ten times in the exercise, so we could also calculate the percentage of dissimilarity by asking how many times it was excluded.

Once you have the results of your triads or pile sorts, you can begin exploring what factors or dimensions underlie the ordering of complex domains. These factors may help reveal deeply held cultural logics, beliefs and values. Paired comparisons, rating and ranking, the topic of the next two sections, can be used to test how well noted criteria and hidden dimensions actually fit the pile sort or triad data.

Identify the rules for arrangement: paired comparisons, rating, and ranking

The next three methods are used to compare items based on predetermined criteria or attributes (also known as dimensions or factors) that you have hypothesized are those that organize items in a domain. Paired comparisons, ratings and rankings ask informants to order items along dimensions, such as economic importance, size, weight, dangerousness, ability to cure, usefulness, and many more. These dimensions may underlie the groups of items discovered in the freelists, triads and pilesorts. Paired comparisons do this using two items at a time; ratings ask the informant to place an item along an abstract scale (1 to 4); and rankings ask the informant to compare items to each other and list them, for instance in order of importance.

Outside of CDA, in more applied research contexts, these tests can be used in workshops or community meetings to help decide which particular items in a domain may be suitable for a predetermined goal. In a community meeting people may want to decide on a set of trees to propagate in a nursery for reforestation. Which ones should they choose? The group could come up with a list of trees and a set of characteristics that are important to them and their goals (marketability, quality of firewood or fodder, growth rate, edibility, etc.) and then rate or rank these individually or in smaller groups. You could also ask informants to rank or rate development problems or management problems along certain criteria (immediacy, severity, cost to remedy, need for outside assistance, etc.).

The first step in the data collection process is to examine the groupings emerging from the previous tests (free lists, triads, pile sorts) and to hypothesize which dimensions may be responsible for the way in which items are organized. A questionnaire is then created to collect informants' perceptions on the location of these items along the proposed dimension. You could also ask about several dimensions at once; for example you could ask informants to rank given plants according to their value as a food source, ability to cure disease, or other domestic uses. Such a questionnaire would be presented as a matrix (known as a 2 Mode Matrix), with the plants presented in the rows, and the uses of these in the columns.
In paired comparisons, the question is “Which of these two items, A and B, is more important as a food source”; for ratings the question might be “Rate the importance of these fruits on a scale of 1 to 4, with one being less important and 4 being very important”; for rankings, the question would be “Place these items in order from least important to most important”. You can collect the data from the individuals or groups carrying out the exercise and tabulate it once again as a proximity matrix, or use a simple table of ranks and scores.

In the following example, from Puri (2010a), the question “which fruit is more exotic?” was asked to five informants in the context of a paired comparison test:

<table>
<thead>
<tr>
<th></th>
<th>Apple</th>
<th>Pear</th>
<th>Orange</th>
<th>Banana</th>
<th>Mango</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apple</td>
<td>-</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Pear</td>
<td>5</td>
<td>-</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Orange</td>
<td>5</td>
<td>5</td>
<td>-</td>
<td>2</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>Banana</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>-</td>
<td>0</td>
<td>13</td>
</tr>
<tr>
<td>Mango</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>-</td>
<td>20</td>
</tr>
</tbody>
</table>

All five agreed that apple is not more exotic, so the square Apple (row) x Pear (column) has zero in it. In fact the whole of row A contains zeros, meaning that no one said that apple was more exotic than any of the four other fruits. It has a total of 0 and is therefore the least exotic. On the other hand ‘mango’ was judged by all five informants to be more exotic than all the other fruits, with a final score of 20 it is at the other end of the scale from ‘apple’. ‘Pear’ received a total score of 5, because all informants thought it more exotic than ‘apple’ but less exotic than the other three fruits. ‘Orange’ and ‘banana’ are very close on the scale, because two informants judged ‘orange’ to be more exotic than ‘banana’ while three thought the opposite.

You can then analyse the data by comparing informant or group scores or regressing this data onto the results of the triads and pile sorts tests to determine underlying criteria organizing the classification system. (You can also use ANTHROPAC to generate questionnaires and analyse data).

Explore the associated values: weighted ranking

Weighted rankings combine rating and ranking by asking informants to score each item using counters (corn, stones, beads). While ranking provides order of preference but no indication of relative magnitude, weighted ranking gives information on both of these factors. If the criterion were ‘importance’, as in the importance of fruits in the diet of a group of people, a weighted ranking allows researchers to say how much more important (in relative terms) is one food item over another. It also is carried out subsequent to the freelists, pile sorts and triads.
For weighted ranking data collection, the researcher asks informants to distribute a set number of counters among the various items you have presented them with, giving more counters to those that are more important. You would emphasise that giving twice the number of counters to one item in comparison to another indicates that it is twice as important. You then record the number of counters on each item on the questionnaire sheet in the column of the attribute being assessed. You can then tabulate the data as a proximity matrix, or use a simple table of ranks and scores. For the weighted ranking, you would draw a linear scale for each attribute and plot the items along this scale, or you could add across the columns to get a total score for each item.

The example used in the following table used 100 counters to rank, according to four different dimensions, the fruits discussed above (Puri 2010a). It also ranks the fruits across different dimensions, resulting in the apple being the most important overall.

<table>
<thead>
<tr>
<th></th>
<th>Taste</th>
<th>Fuel</th>
<th>Sale</th>
<th>Storage</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apple</td>
<td>16</td>
<td>50</td>
<td>25</td>
<td>40</td>
<td>131</td>
</tr>
<tr>
<td>Pear</td>
<td>14</td>
<td>15</td>
<td>15</td>
<td>28</td>
<td>72</td>
</tr>
<tr>
<td>Orange</td>
<td>22</td>
<td>10</td>
<td>24</td>
<td>10</td>
<td>66</td>
</tr>
<tr>
<td>Banana</td>
<td>10</td>
<td>0</td>
<td>26</td>
<td>17</td>
<td>53</td>
</tr>
<tr>
<td>Mango</td>
<td>38</td>
<td>25</td>
<td>10</td>
<td>5</td>
<td>78</td>
</tr>
<tr>
<td>N counters</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>400</td>
</tr>
</tbody>
</table>

As we have seen in this section, there are a number of simple techniques for eliciting information on specific domains of knowledge and practice among communities. They can be used alone, if only targeted information about a domain is needed, or they can be used in combination with other approaches. In the next section we present a basic tool in the anthropologist's toolbox: ethnography.

**Ethnographic Methods**

It is sometimes daunting for researchers used to quantitative methods to begin using qualitative approaches. If this is your case, you may feel that qualitative approaches are not systematic enough, not rigorous enough or not producing any 'real' data. Have no fear! Qualitative approaches are rigorous, empirical, and highly productive of research data, as this section will show. In combination with the quantitative approaches described in the previous section, and other tools such as participatory mapping described below, ethnography can help you derive a deeper understanding of your research question and its broader context.
Ethnography is a broad term that covers the overarching methodology used in anthropology and many social sciences to explore social and cultural worlds. Of Greek origin, the term ethnography means ‘to write about people’. There exist a vast number of ethnographic methods and approaches, each with their own philosophy and adaptations. For lack of space we can only provide an overview of the methodology’s philosophy and principal techniques, but in the reference section at the end of the manual, you will find a series of useful handbooks and methods manuals to complement this section.

Ethnographic approaches are highly relevant for ethnobiologists for a number of reasons. Firstly they are useful for gaining a thorough overview of the situation (e.g. the community’s social and cultural life, relationships between communities and outside actors, or the different perspectives on a specific issue such as medicinal plants). In this way, they complement quantitative approaches by providing the social and cultural landscape within which you can locate the results of quantitative data analysis. Secondly, ethnographic approaches are used to elicit in-depth or detailed information on specific topics of interest. In particular, they are useful for investigating complexities and contradictions, understanding different perspectives and the relationships between them, and exploring the origins and change over time of knowledge and practices (‘the backstage of culture’). They are also relevant in social contexts where more structured approaches are difficult to implement and where complex relationships require sensitive and discreet approaches.

Through long-term fieldwork – a key feature of ethnographic work, and perhaps one of its disadvantages when limited time is available – researchers use ethnography to capture the meanings people give to activities and relationships in their everyday lives in their usual settings. In this way, ethnography seeks to bring the reader to an understanding of the world from the emic perspective of the communities under discussion (i.e. from the insider’s point of view). Researchers build their analyses and interpretations upon their experience of social life, rather than imposing an analytic structure on it from the outside. In order to do this, one of the most important methods developed in ethnography, which is described in greater detail below, is participant observation. When using this method, the ethnographer is called upon to fully participate in the daily lives of the people she is studying while simultaneously observing and taking note of life as it unfolds. The result of long-term participant observation is a highly detailed, vivid, and empirical account of social life, which forms the basis of ethnographic writing.

**Research design**

While ethnographic research design requires little structure and much flexibility, it is important to take time for preparation. One of the key features of your research design will be access to the community you wish to work with (see also the chapter on Ethics). Conversations and meetings with the community and its leaders should start well ahead of the date you plan to start your research. These dialogues are very important as you develop your research design. Your research questions will be most relevant if they are developed with the participation of locals. These initial meetings and conversations should also cover practicalities such as which family or individual you will stay with,
what form your reciprocal relationship will take, when you will arrive, how long you will stay, and so on. Ensuring consensus on these important details will avoid conflicts later on.

This process is the beginning of creating rapport – a close relationship in which communication is fluid – which is an essential ingredient for your fieldwork. Depending on the social and cultural situation you are entering, as well as your own background and approach, it can take hours or months to create rapport: patience, flexibility and a good disposition will help.

BOX 6: Using the term ‘community’ in ethnographic research

The term ‘community’ is a useful shorthand for describing a group of people who share a living space, a territory, kinship ties, a local economy, and so on. However the way the term is often used – to represent a homogenous group of people living in a bounded territory – does not reflect the reality of ‘communities’ as they are, all over the world. Anyone who has spent time in any form of community knows that they are not homogeneous, harmonious, or bounded. Communities are, on the contrary, characterised by internal differences in wealth, status, wellbeing, and power; by fluidity, porous boundaries and constant movement and change; as well as by internal conflict (see Agrawal and Gibson 2001, the definitive reference on the unguarded use of the concept of ‘community’ in social sciences). Ethnographic research often focuses precisely on the heterogeneity, power struggles and changeable nature of communities. Despite this, the term ‘community’ remains a very useful description for the social grouping among which ethnographers carry out their research; when using it, it is of utmost importance to be mindful of the complex realities of the community or communities you are working with and to deal honestly and transparently with these complexities when you carry out your research and write your ethnography.

Ethnographic research usually involves a mixture of participant observation, semi-structured or informal interviews, oral histories, and other methods (described below). The process and sequence of using these methods is flexible and depends to a great extent on the timetables, availabilities, preferences and lifestyles of the people you are working with. For example, if you have joined them at a time when everyone is very busy (e.g. with harvest, a political negotiation, or a religious festival), you might begin with participant observation and informal conversations, following these up with in-depth interviews when your informants have more time.

Moreover, it usually takes time for people to feel comfortable with a researcher in their midst: participant observation is the best way to get to know many different people and become friendly with them, meaning that your eventual interviews will be more effective and relaxed. You will also hone and refine your questions and interview structure as you practice interviews and become more familiar with local customs. On the other hand, if you are carrying out research in a more formal social setting (e.g. a business, government, an organisation), it might be that members of that ‘community’ feel more at ease with interviews than with informal chats or participant observation, and starting with semi-structured interviews will improve your rapport.

Sampling, in ethnographic fieldwork, is mostly unstructured and is usually only necessary for methods such as in-depth semi-structured interviews, oral histories or life histories (see below for
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descriptions of these methods). It can take the shape of snowball sampling (also known as chain referral and respondent-driven sampling), which means that each new person interviewed has been suggested by a previous interviewee or community member. It can also simply be what is known as convenience sampling, by which ethnographers develop relationships with individuals through the course of participant observation and informal conversations that lead to more interviews, conversations and opportunities for participant observation. The choice of sampling technique does affect the degree to which you can generalize from your findings.

In sum, ethnographic research design is inherently flexible: during your fieldwork it is likely that you will make new decisions about your design every day, depending on the situation in which you are embedded, your own evolving understanding of it and the relationships you develop. Therefore, the keys to great design are being aware of all of the methods available to you, following your intuition, and being mindful of changes both in the field site and your own understanding of it.

Methods

Note-taking. Note-taking is central to the practice of ethnography: notes are your primary source of raw data. Even if you audio-record interviews you will also take notes, as this will help you remember the atmosphere of the interview, how interviewees reacted to certain topics, and what your own thoughts were throughout the process. Keep both an official field notebook, which includes all of your observations and interview notes, and a personal diary, in which you will keep up-to-date entries on your feelings and perceptions as fieldwork progresses. Depending on how long you stay in the field, you will use many notebooks and diaries. Keep them tidy, dated and numbered, and safe from humidity (keep them in Ziploc or plastic bags when you’re in the field). If you have access to a computer – whether it is every day or every six months – type up any important reflections, additional notes, or analyses and save them in a specific Field Notes Folder.

Participant observation. This is the central method for ethnographic research. It is a medium- to long-term enterprise, and often ethnographers spend many months, even years, carrying out participant observation in a particular social setting (e.g. a community). However, even if you only have a few weeks of fieldwork, it is still a very relevant method to use. Puri (2010b) is an ideal point of departure for those interested in practicing this method.

Participant observation is a relatively unstructured, interactive method by which the researcher participates in everyday life while simultaneously observing social and cultural practices. You work, eat, drink, sleep, celebrate and, generally, share in everyday life with the community, family and individuals you are carrying out research with. In so doing, you are mindful of what people do, say, relate to each other and outsiders (especially you), what makes them happy, angry, sad, fearful, how they move through their landscape, how and why they make choices, and so on.

Whenever you get a chance, write down: what you are doing and how; what people are saying – how they are describing themselves, their motivations, how they are explaining their social and cultural life to you, what they think of news, events or situations. Take especially detailed notes of
events, rituals, meetings, and conversations in which you have learned a great deal about a particular issue. Habitually, ethnographers find that the end of the day is the easiest moment to write down what has happened during the day and your reflections on it.

**Semi-structured and unstructured interviews.** In a rural or indigenous context, you will often find that people do not respond to highly structured interview approaches, so a flexible semi-structured approach is best. This means you might come to the interview with 5 or 6 questions relating to a topic you would like to discuss (do not use it like a questionnaire!). If the conversation deviates significantly, you can gently steer it back to your topics of interest. Some of the ground rules for interviews are:

- Put your interviewee at ease: start the interview with an informal chat if that is appropriate; keep the interview private as that will help the informant to feel they can speak their mind (or, if the informant is more at ease with someone else around, do it that way); explain how the data will be used and the confidentiality rules; offer the option for the interviewee to refuse any question, or ask that an answer not be included in your records. If at any point the interviewee appears ill-at-ease change your approach;
- Let your interviewee do most of the talking: avoid interrupting as much as possible, and be aware that what might seem as off-topic to you at the time might be significant to your final analysis. Treat what people want to talk about (even if it is different from your pre-established topics) as highly important data.
- Avoid leading questions (e.g. “do you think that X did that because of Y?”), preferring open questions (e.g. “why do you think X did Y?”). Avoid questions where your own opinion is present;
- Use simple, clear language and short questions; match the competence level of the interviewee;
- Explain that you may return for a follow-up interview later on.

Your interviewing technique will improve with practice. It is highly recommended to repeat interviews with the same people because (i) your technique (hence interviewees’ understanding of your approach) improves, (ii) interviewees' answers can help you reflect on new, interesting questions to put to them and others, and (iii) it allows you to explore how their ideas evolve over time.

**Informal conversations.** Often in combination with participant observation and semi-structured interviews, you will have informative informal conversations and dialogues with informants. The technique for eliciting information during informal conversations is to get people on to a topic and then “get out of the way”. Treat every conversation as a possible source of data, and write down your thoughts about them at the end of the day. Try to have conversations with a wide variety of people whenever you can – even people who may not have anything to say regarding your topic. Having regular conversations with informants is helpful for you to reflect on your ideas and to develop collaborative, dialogue-based analyses of social and cultural life. Do not be shy of sharing your ideas and interpretations and asking people for their opinions, as this will be very informative for your final analysis and will help ensure your research remains relevant to them.
Focus groups. Focus groups are used to obtain information regarding perceptions, opinions, beliefs, and attitudes towards a particular issue, that emerge when interviewees communicate with each other. Questions are asked in an interactive group setting where participants are free to talk with other group members. Focus groups are more than mere group interviews: the interactions between participants are also important sources of data (although if you plan to observe behaviour during a focus group, you will have to obtain participants’ free, prior and informed consent to do so). Focus groups therefore require participants to talk to each other – by asking questions, exchanging anecdotes and commenting on each other’s experiences and points-of-view – rather than exclusively to the interviewer/facilitator. The method is particularly useful for exploring people’s knowledge and experiences and can be used to examine not only what people think, but also how and why they see things that way. They are a more formal qualitative research method, and may not be useful in certain social situations.

Oral history and life history. The principal objective of the oral history method is to document change; the data collected take the form of narratives. Many rural or indigenous cultures are oral cultures – i.e. much of their knowledge and culture is transmitted orally, in a storytelling form, rather than in written form. To take an oral history is to carry out in-depth unstructured interview (sometimes over multiple sessions), in which the ethnographer asks an elder to recount the history of his or her people, community, family, etc. Similarly to oral history, life histories are long unstructured interviews in which interviewees tell the story of their lives. These autobiographical narratives can tell us a great deal about local society, culture and history, what aspects of these are considered important and how people remember. Both narrative approaches can be used to describe changes communities have undergone and how people are responding to those changes.

Phenomenological approaches. Phenomenology is a philosophical theory born in the early 20th century, and made famous by philosophers such as Edmond Husserl, Martin Heidegger, and Maurice Merleau-Ponty. While it has its roots in complex theoretical foundations, using a phenomenological approach in ethnography is, in practice, very simple. Phenomenological approaches in ethnography emphasise “embodiment as the common ground for recognition of the other’s humanity and the immediacy of intersubjectivity” (Katz and Csordas 2003:278; our emphasis). What this means is that (i) the ethnographer acknowledges that s/he can share a feeling or an experience with someone, i.e. that they can share ‘subjectivity’ in a given situation (hence ‘intersubjectivity’), and (ii) the researcher seeks to experience the phenomenon he or she is observing using their own body, senses and perception. This approach encourages the researcher to really ‘step into the shoes’ of the people they’re working with – feeling and engaging with the world as the latter would. It is particularly relevant in the context of understanding how people learn, practice and transmit knowledge (see Box C).

Other methods. Here, we have highlighted some key ethnographic methods, however, there exist numerous other approaches and techniques, many of which are described in the textbooks suggested in the Resources section.
Data analysis

While you will begin analysing your ethnographic experience during fieldwork, the bulk of your data analysis will take place when you return home. One of the first things to do is to transcribe to word processing documents all interviews or events recorded – both from audio recordings and from your notebooks. This is a lengthy and sometimes tedious process, but essential. To have all of your data easily accessible in a computer file significantly simplifies the process of analysis, use and storage of your data. Moreover, by listening carefully to your audio recordings and copying key passages from your notebooks out, you will become familiar once again with data that you may have collected over as much as a year previously. The overview that this process provides is invaluable to your process of reflection. Once you have all of your data in accessible word processing files – (remember to back them up!) – then you can begin systematising it.

**Become very familiar with your data.** You will have become familiar with a significant portion of your data in the previous step. In this step, you read it *all* through again, with fresh eyes. Do not rely only on your memory. As you read through all of your data, become aware of the patterns and themes present within it. Take large sheets of blank paper and draw (evolving) mind maps of themes, events and actors and how they link together. As you do so, you will probably see new connections and have new ideas regarding your data. Take a break from your data and return to it with fresh eyes; read through some notes again, make new thematic mind maps, and cross reference with your previous mind maps. Familiarizing yourself with all of your data early on in the process will help you develop your analysis and arguments, and will help as you refer frequently to your raw data in the later stages of the write up.

**Themes and Data Matrix.** As you read, visualise emerging themes and their connection to your data by building a ‘themes and data matrix’ (see below), which you can fill in as you continue reading and re-reading your data. Do this on a computer so that you can be flexible with the hierarchies you give and the location of sub-themes. This process is continuous and can be very useful as you structure your writing and build evidence to support your arguments.

<table>
<thead>
<tr>
<th>Main theme</th>
<th>Sub theme</th>
<th>Data/evidence</th>
<th>Location</th>
</tr>
</thead>
</table>
| Use of plant K | Ritual use | - Interview with X the community healer (great quote to use: “xxx”)  
- Interview Y, the local town herbalist  
- Session learning how to prepare plant K for ritual use with the community healer.  
- Participant observation of the ritual healing of a sick child – followed by interview with child’s parents and healer  
- Etc. | Notebooks 3, 4 and 7.  
Interviews X, Y and Z.  
Video recordings |
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<table>
<thead>
<tr>
<th>Domestic use</th>
<th>Cultural Domain Analysis of plant K’s use</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Interview with X, Y and Z about how they use plant K in their everyday lives</td>
<td></td>
</tr>
<tr>
<td>- Participant observation of the use of plant K</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Notebooks</th>
<th>2, 3 and 5.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interviews X.</td>
<td></td>
</tr>
</tbody>
</table>

**Systematise your Interviews.** Once you have read through all of your interviews, you can begin systematising them: one example of how to do so is given here, although you are encouraged to create your own systems if you find them more suitable. A table of interviews is a useful rapid reference when you are writing up, as it can save you the time of sifting through hundreds of pages of transcription in order to find a quote or a theme of discussion.

<table>
<thead>
<tr>
<th>Interview</th>
<th>Location</th>
<th>Date/place</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. John Doe, community healer from Community X</td>
<td>Notebook #7, tape recorder, transcription</td>
<td>12.12.2012, 8am</td>
<td>Key theme: how he learned to use the plant; who were his ritual teachers and spiritual teachers; the first time he used it to cure –story of the old lady who was bewitched. Important quote about the significance of the plant's spiritual owners and the respect they are due on p.36 of the notebook &amp; minute 33 of the recording.</td>
</tr>
</tbody>
</table>

**Code your data.** Coding is an important part of analysing your data. You can code all of your data sources: notebooks, diaries, transcribed interviews, word processor documents, official documents, stories, etc. Coding involves deciding which themes and subthemes are salient in your data and indicating their location in the various texts you have. You can use colourful sticky labels and highlighting to mark the particular textual passages that refer to the code. The process of coding is best done in continuous dialogue with the process of building your themes-and-data matrix and interview table, as you might, for example, discover a theme or a sub-theme that you had not previously noticed emerging from the process of coding, and vice versa. It is very important you do not create too many codes because they rapidly become unmanageable, and are irrelevant if they no longer function as an analytic tool. *Grounded Theory* (further described below), an approach whereby theory is developed inductively based on a corpus of data, provides very useful techniques for coding ethnographic data.
Ethnographic Writing

Read ethnographies. The best way to learn how to write ethnographically is to read ethnographies and anthropological articles that use ethnographic writing, whether they are related to your topic or not. A number of great ethnographies are showcased in the Resources section, and you will find a wealth of ethnographic articles in journals such as *American Anthropologist, American Ethnologist, Current Anthropology, JRAI, Cultural Anthropology*, and many more. Reading ethnographies is also an excellent way to get motivated to write at this stage of the process.

Start writing. Ethnographic writing and data analysis can start roughly at the same time, as they often inform each other. Writing badly is an essential step on the path to writing well, so do not be afraid of starting to write even if (a) you feel you do not fully understand your data or how to use it, (b) you do not have a ‘plan’ for your structure, or (c) you feel less than confident about your writing skills. It is often through writing that purpose, arguments, data, analysis and their interconnections become clear; also, as you write, you build practice and confidence in writing. Moreover, ethnographic writing requires you to experiment, to go beyond the boundaries of the conventional (Kahn 2011:176), so expect to discard a lot of text, to change things around, and to completely rethink your arguments, as these are all important steps towards a finished product that you are satisfied with.

Thick description. Ethnographic writing is characterised by what is known as ‘thick description’, in which the ethnographer fully describes an event or an encounter, giving the reader details on the locale, the atmosphere, the colours, the smells and the movements on the people involved, encouraging them to feel like they were ‘there’ at that moment. Clifford Geertz’s classic essay *Deep Play* (See Resources section) is one of the most renowned examples of thick description. Another example of thick description can be found in Puri (2010b:77-78). These thick descriptions often hold important elements for building theoretical arguments on social and cultural practices, and it is in describing them in great detail that these arguments make sense to the reader. Writing thick descriptions of particular events or encounters is a useful way to start writing, as it gets creative juices flowing and is often a fun part of the write-up process.

Ground your theory. Ethnography is based on inductive reasoning, whereby the ethnographer constructs his or her arguments on empirical data and experience, without a pre-conceived hypothesis or conclusion in mind: theory is built from the ground up. In practice, you will present your evidence – in the form of thick descriptions, interview quotes, and other data – and based upon that you will build arguments and draw conclusions. Good ethnography requires the ethnographer to return to their data – self-reflexively and mindfully – over and over again to make sure they are not ‘expanding’ on, or being too creative with, them (i.e., do not put forward arguments for which you have no evidence!). This regular return to your data ensures that your theory remains grounded. Please visit the website www.groundedtheory.org for more information.

Be flexible. As mentioned above, writing ethnographically is an experimental process, so do not be disheartened if you have to transform your arguments (even quite dramatically) as you progress.
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through your writing and reflection. Remember that some of our most creative moments take place as we dismantle our preconceptions and fixed ideas. Returning to your data with a new eye throughout the writing process will help you whenever you feel stuck with an argument or unable to ‘think yourself out’ of a problem. Be open to change and flexible about the final outcome of your research.

**Capture the reader’s attention.** Ethnographic writing is above all a creative process: its outcome is an exciting, provocative product, and should read rather like a story (a story presenting deep social analysis based on empirical data, but a story nonetheless). Try to find ways of writing that capture the attention of the reader at the beginning of your publication. There are different ways of doing that, and here we present a few approaches that are often used. One is to capture attention by presenting an exciting piece of thick description at the start of the article (see Rubenstein 2007 for a good example of that). The other is by writing (a thick description of) a personal narrative or experience had during the ethnographic process, for example of moments of particular intensity or inspiration when a specific aspect of social or cultural life became clear to you. Another attention-capturing mechanism is to start the text with a newsworthy excerpt of a newspaper article, a speech or a quote that is relevant to the topic of the text. In short, try to capture the reader’s attention with a story or an item of relevance to public life.

**BOX 7: Ethnography in the study of indigenous/local knowledge and practices**

Participant observation is particularly useful in the study of local knowledge and practices. In general, ethnographers carry out participant observation to learn about a culture; therefore the transmission of knowledge – be it about the environment, cooking, medicine, or how the world works – between community members and ethnographers is at the centre of the ethnographic process. They also learn about knowledge transmission practices by observing how elders teach youth, and how peers explain things to each other. They learn about how people know and use the environment by watching them harvest, collect, plant, process and relate to plants and animals, and they can then practice it themselves as they participate in social life. If they have spent enough time with a community, they may even be invited to participate in (and observe) rituals, ceremonies and healings, which are sites of particular interest to students of indigenous knowledge and practices.

Indigenous knowledge and practices are particularly amenable to a phenomenological approach (see above). As an example, if carrying out ethnographic research on the practice of traditional weaving, an ethnographer might spend a large proportion of her time learning how to weave and in so doing learn how to collect dye plants, mix colours and dye fabric, explore how the repetitive and creative process makes them feel, observe their own bodies enter a rhythm, and examine how their bodies work with the material to create a sense of communion between body and product. In this way, the ethnographer might come closer to understanding how the people she is carrying out research with think about producing material, how they use their bodies, how they embody knowledge, and about the connection between knowledge and practice. Finally, learning about knowledge and practice through participant observation and phenomenological ethnography forces the researcher to take a leap out of their own epistemological framework and into another, expanding their understanding of what it means to be, to know and to do in the culture they’re studying.
Participatory Mapping and Ground-truthing

Participatory mapping is a tool used to gather information about – and create a visual representation of – the territorial extent and components of a community, their natural resource use and management, and their perception of place, landscape and resources. Participatory mapping has a diversity of goals: as political tools (Peluso 1995; Neitschmann 1995; Taylor 2008); for conservation purposes (e.g. Ramirez-Gomez et al 2013); as part of research, including ethnobiological research (Gilmore & Young 2012); to help communities make better natural resource management and governance decisions and understand land use and environmental change in their territories; to preserve traditional knowledge (Chapin & Threlheld 2001); and to illustrate customary land use and management systems (ibid).

For ethnobiologists, knowing how to implement the simple tool of community resource mapping can be a definite advantage. The visual link between indigenous knowledge, natural resources, and spaces, landscapes and places provided by maps is a powerful tool for reflection and analysis. Mapping can help ethnobiologists explore the location, salience, knowledge and use of different biological and cultural resources, as well as differences within communities regarding these elements (Gilmore and Young 2012). When conducted with communities in workshops, mapping exercises can serve as icebreakers. They may also identify local experts and potential research assistants and provide information on patterns of variation in people’s local knowledge and use of land and resources. Maps can also be very fruitfully used as visual props during semi-structured interviews.

There are several steps to participatory mapping: consulting with the community or group in question, preparation of a base map, mapping exercises with individuals or groups, ground-truthing maps and preparation of final results. In total, these steps need not take more than a couple of days, making participatory mapping an excellent way to get to know your location and the community you are working with. This section outlines these steps, based on Puri (2010c).

Consultations with communities should begin by implementing best practice approaches for obtaining free, prior and informed consent as described in the Ethics Chapter. Once consent has been obtained, it is important to work out the objectives of the mapping with the full participation of the community. Community leaders may request that certain resources or boundaries are not mapped or that the maps not be made public. Ideally a large proportion of the community population would be present at the first mapping workshop as it is important to have broad consensus among community members about the objectives, process and participants in the mapping work. This first mapping workshop is the ideal location for finding knowledgeable assistants to help with the development of the maps, ground-truthing and future research. These knowledgeable assistants would know their community’s territory well, know local toponyms, sacred sites, natural resource sites, and so on.
Depending on what your objective is, you might want to use a base map. If, for example, the map is intended principally as a tool for communities to enhance their internal natural resource management and use, or alternatively for ethnobiologists to understand a community’s relationship with its natural resources and how these are distributed through the landscape, the maps do not need to be to scale or accurate cartographic representations. Simple maps, drawn by hand on blank pieces of paper will be sufficient.

However, if the map has a more formal objective, such as making a territorial claim for the purposes of engaging in ‘formal’ community conservation processes, or if the ethnobiologist needs a more precise cartographic representation for their research, then a base map may be necessary. You can prepare a base map in the following way (from Sheil et al. 2003):

1. Collect and compile suitable information from all available maps of the area (major features, particularly rivers, roads, villages, logging camps and peaks).
2. With local informants and a basic map, begin to collect and check location names around the village, at forks of main tributaries, and at road intersections. If possible create a global positioning system (GPS) database of these points. Add these to the base map. Note the scale. If you can add latitude and longitude markers on the edges of the map, these will be helpful when ground-truthing.
3. Leaving a corner or edge of the paper blank for a legend, prepare a simple map of the main rivers, tributaries, location of present villages and landmarks, with the local names as provided by informants.
4. Make sufficient copies for mapping exercises on large paper (A1 or A0).

The mapping exercises themselves can be carried out in groups or with individuals, depending on the objective of the mapping process. The general idea is to ask community members to map places of interest to you and them: the community territory in general, sites of special interest, household resource extraction sites, areas where specific natural resources occur, areas of natural resource management, and so on (see Puri 2010b). These exercises can be carried out in a large communal area, where every group or individual has a base map and markers of various colours. It is important to let people draw without too much intervention, leaving them to express themselves and allow them to include what is significant to them, albeit with clear instructions about what the objective of the exercise is.

Ideally, you would get the mappers to leave a space on the edge of the map (by drawing a margin or a box in the corner) to be used as a key to list resources or land cover or land use types, and then assign symbols and / or colours to represent each item in the list on the map (Puri 2010c). It may be simplest to ask informants to list the fruits, birds or other resources first before they start mapping them. These lists can be analyzed as freelists (see above) and compared between different individuals and groups. If many items are listed then it is probably best to use an additional sheet of paper as a key, or make several maps for different domains of information (e.g., palm trees, mammals, black soils, water sources). You may also be interested in changes to the landscape or resources in particular, which you can research by asking your mappers to map the landscape of 10 or 20 years
ago, and for future scenarios, asking them to map the landscape of 20 years from now. Varying the
temporal frame of any if the exercises discussed in this handbook is easy and extremely useful for
studying change and perceptions of change (see also Puri 2010a).

Once the maps have been prepared, you should go – accompanied by your knowledgeable
assistants – and ‘ground truth’ the maps by walking around the physical area mapped and checking
that the items on the map correspond to the items on the ground (Puri 2010b). You would ideally use a
GPS unit for ground-truthing. The process of ground-truthing involves visiting an item located on the
participatory map, taking a GPS reading of the spot, and then comparing the reading to the location on
the hand-drawn map. If the base maps were prepared using geo-referenced map, this process is
straightforward. In absence of a GPS unit, you can ground truth maps by using a transect walk (Puri
2010b; see also below).

The first step in map analysis is to facilitate a dialogue with community members, in a
workshop-style session. To foment discussion, questions like these can be used:

• What can the maps tell us about [our objective]?
• How else can we use the information in the maps?
• What information could we add?
• What information do we not want shared with outsiders?
• How can we use our maps?

Following this informal analysis, if you have taken GPS points for the maps, you can upload
them to your computer using GIS software and develop digital maps, which include multiple layers,
photographs, interviews, knowledge about particular resources, and so on. GIS software permits a
number of different quantitative and qualitative analyses. Finally, it is important that the community
decide – through a participatory process – what they want to do with the maps, and that you respect
their final decision.

**Market Ethnobotany**

Market ethnobotany is a broad term used to cover the practice of research on people’s
relationships with plants in marketplaces (i.e. physical places where goods are bought and sold, not
abstract markets). As part of market ethnobotany you can carry out an inventory of plant, animal or
other products sold in a marketplace(s) in conjunction with a census of permanent market stall/store
owners/employees, ambulatory product sellers, and consumers. The data collected in the inventory
and the census can vary according to research needs.

Market ethnobotany allows you to determine what plants/animals are being collected/hunted
and sold in an area used by market goers. You can also use the method to determine the uses of plant
and animals being sold, including their nutritional or medicinal effects (pharmacological effects), or to
determine the economic value of commercialized natural products. Tracking changes in market prices
provides an indicator of increasing rarity or other threat to the sustainability of the resource or its
economic value. Markets are a starting point for tracing commodity chains, back to source areas and forward to consumers/buyers/exporters.

An ethnographic evaluation of a market might:

1. Determine who is involved in the trade in natural products, why they participate, the importance of commodities in their economy. Study the social relations of natural resource production (e.g., urban vs. rural users)
2. Determine who is buying these products and why. Examine patterns of consumption and cultural/social or economic values that underpin the trade.
3. Offer a means of social entry into a community, and a potential source of informants.

How to do it?

1. Once you have chosen a market or a set of markets, begin by visiting them as a buyer. Observe both consumers and sellers, engage in casual conversation. Get a sense of what the market is all about. Then you have several ways of proceeding.

2. Inventory emphasis: buy or request a sample of all products being sold, for identification (forensic ethnobotany). Photograph if it is not possible to buy. Often the goal is to accumulate as complete a collection as possible of everything passing through the market. Information on use, origins, and price may also be collected, but data is sorted by species/variety rather than by stall/shop.

3. Census emphasis: sample a number of stalls or vendors or consumers. Find out what they sell/buy, how much they sell, what the uses of then products are, their prices, and why? Sample of products can be bought for identification purposes.

4. Arrange a time for an interview to collect biographical information, and economic data, usually outside of market hours. Follow general guidelines for participant observation and interviewing.

5. Be aware that there are seasonal differences in availability of products, so you may have to come back several times.

Plots, transects and tree trails

These can be used as approaches to structured interviews to collect a variety of ethnobotanical data. As discussed above under Cultural Domain Analysis, identification of plants with vernacular names, and vice versa, is an important and necessary step in documenting local ethnobotanical knowledge. While voucher specimens or pictures are often the most convenient and efficient way to collect such data from a large sample of informants, in situ identification exercises are often much more accurate and also lead to more contextual information (ecological and social) about plants and their uses. It may be that people use a variety of different criteria for identification and classification that are not visible, audible or odorous in dried specimens or photographs. Botanical gardens or permanent plots that have scientifically identified plants are often the fastest and most accurate way to secure good correspondence between local vernacular names and scientific ones.
Plant or tree trails have been used successfully to study children's knowledge, often in comparison with adults, and transmission of knowledge. A small sample of trees are selected, depending on one's aims, and informants are brought along a trail connecting them one by one, and asked to identify them and answer other questions of relevance to the research (e.g., How do you know what it is? How is it used? Who taught you about this plant? Have you ever used it? etc.). Transects may be used in ground truthing community maps (as described above), but they can also be used to sample the range of habitats (i.e., ethnoecological categories) in a community's territory and also to conduct interviews about the plants encountered along the way. Remember that all of these structured interviews can be adapted to study change over time by varying the temporal reference in the question. See Puri and Vogl 2005 for more explicit instructions for using plant trails, plots and transects.
Botanical Methods: collecting specimens, managing collections and assessing the conservation status of plants

By Hassan Rankou and Emily Caruso

Ethnobotanical researchers need to be conversant in the methods, approaches and technologies used by botanists. They may be required to collect voucher specimens, to carry out conservation assessments of threatened plant species or, more simply, to find strategic and efficient ways of managing any collections they make and engaging with knowledgeable botanists regarding the taxa they are interested in. This chapter provides some key tips and techniques for ethnobotanists who need to hone their skills in botanical research.

Collecting a botanical voucher specimen

There are numerous excellent and detailed manuals out there explaining how to collect a botanical voucher specimen: please see the Resources section for one very clear and easy-to-use manual that you can download from the Internet. In this section we provide some tips and tricks for successful voucher specimen collection, and some comments for making ethnobotanically useful collections.

Firstly, the list of essentials to bring with you when collecting:

1. **Collection book**: your collection book is essential when you are in the field planning to collect a botanical voucher specimen. In the collection book, you will write down all the details surrounding the collection:
   a. **Number of the plant collection**
   b. **Name(s) of the plant**: Give your specimen a name and a code and make sure that if you are collecting in a plastic bag for pressing later you put a label with the same code on the plastic bag. Write down the full scientific name or at least genus, if you know it. If you are collecting with local residents or researchers, remember to record their vernacular name(s) and the language(s) they are using; you should always indicate who the informants were, perhaps using a code for local names.
   c. **Locality** (Province, gazetteer, name, description of where in the area, GPS points, altitude, etc.)
   d. **Habitat description**
   e. **Plant description**, including smell, colour, details of the leaves, roots, etc. Be as detailed as possible! These should include notes on any feature of the gathering that may not be apparent from the dried specimen in years to come. Flower colour, whether annual, biennial or perennial, height if a tree or shrub, stems erect or ascending, frequency and variability.
Conducting and Communicating Ethnobotanical Research

f. Anything you learn from local peoples: what the plant is used for (or was used for in the past), changes in abundance, etc. You should always indicate who the informants are, perhaps using a code for their names. *Important: distinguish between the uses of the actual individual plant being sampled; and uses of the category/species in general; distinguish between uses by the individual respondent and uses by “people” or “community” in general.

2. Presses, straps and paper
3. Paper or envelopes for collecting seeds. This is the easiest way to collect seeds. Place the seeds in the plastic bag with the specimen.
4. Plastic bags
5. Pencils and pens
6. Labels
7. GPS
8. Map
9. Gloves and the right footwear

It is very important that you write down the plant, habitat and locality description in your collection book in great detail, as this will ensure not only that you correctly identify the specimen, but also it will be of great help for other researchers who will have access to a complete description of the specimen once it is uploaded to an online database like BRAHMS (see below).

Be aware that most common mistake made during collections is to forget to label the bag containing the specimen. Without a label, you are likely to return to the base camp or lab and find wilted, colourless, odourless plants in your plastic bags and not remember which one is which! If you press your specimens directly in the field you will avoid that pitfall. However, it is not always possible to press in the field, for example if weather conditions are poor, you are collecting in difficult terrain or if you need to collect a large number of specimens. Remember that a proper plant press is heavy and large!

Whenever possible, try to collect plants with flowers and fruits, and as much plant material as possible (roots, leaves, etc.). Also, if the species is locally abundant, it is recommended to collect more specimens (e.g. 3 or 4 duplicates) because this will allow distribution to multiple herbaria, DNA sampling and other uses. However, if the specimen is very rare, ideally you would not collect it but simply write down all of the details in the collection book, take some good photographs, and perhaps take some minor plant material if DNA research is planned.

BOX 8: Template for collection book

FLORA OF Name:

Province:
Conducting and Communicating Ethnobotanical Research

<table>
<thead>
<tr>
<th>Locality:</th>
<th>F/M.</th>
<th>Lat</th>
<th>N/S.</th>
<th>Long</th>
<th>E/W.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grid Ref.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Habitat/Soil type:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Specimen notes:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local Name(s) (Language):</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local Uses:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Informants:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collector(s):</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Date</td>
<td>Herb</td>
<td>Spirit</td>
<td>Living</td>
<td>Seed</td>
</tr>
</tbody>
</table>

**Collection Management: exploring and using BRAHMS**

The Botanical Research and Herbarium Management System (BRAHMS) was developed by the Department of Plant Sciences at Oxford University as a unique, centralized, flexible database manager for botanists and herbaria. In its own words, BRAHMS:

"provides wide-ranging and innovative functionality to gather, edit, analyse and publish botanical data, optimizing its use for the widest possible range of curation services and research outputs." (www.http://herbaria.plants.ox.ac.uk/bol/)

There are active BRAHMS projects in about 60 countries, including many biodiverse tropical and subtropical regions. The BRAHMS databases collectively house about 7 million specimen records. The country with the highest number of individual projects is Brazil, where all of the Amazonian region’s herbaria are fully recorded in online databases. The largest database is in the Netherlands, which holds about 3 million specimen records.

Amongst others, the BRAHMS system helps research institutions catalogue, curate and manage their collections held in herbaria, botanic gardens, living collections, field observations, botanical surveys and seed banks. It also supports researchers carrying out taxonomic studies, including writing or revising monographs, and those implementing diversity analyses, by helping to prepare floras and checklists. Its multiple uses are enabled by a systematised database that contains the following categories of data (or modules):

- **Taxa:** in this module the taxonomic details of the specimen are entered. All BRAHMS databases have a central list of taxonomic names. New projects can also import names from the
International Plant Names Index (IPNI) and other sources (e.g., see The Plant List at www.theplantlist.org).

All information and details (e.g. taxonomic status, authors, validity, legitimacy, protologues, selected references, synonymy, descriptive texts, habit, conservation coding, etc.) about plant names can be stored at all taxon levels. The System provides the tools to assemble and format taxonomic data.

- **Geodata**: longitude and latitude of the specimen’s collection location. In conjunction with data from other specimens of a given taxon, this geodata can be used to map the distribution of a species.
- **Botanical records**: where the specimen is housed or where it was observed.
- **Specimens**: These are physical objects such as herbarium sheets; fruit, seed, resin and wood samples; microscope slides; or DNA leaf material amongst others – specimen categories can be added if necessary. A number of different types of specimens of the same taxon may be entered for one botanical record.
- **Images**: images of plants, specimens, maps, drawings, and so on can be used across all categories and uploaded and registered in BRAHMS.
- **Plot Samples**: This module is where the botanical survey information regarding the specimen is entered. Plot data can be combined with other data for diversity analyses. The module manages plots (of varying sizes), whether they are temporary or permanent and have multiple research objectives. Plot data files may only register species presence, but more complex files can be used too, including other identification markers (for example in forest inventories). There are no restrictions on the data fields that can be added.
- **Living collections**: contains the description of plants in botanic gardens, images of plants, details about the origin of the material, and information about management events, including garden inventories.
- **Seed**: developed in partnership with the Millennium Seed Bank at the Royal Botanic Gardens, Kew, it stores all details about seed, including processing and testing. Data are publishable, published and accessible online.
- **Literature**: any bibliographic references to the taxon.

For beginners to learn how to use the BRAHMS system, including how to start a database, add data to one, create new fields, and so on, Denis Filer from Oxford University’s Plant Sciences maintains an updated training manual freely available on the BRAHMS website (see Resources, below).

Knowing how to use and contribute to the BRAHMS databases is essential for researchers in ethnobotany, ethnomedicine and ethnopharmacology. It allows researchers to upload the information regarding specimens they have collected, contributing in this way to knowledge about that taxon. It is also very useful for species identification. For example, you collect a specimen of a plant used by a community to cure a particular ailment. You know which genus it might belong to but are unsure of the species. By inputting the genus name and location of the collection into BRAHMS you can retrieve
entries for a series of possible species, with photos, descriptions and other identification tags to help you determine the species you are working with.

Another interesting aspect of BRAHMS for researchers in ethnobotany is the potential it provides for publishing taxonomic revisions, checklists, floras and other such material. Once the data is entered into the system, it can be retrieved in different formats and combinations to suit any kind of publication. It also can be used as a reference management tool, helping you to manage your references for publication.

Another very useful tool for ethnobotanists is the mapping tool. You can obtain distribution data using GIS software or Google maps, and the System also allows you to visualize Areas of Occurrence and Extent of Occurrence of the taxon in question. BRAHMS also helps to create connections between botanists, enhancing knowledge exchange and collaboration.

A new feature provided by the most recent versions of BRAHMS is the Conservation Assessment Module. This module both records and reports on conservation assessment data, primarily IUCN Red List assessments (see next section for more information). The conservation assessment form allows users to enter information in data fields that are grouped according to the different elements of the IUCN conservation assessment forms. Developers are planning a direct link between the BRAHMS database and the IUCN’s Species Information Service database, which contains all of the information on conservation status of species around the world.

Conservation assessment and IUCN red-listing: the formalities

Knowing what a species conservation assessment takes and how it is carried out is an important tool in the ethnobotanist’s or ethnopharmacologist’s toolbox. Why? It may be, for example, that the taxon you are interested in for your research is threatened. In this case it is useful to have a simple, standardized, go-to document that contains all of the information relating to that plant: its taxonomy; how endangered it is and the causes of threat; where it is found; its uses and trade; its synonyms, local names and common names; its current population size and so on.

You could also be called upon as an expert in the ongoing assessment of a species you are researching, in which case knowing your criteria and categories is an asset. On the other hand, you may discover, through your research, that a taxon that was once widely available or known to the community(ies) you are working with is now scarce, indicating, perhaps, the need for a conservation assessment (either at the regional or global level). If the conservation assessment for an important species you are researching is lacking, you may consider launching the process yourself or motivating other actors to team up with you to implement it. Given your dual people-and-plants position, you may even be able to foment a participatory approach to the implementation of the conservation assessment. Finally, given that conservation funding is now given based on species’ conservation

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8The text for the definitions, criteria and categories in this section are adapted directly from the IUCN materials (provided in the reference section).
status, it is also important for project proposal development to know what it takes to carry out a
conservation assessment.

In this section, we provide the formal definitions and processes that you should know about
conservation assessments according to the IUCN Red List Categories and criteria. In the subsequent
section, we provide a detailed how-to guide for red-listing based on a case study by one of this
chapter’s authors, Hassan Rankou.

The IUCN Red List is the world’s most comprehensive information source on the extinction risk
of plant and animal species. It compiles conservation status of species at the global and regional
levels and is based on the best scientific information available. The information in the IUCN Red List is
widely used to inform biodiversity conservation policy and practice, making the IUCN Red List the
global gold standard for conservation decision-making.

The goal of the IUCN Red List Unit is to provide information and analyses on the status, trends
and threats to species in order to inform and catalyze action for biodiversity conservation. This goal
includes the "traditional" role of the IUCN Red List in identifying particular species at risk of extinction.
While the role of the IUCN Red List in underpinning priority-setting processes for single species
remains of critical importance, the goal has been expanded. Now Red List data is used to carry out
multi-species analyses in order to identify and monitor trends in the status of biodiversity and to
catalyze appropriate conservation actions. To achieve this goal, the IUCN Red List aims to establish a
baseline from which to monitor the change in status of species, provide a global context for the
establishment of conservation priorities at the local level and monitor, on a continuing basis, the
status of a representative selection of species (as biodiversity indicators) that cover all the major
ecosystems of the world.

IUCN Red List provides an estimate of extinction risk and classifies species according to this
risk. It highlights those species that are most likely to become extinct in the near future given current
knowledge of population trends, range and habitat availability, population size and structure, and
recent, current or projected threats acting on the species. It is very handy for ethnobotanists and
ethnopharmacologists to have, collated in one place, all of these data about taxa you are interested in,
as it can help inform your research process.

The IUCN Red List categories and criteria were first published in 1994 following six years of
research and broad consultation (IUCN 1994). The 1994 IUCN categories and criteria were developed to
improve objectivity and transparency in assessing the conservation status of species, and therefore to
improve consistency and understanding among users. In 1998-9, the IUCN initiated a review of the
1994 categories and criteria; once completed, the new IUCN Red List Categories and Criteria (version
3.1) were published in 2001 (IUCN 2001, 2012b).

IUCN Categories

There are nine clearly defined categories into which every taxon in the world (excluding micro-
organisms) can be classified.
### BOX 9: The IUCN Categories: a summary

This list is adapted and summarised from IUCN 2012b, available at [www.iucnredlist.org/technical-documents/categories-and-criteria](http://www.iucnredlist.org/technical-documents/categories-and-criteria). See also Figure 5, below.

**EXTINCT (EX)** A taxon is Extinct when there is no reasonable doubt that the last individual has died.

**EXTINCT IN THE WILD (EW)** A taxon is Extinct in the Wild when it is known only to survive in cultivation, in captivity or as a naturalized population (or populations) well outside its historical range.

**CRITICALLY ENDANGERED (CR)** A taxon is Critically Endangered when the best available evidence indicates that it meets any of the criteria A to E (see p. 50 for the description of the criteria) for Critically Endangered, and it is therefore considered to be facing an extremely high risk of extinction in the wild.

**ENDANGERED (EN)** A taxon is Endangered when the best available evidence indicates that it meets any of the criteria A to E for Endangered, and it is therefore considered to be facing a very high risk of extinction in the wild.

**VULNERABLE (VU)** A taxon is Vulnerable when the best available evidence indicates that it meets any of the criteria A to E for Vulnerable, and it is therefore considered to be facing a high risk of extinction in the wild.

**NEAR THREATENED (NT)** A taxon is Near Threatened when it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future, say if ongoing conservation actions abate or cease.

**LEAST CONCERN (LC)** A taxon is Least Concern when it has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are included in this category. Categorising a species as of Least Concern does not mean it is of lesser concern in conservation action.

**DATA DEFICIENT (DD)** A taxon is Data Deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status. A taxon in this category may be well studied, and its biology well known, but appropriate data on abundance and/or distribution are lacking. This category does not provide any information on the current threat to the species.

**NOT EVALUATED (NE)** A taxon is Not Evaluated when it is has not yet been evaluated against the criteria, therefore it also does not provide any information on the current threat to the species.
IUCN Criteria

There are five quantitative criteria which are used to determine whether a taxon is threatened or not, and if threatened, which category of threat it belongs in (Critically Endangered, Endangered or Vulnerable) (Table 1). These criteria are based around the biological indicators of populations that are threatened with extinction, such as rapid population decline or very small population size. Most of the criteria also include subcriteria that must be used to justify more specifically the listing of a taxon under a particular category. Figure 2, below presents some of the key terms and concepts used to define the five criteria, as well as summarized versions of their definitions.

The five criteria are:

A. Declining population (past, present and/or projected)
B. Geographic range size, and fragmentation, decline or fluctuations
C. Small population size and fragmentation, decline, or fluctuations
D. Very small population or very restricted distribution
E. Quantitative analysis of extinction risk (e.g., Population Viability Analysis)
### Key terms and concepts

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Population:</strong></td>
<td>Total number of individuals</td>
</tr>
<tr>
<td><strong>Population Size:</strong></td>
<td>Number of mature individuals only</td>
</tr>
<tr>
<td><strong>Mature Individuals:</strong></td>
<td>The number of individuals known, estimated or inferred to be capable of reproduction</td>
</tr>
<tr>
<td><strong>Subpopulations:</strong></td>
<td>Geographically or otherwise distinct groups in the population between which there is little demographic or genetic exchange</td>
</tr>
<tr>
<td><strong>Generation Length:</strong></td>
<td>Average age of parents of the current cohort, reflecting the turnover rate of breeding individuals in the population</td>
</tr>
<tr>
<td><strong>Severely Fragmented:</strong></td>
<td>Increased extinction risks due to the fact that most individuals are found in small and relatively isolated subpopulations, and dispersal is limited between these subpopulations. These small subpopulations may go extinct, with a reduced probability of recolonization.</td>
</tr>
<tr>
<td><strong>Quantitative Analysis:</strong></td>
<td>Any form of analysis which estimates the extinction probability of a taxon based on known life history, habitat requirements, threats and any specified management options</td>
</tr>
<tr>
<td><strong>Continuing Decline:</strong></td>
<td>A recent, current or projected future decline which is liable to continue unless remedial measures are taken</td>
</tr>
<tr>
<td><strong>Reduction:</strong></td>
<td>A specific (%) decline in the number of mature individuals; the decline can be caused by a one-time event</td>
</tr>
<tr>
<td><strong>Extreme Fluctuations:</strong></td>
<td>Population size or distribution area varies widely, rapidly and frequently, typically with a variation greater than one order of magnitude (i.e. a tenfold increase or decrease)</td>
</tr>
<tr>
<td><strong>Extent of Occurrence (EOO):</strong></td>
<td>Area contained within the shortest continuous imaginary boundary (minimum convex polygon) which can be drawn to encompass all known, inferred, or projected sites presently occupied by the taxon.</td>
</tr>
<tr>
<td><strong>Area of Occupancy (AOO):</strong></td>
<td>Area within the extent of occurrence (EOO) which is actually occupied by the taxon (usually measured by overlaying a grid and counting number of occupied cells).</td>
</tr>
</tbody>
</table>
**CRITERION A: Declining population**

Criterion A is based on rate of population reduction in the past, present or future. In order to use criterion A, we must first find out what the time period for measuring the reduction should be: either 10 years or 3 generations, whichever is longer. We must therefore find out the generation length.

Once you know the time period over which the reduction should be measured, examine all of the information and data available related to rate of decline in population size over that time period.

Criterion A is split into four subcriteria:

**A1** is used for a reduction over the past 10 years or 3 generations, where the causes of the reduction are understood and the reduction is reversible.

**A2** is used for a reduction that took place in the past 10 years or 3 generations, where the causes of the reduction may not be understood or the reduction may not be reversible.

**A3** is used for a reduction projected to occur over the next 10 years or 3 generations (up to a maximum of 100 years in the future). For A3, there should be some information available to support the future rate of decline used. Ideally a population decline model should be used based on current and likely future events.

**A4** is used for a reduction over a period including some time in the past and sometime in the future (also known as the shifting time window). Again, there is a time cap of 100 years on the future projection, so if you are assessing a very long-lived species, you are not required to project more than 100 years into the future.

**Points to remember (Source: IUCN):**

To use criterion A, an estimate of the generation length is needed.

Population reduction may be a one-off event...

...Or it may be ongoing
BOX 10: Data Quality: some definitions

In the Red List Categories and Criteria you will see the following terms used: Observed; Estimated; Projected; Inferred; Suspected. These terms refer to the quality of the information used in the assessment, as defined in the Red List Categories and Criteria.

Observed data
Observed information is directly based on well-documented observations of all known individuals in the population.

Estimated data
Estimated information is based on calculations that may involve assumptions and/or interpolations in time (in the past).

Projected data
Projected information is the same as “estimated”, but the variable of interest is extrapolated in time towards the future

Inferred data
Inferred information is based on variables that are indirectly related to the variable of interest, but in the same general type of units (e.g. number of individuals or area or number of subpopulations). Relies on more assumptions than estimated data.

Suspected data
Suspected information is based on circumstantial evidence, or on variables in different types of units. In general, this can be based on any factor related to population abundance or distribution.

CRITERION B

Criterion B is designed to identify populations with restricted distributions that are also severely fragmented, undergoing a form of continuing decline, and/or exhibiting extreme fluctuations (in the present or near future). Criterion B is based on two subcriteria:

B1 is based on the estimated extent of occurrence.

B2 is based on the estimated area of occupancy.

In order to list a species as threatened under criterion B, it must first meet the thresholds for either criterion B1, or B2, or both B1 and B2. In addition, it must also meet at least two of three further subcriteria:

- The population is severely fragmented, or occurs in few locations.
- There is evidence of continuing decline.
- There is evidence of extreme fluctuations.
CRITERION C

Criterion C is designed to identify taxa with small populations that are currently declining, or may decline in the near future. Criterion C is based on a small population size; the following subcriteria are used:

C1 refers to a continuing decline in the number of mature individuals at a specific estimated rate, or

C2 is used to refer to a continuing decline in the population size at any rate, and either:

C2a: a population structure of either very small subpopulations, or most of the mature individuals distributed in just one subpopulation

C2b: there are extreme fluctuations in population size

(Source: IUCN)
CRITERION D

Criterion D identifies species with a high risk of extinction because they have extremely small or restricted populations. A taxon can be listed under criterion D if it has a very small population size, or if it has a very restricted area of occupancy or is found in just a few locations. While there is only a “D” option for Critically Endangered and Endangered, the Vulnerable category (VU) is split into D1 and D2. D and D1 concern VERY small population sizes; to use these we must have an estimate of population size.

D2 concerns VERY restricted area of occupancy or few locations and relates to the Vulnerable category only; to use this criterion there must be a serious plausible threat that could cause the taxa to become Critically Endangered or even Extinct within just a few generations, and this threat must be stated in the assessment. Here, the threshold values given in the criteria are given as indicators only. The most important focus of Vulnerable category D2 is that the taxon is found in a very restricted area and there is a plausible threat that could cause it to become highly threatened within a very short time period.

CRITERION E

To qualify under criterion E, a quantitative analysis such as a Population Viability Analysis must be conducted to determine a species’ probability of extinction over a given time period. This criterion has very specific thresholds for the probability and time period over which extinction is likely to take place (see figure, for each of the three threatened categories). It is measured up to a maximum of 100 years into the future.

Very few species on the IUCN Red List are listed under criterion E, but if you have sufficient data to run a quantitative analysis, you can find more guidance in the User Guidelines about which methods and models can be used.
Figure 7: Categorisation of the taxon, based on criterion E's probability of extinction over a given time period (Source: IUCN)
Table 1: Summary of the five criteria (A-E) used to evaluate if a taxon belongs in one of the three IUCN threatened categories (Critically Endangered, Endangered or Vulnerable). (Source IUCN 2012b)
### SUMMARY OF THE FIVE CRITERIA (A-E) USED TO EVALUATE IF A TAXON BELONGS IN AN IUCN RED LIST THREATENED CATEGORY (CRITICALLY ENDANGERED, ENDANGERED OR VULNERABLE).

<table>
<thead>
<tr>
<th>A. Population size reduction. Population reduction (measured over the longer of 10 years or 3 generations) based on any of A1 to A4</th>
<th>Critically Endangered</th>
<th>Endangered</th>
<th>Vulnerable</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>≥ 90%</td>
<td>≥ 70%</td>
<td>≥ 50%</td>
</tr>
<tr>
<td>A2, A3 &amp; A4</td>
<td>≥ 80%</td>
<td>≥ 50%</td>
<td>≥ 30%</td>
</tr>
</tbody>
</table>

- A1 Population reduction observed, estimated, inferred, or suspected in the past where the causes of the reduction are clearly reversible AND understood AND have ceased.
- A2 Population reduction observed, estimated, inferred, or suspected in the past where the causes of reduction may not have ceased OR may not be understood OR may not be reversible.
- A3 Population reduction projected, inferred or suspected to be met in the future (up to a maximum of 100 years) [i.e. cannot be used for A3].
- A4 An observed, estimated, inferred, projected or suspected population reduction where the time period must include both the past and the future (up to a max. of 100 years in future), and where the causes of reduction may not have ceased OR may not be understood OR may not be reversible.

- (a) direct observation (except A3)
- (b) an index of abundance appropriate to the taxon
- (c) a decline in area of occupancy (AOO), extent of occurrence (EOO) and/or habitat quality
- (d) actual or potential levels of exploitation
- (e) effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites.

<table>
<thead>
<tr>
<th>B. Geographic range in the form of either B1 (extent of occurrence) AND/OR B2 (area of occupancy)</th>
<th>Critically Endangered</th>
<th>Endangered</th>
<th>Vulnerable</th>
</tr>
</thead>
<tbody>
<tr>
<td>B1. Extent of occurrence (EOO)</td>
<td>&lt; 100 km²</td>
<td>&lt; 5,000 km²</td>
<td>&lt; 20,000 km²</td>
</tr>
<tr>
<td>B2. Area of occupancy (AOO)</td>
<td>&lt; 10 km²</td>
<td>&lt; 500 km²</td>
<td>&lt; 2,000 km²</td>
</tr>
</tbody>
</table>

AND at least 2 of the following 3 conditions:

- (a) Severely fragmented OR number of locations
- (b) Continuing decline observed, estimated, inferred or projected in any of: (i) extent of occurrence; (ii) area of occupancy; (iii) area, extent and/or quality of habitat; (iv) number of locations or subpopulations; (v) number of mature individuals
- (c) Extreme fluctuations in any of: (i) extent of occurrence; (ii) area of occupancy; (iii) number of locations or subpopulations; (iv) number of mature individuals

<table>
<thead>
<tr>
<th>C. Small population size and decline</th>
<th>Critically Endangered</th>
<th>Endangered</th>
<th>Vulnerable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of mature individuals</td>
<td>&lt; 250</td>
<td>&lt; 2,500</td>
<td>&lt; 10,000</td>
</tr>
</tbody>
</table>

AND at least one of C1 or C2

- C1. An observed, estimated or projected continuing decline of at least (up to a max. of 100 years in future) 25% in 3 years or 1 generation (whichever is longer) 20% in 5 years or 2 generations (whichever is longer) 10% in 10 years or 3 generations (whichever is longer)
- C2. An observed, estimated, projected or inferred continuing decline AND at least 1 of the following 3 conditions:

- (a) Number of mature individuals in each subpopulation
- (b) Percentage of mature individuals in one subpopulation

<table>
<thead>
<tr>
<th>D. Very small or restricted population</th>
<th>Critically Endangered</th>
<th>Endangered</th>
<th>Vulnerable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of mature individuals</td>
<td>&lt; 50</td>
<td>&lt; 250</td>
<td>&lt; 1,000</td>
</tr>
</tbody>
</table>

D2. Only applies to the VII category

- Restricted area of occupancy or number of locations with a plausible future threat that could drive the taxon to CR or EX in a very short time.

<table>
<thead>
<tr>
<th>E. Quantitative Analysis</th>
<th>Critically Endangered</th>
<th>Endangered</th>
<th>Vulnerable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indicating the probability of extinction in the wild to be:</td>
<td>≥ 50% in 10 years or 3 generations, whichever is longer (100 years max.)</td>
<td>≥ 20% in 20 years or 5 generations, whichever is longer (100 years max.)</td>
<td>≥ 10% in 100 years</td>
</tr>
</tbody>
</table>

---

1 Use of this summary sheet requires full understanding of the IUCN Red List Categories and Criteria and Guidelines for Using the IUCN Red List Categories and Criteria. Please refer to both documents for explanations of terms and concepts used here.
Use at the regional level

The IUCN Red List Categories and Criteria were designed for global taxon assessments. However, many people are interested in applying them to subsets of global data, especially at regional, national or local levels. To do this it is important to refer to guidelines prepared by the IUCN/SSC Regional Applications Working Group and the National Red List Working Group of the IUCN SSC Red List Committee (e.g. Gärdenfors et al. 2001; IUCN 2003, 2012a). When applied at national or regional levels it must be recognized that a global category may not be the same as a national or regional category for a particular taxon.

The regional assessment process is made up of three steps:

• **Step 1: Identify Not Applicable taxa**

First you must decide which taxa are not applicable for the regional Red List, and which taxa you will assess. So, which species are not eligible for regional assessment?

• **Introduced taxa** – those taxa that are not native to the region and are introduced for reasons other than conservation – are not eligible for assessment. The only introduced taxa that can be assessed are those populations resulting from a benign introduction (= populations of a species not naturally found in the region that have been established in the region for conservation purposes); if the benign population is self-sustaining, it could be assessed for the regional Red List.

• **Vagrant taxa** – those that are not native to the region but do show up in the region occasionally and irregularly – are also excluded from a regional Red List.

• **Step 2. Preliminary assessment**

Then the regional population for each taxon is evaluated according to the IUCN Categories and Criteria: in this case the Categories and Criteria are applied to the population within the region as if it were the only population in existence, ignoring all information from populations outside the region. Based on this, a preliminary category is assigned.

• **Step 3. Final regional assessment**

Finally the potential ‘rescue effects’ of populations of the same taxon in neighbouring regions on the regional population are considered, and the preliminary category is up- or down-listed, if appropriate. Using the flowchart found in Figure 8, we can answer a series of questions to aid in this assessment. These questions determine whether there are populations outside the region that may “rescue” the regional population through immigration.
Therefore, it is important to note that when carrying out regional assessments, there are two additional categories that do not exist at the global level: (i) Not Applicable: Taxa that have not been assessed because they are unsuitable for inclusion in the regional Red List; and (ii) Regionally Extinct: Taxa that are considered extinct within the region but populations still exist elsewhere in the world.

Conservation priorities and actions

The category of threat is not necessarily sufficient to determine priorities for conservation action. The category of threat simply provides an assessment of the extinction risk under current circumstances, whereas a system for assessing priorities for action will include numerous other factors concerning conservation action such as costs, logistics, chances of success, and other biological characteristics (Mace and Lande 1991). The Red List should therefore not be interpreted as a means of priority setting (IUCN 2001, 2012b). However, assessment and categorization of taxa using Red List Criteria represents a critical first step in the process of setting priorities for conservation action.

Many taxa assessed under the IUCN Red List Criteria will already be subject to some level of conservation action. The criteria for the threatened categories are to be applied to a taxon whatever the level of conservation action already in place; any current or past conservation measure must be
included in the assessment documentation. It is important to emphasize that a taxon may require conservation action even if it is not listed as threatened, and that effectively conserved threatened taxa may, as their status improves over time, cease to qualify for listing.

Documentation

The IUCN requires full documentation for all conservation assessments, including all the data used to generating the listing. These data must be referenced either to a publication that is available in the public domain, or else be made available. As mentioned in the previous section, the BRAHMS system now has a conservation assessment module, which allows recording and reporting of conservation assessment data, in accordance with IUCN Red List Categories and Criteria. In other words, if you carry out a conservation assessment of a certain species, you can record, in determined data fields, all of the information (including the all-important criterion-fulfilling data) that is included in the conservation assessment. You can also use the BRAHMS system to find out information about conservation status of species that aligns with the IUCN Red List formula.

When any of the three ‘threatened’ classifications are used, the criteria and subcriteria they meet must be clearly stated. Clearly listing the subcriteria demonstrates (i) the reasoning for placing a taxon in a specific category, although the reasoning can be re-examined if necessary; and (ii) the primary threats facing a taxon and may aid in conservation planning. Notably, assessments will not be accepted as valid for the IUCN Red List unless at least one criterion and any qualifying subcriteria are given.

Components of an IUCN Red List assessment

- Red List category and criteria
- Documentation supporting the category and criteria
- Map of species’ distribution

Documentation supporting the category and criteria

Once the listing is complete, the supporting documentation is displayed on the Red List website and provides Red List users with a clear explanation of why the species qualifies for the assigned category and criteria, through detailing the available knowledge, data, and information sources used to lead the assessor to that conclusion. This includes a written summary of what is currently known about the species:

- Taxonomy
- Distribution
- Population size and trends
- Habitats and ecology
- Uses and trade
- Threats
- Conservation actions in place and required
The IUCN Species Information Service (SIS)

SIS is IUCN’s online centralised data storage management system, i.e. every assessor enters data in the same format into the same system. SIS links directly to the Red List website and thus facilitates the standardized publication of the Red List – the information in SIS appears on the website exactly as it is entered in SIS. As mentioned above, future versions of the BRAHMS management system will be directly connected to the IUCN’s SIS, facilitating the visualization of the relationship between botanical data about a given taxon and its conservation status.

BOX 11: Red-listing in practice by expert and IUCN trainer Hassan Rankou

This box describes the principal practical steps in the elaboration of a conservation assessment.

**Step 1.** The first step is to carry out preliminary data collection. This requires you to find all of the herbarium data you can (BRAHMS is an excellent resource), and to carry out research on all the aspects of the plant: taxonomy, distribution, geographical range, local uses, nomenclature, and so on. The more detailed the data you find, the better (which is why it is important to include as much detail as possible when collecting herbarium voucher specimens!)

**Step 2.** Go to the field to collect ‘observed data’. Ideally you would visit at least 2 of the floristic regions of your species, one where it is abundant and one where it is scarce, so that you can make comparisons. Visiting all of the regions where the species occurs is even better, but in some circumstances you may only be able to visit 1 floristic region, which is good enough. If you cannot visit all of the floristic regions, you will infer ‘suggested data’ for the regions you cannot visit. In the field, you will take GPS points in order to calculate the area of occupancy and distribution, and you will carry out a survey of the individuals present and calculate density (you can choose your own preferred method for this: quadrats, transects, or, if the population is very small, you can count individuals). It is important, for this step, that you make sure you know the taxonomy of the species you are looking for very well as it is very easy to exchange one species for another when in the field. For this, you must find very detailed descriptions and study as many voucher specimens as possible (another reason to provide very detailed descriptions when collecting botanical voucher specimens!)

**Step 3.** Carry out some basic ethnographic fieldwork: interview locals, herbalists, traders, collectors and anyone else that you can think of about plant distribution, changes in distribution, what it is used for, changes in price, and any other information regarding the species in question. This is a key part of the assessment as locals or individuals who use or trade in the plant are very knowledgeable about the species and its availability and distribution.

**Step 4.** Write up your assessment according to the IUCN template (see Figure X) and create a map. Send it to a colleague or friend for an informal review prior to submitting it to the IUCN.

**Step 5.** Submit the assessment to the IUCN for anonymous review.

Applying the Conservation Assessment process in a half-day workshop practical

During the MedPlant Summer School, we implemented a half-day practical to allow students some hands-on practice, which brought together plant surveys, a summary conservation assessment and some communications practice (see also the next chapter). The students were divided into 4
groups. Each group was allocated a species (and given background data and documentation on the species) that was found in the same general practice area near where the summer school was being carried out.

They were given 1.5 hours to collect data for their assessment. Some of the groups had to count the individuals of their species, because there were only very few of them, while others had to make an estimate of population size of the practice area on the basis of a smaller area. They were then given 1.5 hrs to make posters that presented both the conservation assessment for their species, and how they had reached their conclusions. The target audience they were addressing were from a different field, yet the students were required to use IUCN Red List formula. This encouraged them to be creative in their presentation. Subsequently, the posters were evaluated by course convenors and the group discussed Red List assessment methods and their broader use.

**Effective science communication at all scales**

*By Ruth Krause, Inanc Tekguc, Gary Martin and Emily Caruso*

Once you have completed some or all of your research, you are likely to go down the well-trodden path of communicating your results via scientific conferences and peer-reviewed publications. These are, of course, the *sine qua non* of scientific research, and we expect you know or have easy access to advice and ideas for these types of communication. Our objective here is to explore different avenues of communication with you, beyond those that you are already familiar with as a scientist.

Let us make three assumptions: (1) that as an ethnobiologist you hope that your research has some positive impact on the world, perhaps by supporting communities to manage their resources more effectively, or by finding plants that may be useful to the world for medical or other purposes; (2) that as a researcher you hope that your ideas are interesting to other people, including scholars and ‘lay people’, and that it will be used to positive ends; and (3) that you hope your work will continue to be funded. If these three assumptions are correct, an important part of your process as a scholar is to reflect on how you wish to communicate your research beyond the peer-reviewed publication and the scientific conference.

Let us make another assumption: that you have not been living under a rock for the past 20 years. You are therefore fully cognisant of how communications have been dramatically transformed in the internet era, particularly by what is known as Web 2.0 – i.e. World Wide Web sites that are dynamic, interactive, collaborative and network-based, including social media, video-sharing sites, blogs, wikis, and so on. Knowing how to navigate and utilise these rapid, interactive and mobile communications platforms will enable you to widen the audience of your research ideas and develop your ability to share the exciting results you are producing. In addition the process of preparing your communications pitch for a diversity of audiences and media is itself a powerful incubator of ideas for the development of your research. In this section, we present some key tools for preparing your results to be shared with different audiences, in different media, and through Web 2.0 sites.
Creating a message map

According to communications coach and author Carmine Gallo, you need to learn how to communicate your ideas effectively in 15 seconds flat. A message map provides a visual framework for doing that. You can rapidly familiarize yourself with your message map, so that the next time you are asked about your research you will remember the prompts for each of the elements of your map. There are many ways of preparing a message map – some complex and some very simple. Gallo’s approach is very simple, adapted here for scientific communications:

• Step 1: Create a Twitter-friendly version of your research (or PhD) title. This is the single overarching message you want your audience to know about your research. Try to make it no longer than the 140 characters of a tweet, and remove any scientific jargon. Given that in step 2 you will have to make 3 key points about your research, it is useful to somehow refer to these in your headline.
• Step 2: Make 3 key points about your research that support the title. According to Gallo, the human mind can only process 3 pieces of information at a time in its short-term memory. Ideally these three key points will refer to the headline.
• Step 3: Support the three points with a message in the form of a story, statistics or examples. Remember a few key words for each message that will prompt you when you share your research.

Using the technique of the message map, you will be prepared to widely and effectively communicate your research and its results through many Web 2.0 channels such as Twitter, Facebook, Academia.edu, etc.

Communicating like TED

TED conferences began as a series in 1990 in California. The early emphasis of the conferences was on technology, entertainment and design (the origin of the acronym TED) given their inception in Silicon Valley, however, over the course of the 1990s the conference opened out to invite speakers from all disciplines and backgrounds (including scientists, philanthropists, politicians, entertainers, authors, artists, and many more), as long as they had “an idea worth spreading”. Since June 2006, the talks given during TED conferences have been available for free online viewing through TED.com. This gave them mass appeal, allowing the worthy ideas they contained to spread far and wide.

At the core of the TED appeal, is a strict code for communicating effectively, one that all scientists – and anyone with an idea worth spreading – can learn a lot from. One of the secrets of success of TED speakers is that the organisers send them a list of rules for preparing their talk inscribed in a small slab of stone called the TED commandments (Source: www.ted.com):
Similarly to these commandments, Carmine Gallo came up with the 9 secrets of successful TED speakers. Note that these are valuable points for everyone making an oral presentation, not only TED speakers. Any presentation you make, whether in a departmental seminar room, a large scientific conference, or a public lecture, will benefit from including these tips.

1. **Show your passion.** Your passion will be at the root of your confidence and mastery. You cannot inspire others unless you are inspired yourself. You stand a much greater chance of persuading and inspiring your listeners if you express an enthusiastic, passionate, and meaningful connection to your topic. Ron Finley’s exhilarating talk about leading a curbside gardening revolution in South Central LA to improve physical health and create community is a
Conducting and Communicating Ethnobotanical Research

wonderful example of this passion in action: http://www.ted.com/talks/ron_finley_a_guerilla_gardener_in_south_central_la.

2. Tell three stories. As mentioned in the section on ethnography, above, stories and narratives are key to sharing your research effectively. As Brené Brown, social scientist at the Houston Graduate College of Social Work, and much-loved TED speaker suggests, “stories are just data with a soul”. In other words, your data can also be shared using stories! Tell stories to reach people’s hearts and minds. In this vlog post http://www.duarte.com/blog/engage-through-storytelling/, Nancy Duarte, a communications specialist, argues for the importance of storytelling when presenting data, and gives some tips on how to do it. A powerful TED talk that uses narrative to present science is the one by Jill Bolte Taylor, a neuroanatomist who had a stroke, http://www.ted.com/talks/jill_bolte_taylor_s_powerful_stroke_of_insight

3. Practice relentlessly. Practice your talk so that you can deliver it as comfortably as having a conversation with a close friend. Although you might not need to practice 200 times prior to giving it (which some TED speakers do), practicing your presentation so that it flows and is engaging is essential. It is also a very useful practice to give your presentations to friends or family and ask for feedback.

4. Teach your audience something new. The human brain loves novelty. An unfamiliar, unusual, or unexpected element in a presentation jolts the audience out of their preconceived notions, and quickly gives them a new way of looking at the world. Robert Ballard is an explorer who discovered Titanic in 1985. He told me, “Your mission in any presentation is to inform, educate, and inspire. You can only inspire when you give people a new way of looking at the world in which they live.” Simon Sinek provided a fascinating insight into what makes leaders to effective and powerful in the following TED talk: http://www.ted.com/talks/simon_sinek_how_great_leaders_inspire_action

5. Deliver jaw-dropping moments. The jaw-dropping moment—scientists call it an ‘emotionally competent stimulus’—is anything in a presentation that elicits a strong emotional response such as joy, fear, shock, or surprise. It grabs the listener’s attention and is remembered long after the presentation is over. See, this presentation by David Gallo, for example: http://www.ted.com/talks/david_gallo_shows_underwater.astonishments

6. Use humour without telling a joke. Humour lowers defences, making your audience more receptive to your message. It also makes you seem more likable, and people are more willing to do business with or support someone they like. The funny thing about humour is that you don’t need to tell a joke to get a laugh. Self-deprecation, funny stories. Lighten up. Don’t take yourself (or your topic) too seriously. The currently most popular TED talk, which has attracted over 30 million views, was given by Sir Ken Robinson in February 2006: http://www.ted.com/talks/ken_robinson_says_schools_kill_creativity. It is humorous, through the use of body language, self-deprecation, and wit.
7. **Stick to the 18-minute rule.** A TED presentation can be no longer than 18 minutes. Eighteen minutes is the ideal length of time to get your point across. Researchers have discovered that “cognitive backlog,” too much information, prevents the successful transmission of ideas. TED curator Chris Anderson “long enough to be serious and short enough to hold people’s attention.” Often, you have less than 18 minutes when you are presenting.

8. **Favour pictures over text.** PowerPoint is not the enemy. Bullet points are. Some of the best TED presentations are designed in PowerPoint. Others use Apple Keynote or Prezi. Regardless of the software, there are no bullet points on the slides of the best TED presentations. There are pictures, animations, and limited amounts of text—but no slides cluttered with lines after line of bullet points. This technique is called “picture superiority.” It simply means we are much more likely to recall an idea when a picture complements it. In addition, rather than reading text on the slide, the audience will be listening to the speaker. The image is simply a mnemonic—a mnemonic shortcut to the content of their talk. An early ted talk by Hans Rosling in 2006 uses graphs to great effect (see [http://www.ted.com/talks/hans_rosling_shows_the_best_stats_you_ve_ever_seen](http://www.ted.com/talks/hans_rosling_shows_the_best_stats_you_ve_ever_seen))

9. **Be authentic.** The most inspiring TED speakers are open, authentic, and, at times, vulnerable. Brené Brown, one of the most popular TED speakers, gave a talk about vulnerability, which is both useful to examine for both her excellent communications skills and her important message about showing your vulnerability to connect with people (see [http://www.ted.com/talks/brene_brown_on_vulnerability](http://www.ted.com/talks/brene_brown_on_vulnerability))

The point of sharing these rules is not because we expect you to do TED talks to share your research, but because they are universal rules for orally communicating your ideas effectively in any circumstance.

**Visual Anthropological Techniques**

Video and photography are a fun medium through which to disseminate the results of your research. Why would you use video as a means for communicating your research? Videos can: reach a very broad audience, especially if they are shared using Web 2.0 means; help you promote your research outcomes; help you fundraise for your research; be used for advocacy; and expand your network.

If you are being interviewed about your research, you need to pay attention to a number of issues prior to recording, during recording and after the recording.

Prior to recording, you need to ask yourself the following questions:

- Who is the target audience for your video? This will significantly affect the style, approach, language, content and editing of your video.
- Who will be the interviewer? What is the title of the programme on which you may appear?
- What are your rights? What is your expected role?
- What is your content and how are you expected to present it?
The more you know about the interviewer, the target audience and the programme, the easier it will be to frame your answers in a convincing way. Knowing whom the interviewer is and what his agenda is will make you more relaxed. Never give an interview to someone whose ethics or professionalism you do not trust!

During the recording, you should remember the following points:

- The video can be broken down into sound, visuals and content. For example, when watching a TV presenter, the attention of an average viewer is divided in the following way when watching a video: 38% of her attention goes to sound, 55% goes to the visuals and 7% goes to the content.
- The average duration of a video soundbite is 20 seconds.
- The time until your audience notices your mind is blank is 6 seconds.

This doesn't mean that you have to be a supermodel in order to bring across your research convincingly, it simply means that there shouldn't be any visual distraction: don't button your shirt wrong, make sure there are no leftovers of lunch on your chin etc. Avoid delivering a long speech: if it is a pre-recorded interview, it will be cut into soundbites of around 20 seconds later on, so try to give short, precise answers with concrete examples. If you have to deliver a live interview and you get stuck during an answer, don't worry: The audience will assume it is a natural break, unless the pause exceeds around 6 seconds, which is a long time! However, the most important aspect is that if you are being interviewed, you need to (a) make sure you are comfortable in front of the camera (make yourself so!) and (b) make sure your language is clear and jargon-free, and your body language is open, relaxed and confident. One trick to make you feel more comfortable in front of the camera is to imagine that instead of a camera it is a good friend of yours who is “watching” you. Another one is to do “power poses” before the interview: Take a moment, put your hands on your hip, keep your chin up and your chest out, or raise your arms as if you just had won a gold medal at the Olympics. “Powerful” poses like these will make you feel more confident. And in the end, if you are confident and relaxed in front of the camera, you will not only be able to concentrate better and get your message across, but you might also be surprised by how enjoyable the interview suddenly is. To cut a long story short: Instead of seeing the interview as a terrifying challenge, try to see it as a great opportunity for yourself and your research.

Besides being interviewed, the second option of spreading your research finding is to produce a video of your research yourself! Nowadays, you do not need a fancy or expensive camera to create great videos: if you have a smartphone, the quality of video it produces is good enough to present your research on the web and the process is very easy. You can do it on the fly, by simply pulling out your smartphone, keeping your interviewees close to the microphone, and trying to keep your phone steady as you record. However, if you are serious about making a video using your phone, you might want to invest in some inexpensive support equipment: tripod mounts, audio adapters, microphones and lights will ensure you capture the best video possible. In the resources section, we share some websites that present and review the various options available for this gear.
**Conducting and Communicating Ethnobotanical Research**

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**BOX 12: Some basic principles of ethnographic film by Eda Elif Tibet**

You might be interested in taking your video communications a step further and producing an ethnographic film. Eda Elif Tibet, a visual anthropologist and award-winning documentary filmmaker from Turkey, provides here some words of advice on ethnographic filmmaking ‘from the heart’.

Making an ethnographic film is a process that begins with mutual respect and friendship between the filmmaker and the subjects of her film. In it, the filmmaker must learn how to put herself in the place of the other. Telling the story of someone else’s life in a fulfilling and heartfelt way is not possible without being granted access to that person’s life, issues, cause, or struggle. Therefore, the steps towards beautiful and meaningful ethnographic filming are:

1. Become friends with your protagonists.
2. Become very good friends with your protagonists....
3. Spend time together: the more you spend time together, the more you understand and respect each other’s personality, characteristics, perceptions, ideas, desires, perspectives, and so on.
4. Improvise together: visualize or imagine together how you would illustrate your protagonists’ dreams or visions, how you would represent the way she sees her community, society, ecosystem, or how she perceives space, time, and her landscape
5. Develop shared knowledge. Read together, if possible. Some references are Wickett (2003), Henley (2009), and the Insightshare Handbook for Participatory Video (see Resources section).
6. Once you feel you have developed a shared perspective and have decided on the story you would like to tell, decide on the core motivation or drive for you to tell the story, so that you can narrate it with that motivation in mind. The story’s motivation is different to the story’s theme: the motivation is the feeling, the emotion you wish to share with the story. This will help ensure you don’t fall into the trap of trying to make sure people ‘understand’ your theme the way you wish it to be understood. Let your audience do their own thinking, and give them space for interpreting it in ways that are not intended by you. Deliver emotions rather than simply facts or outcomes.
7. The editing process: this is key to the production of an inspiring film. Bring inspiration into your process because that will help keep the editing process inspired: use sound and music for inspiration; dance, jump— make sure you feel alive!
8. Do not impose your own artistic or ideological perspectives on to someone else’s life story; always ask their opinion by asking “do you think this represents you?”; even if the answer is “sort of,” that’s great – when someone gives their consent, accept it graciously.
9. Always be critical and self-reflexive about your work, but don’t be too hard on yourself – respect and value your effort and labour.
10. Ask for feedback: show your film to someone who knows nothing of your experience, and ask what he or she got out of the experience of seeing it. It is more important that they were inspired or thrilled than that they understood your message....

I also suggest 7 ethical principles to guide ethical visual anthropological filmmaking. They are gathered from personal experiences and from literature, particularly the book Working Images: Visual Research and Representation in Ethnography (Alfonso, Kurti and Pink 2004);

1. The film’s main characters should become full members of the research and film-making process;
2. There should be the desire to reach and work towards social change leading to a fairer society based on self-management and solidarity among persons and groups;
3. There should be a (self-) critical passion for revealing hidden aspects of our society and ourselves;
4. There should be a conviction that social change will only follow individual transformation, and can be best achieved through group work and equal participation;
5. The achievements of our individual and collective efforts should work to reduce negative entropy;
6. In order to work this way it is imperative that no person or institution, including the film / research team, NGO or association sets the agenda on the basis of their financial contribution. It is a prerequisite that our documentaries are significantly self funded and visuals are strictly protected and not shared other than for education and cultural use with third parties.
7. That all the earnings from any awards and royalty rights from the distribution of the films or images shall be shared equally between the filmmaker and the main characters.

To begin the process of developing your film, you must first think of the message you want your film to convey. Then decide on the target audience, the people you want to show your film to. This will determine not only the content, but also the literal and technical language you will use and where you will want to show the film.

In order to produce a narrative video of your research, you first need to prepare a storyboard. In your storyboard, you might want to list: who your 'protagonists' are, what shooting locations you should visit, what actions you may wish to film to get your message across, and so on. It might help to sketch some of the scenes on a sheet of paper in order to get a better understanding of what positions you want the camera to be in, where the light will be in your shot, where your protagonists will be, where an interviewee will be positioned, etc. In terms of ground rules for storyboarding, there are 2 basic ones. The first is that you need to make sure that your story has a clear beginning and a clear end. The second, and golden, rule is that the audience will follow your film if it feels connected to the protagonists. In other words, as important as it is to ensure your audience understands the subject intellectually, it is more important that they fall in love with the protagonists. So it is important not to reduce your protagonists to their jobs or some other superficial aspect of their identity, but to show the challenges they face, their struggles, their passion, and what they fight for.

The degree of precision of your storyboard will depend on your subject, your experience and the size of your team. In fact, writing the storyboard is an ongoing process that might even continue as you shoot. An experienced filmmaker shooting a portrait of a charismatic person might not use a storyboard at all, as her intuition and experience may give her enough clues regarding what to shoot next and which shots are missing to tell the story convincingly. If you are shooting for the first time, you need to cover a complex topic or work in a bigger group, a storyboard will help you narrow down your ideas and limit the material gathered to a manageable size.

When you are shooting, it might be a challenge to think about everything simultaneously: the protagonist, the storyboard, the equipment and the shots needed at that moment. To make life easier, you can work with the 5-shot rule, which means that in every situation you shoot: (1) a close-up of the subject’s hands, showing what is happening; (2) a close-up of the subject’s face, showing who is doing it; (3) a wide angle shot, showing where the action is taking place; (4) a shot over the subject’s shoulder, which enables the audience to see the protagonist’s perspective; and (5) an unusual creative ‘beautiful’ shot. If you get all of these five shots, you will have enough material for the editing process.

When it comes to communicating your ideas on a visual medium like a short video or a mix of video and photographs, your story or the message you want to convey is still the key element. However, style and technique also play a role in improving the way your message will be received, understood or simply whether it is viewed. For example, if you plan to have spoken messages in your film, or if the audio will be important for other reasons, we advise that you invest more time to learn tips on audio recording and even invest more funds in better audio equipment. These planning steps are essential before you start shooting as they will make the process more enjoyable and efficient.

You must also bear in mind that following the shooting, you will need to edit the footage and for that you will need to use particular editing software. Basic and free software packages exist, as well
as professional level ones that require more time to learn, but in return give you a lot more control and possibilities to improve the footage, like correcting colour and audio balance. iMovie and Windows Movie Maker are very simple free software packages, however, they do have limits, especially when it comes to editing sound. If you want to try out something more professional without investing a lot of money, you can download an Adobe Premiere Pro CC trial version for free for 30 days (for both Apple and Windows). Final Cut and Avid are professional software that you will have to buy; they give you a greater range of options, though you will need more time to learn your way around them. And there are many more!

Thanks to technological progress, it is now possible to produce your own videos with a very low budget, using a photographic camera or a smartphone. However, we advise that you do not rely on the equipment to do the job and instead spare some time to learn at least the basics of filmmaking before you start shooting. This will help you avoid potential obstacles down the line. Below are some links to a few websites that provide many tutorials to all levels of filmmaking:

Lynda (www.lynda.com), Kelby One (www.kelbyone.com) and CreativeLive (www.creativelive.com) are three excellent sources to learn about a broad number of subjects from design to education, to photography, business and video. You learn how to use the camera as well as how to edit your footage on specific software, and even how to promote it. All three schools have many short sections of their intensive 2-to-5-day courses in YouTube. However, if you like to get more in-depth training and gain any-time access to their extensive archives you will need to pay a monthly fee or buy a course.

Luckily, CreativeLive has the goal to bring free education to everyone around the world, through the Internet, by free live broadcasting of courses as they take place, before they are archived. The instructors, just as on Lynda and Kelby One, are among the most successful artists in their fields, as well as being great teachers. Some are actually the authors of the best manuals of the software they teach.

There are free alternatives to these websites, although the organization and depth of teaching is not as high-calibre as in the schools mentioned above. The following two links can provide quicker answers to specific questions that you may have about particular steps in shooting or editing videos:
http://vimeo.com/videoschool
https://www.youtube.com/playlist?list=PLKLvcG7d3JC8aL-Q9QDtv4SjjfXU6_sl

If you prefer to have the process of filming summarized in a written format, in a bit more depth than provided in this document, you can visit these links:
http://multimedia.journalism.berkeley.edu/tutorials/shooting_tips/
http://www.jiscdigitalmedia.ac.uk/infokit/video-creation

These websites can help give you an overview on filmmaking as well as providing you enough access to dig deeper in any part of it. Remember that you can always just ask your specific question to YouTube. It is very easy to find short and targeted tutorials from other users. Thousands of people trying to learn the same thing may be asking very similar questions!
Communicating with communities

So far, we have spoken of alternative approaches to disseminate your research results to the general public as well as scholar and practitioner audiences. It is also very important that you find appropriate and meaningful ways of sharing your research results with communities you have worked with. Extractive research with little to no return of data is a common experience among many rural communities. In recent years, there has been a growing demand for research data, results and analyses to be systematically returned to communities of origin, so that they can use these to resolve their problems and answer their questions. It is also a core principle of the ISE Code of Ethics.

In line with best practice, the 'ownership' of data and results should be shared between the researcher and the community, meaning that any publication by the researcher should be produced with the full consent of the communities involved. The details of such a process should be made clear in your community research agreement made at the start of the research. If it was not formally stated in a research agreement, ethnobiologists are strongly advised to follow ethical best practice and involve communities in decision-making regarding results publication, especially if there are any data that may be sensitive.

Simultaneously, you are called upon to share your results with your host communities in ways that are clear and culturally appropriate. Ideally you would not limit yourself to sending them a digital or paper copy of a paper or a thesis, for example. You may decide to make a return trip to the community and invite the whole community to a meeting in which you share your results and analysis. If community members wish it, you could also discuss with them community how it could use the research to improve decision-making, resource management, community wellbeing, or whatever it is you are working on. You could also choose to publish a layperson's guide to your research and results, perhaps with images and photos for the community to keep and refer to if necessary. Finally, you might want to develop some skills in video production and create a short video for the community on your research and results.

In order to create any of these outputs – a community presentation, a layperson’s guide, or a video – you need to learn how to explain your research in a clear and understandable way. Simplifying what is necessarily a highly complex piece of intellectual work is not easy! However, an essential part of your research communications toolbox is learning how to explain exactly what you're doing in very simple terms (see the message map section above). This not only means that your ideas are likely to be spread further, but is also a helpful way for you to develop an overview of your research approach and long-term objectives. The more simple your communication of those, the more you have understood and internalized the complexities you are dealing with. The tips and tricks provided in the section on ‘communicating like TED’ are helpful – particularly the advice on using stories to present your data.
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References

Ethics


Anthropological methods

*Cultural domain analysis*


**Ethnography**


**The first ethnographies:**

These are among the first social anthropologists to use ethnography as a design and participant observation as a method. They are classic texts that are very informative regarding the origins of the method.


**Reflexive ethnographies:**

In the latter half of the 20th century, ethnographers began highlighting in the text their own role as participants in the social life they were describing. They began to take seriously the idea that they were probably influencing the event, or the relationships they were witnessing, and began exploring the possibility of including themselves in the text and their position as a source of material for the interpretation of the social life they were participating in.

The ‘post-modern turn’ in ethnography:

Towards the end of the 1980s, anthropology suffered from a ‘crisis of representation’ (see Chapter 2). As a result, innovative approaches were developed: ethnography became multi-sited, autobiographical, dialogic, narrative and/or collaborative. On the other hand, this period was also one in which more experimental ethnographies were published, a genre epitomised by Michael Taussig, who uses a quasi-magical realist writing style to draw the reader into emotional and intellectual spaces that allow him to feel the world created by the ethnographer.


Recent ethnographies:

Recently, ethnographers often make explicit the role of the ethnographer in the story they are telling, but seek to weave this self-reflexivity in with a strong empirical grounding, resulting in complex, deeply analytic and politically engaged texts. Ethnography over the last forty years has also expanded beyond the ‘traditional’ setting of the rural, indigenous community. Now we have ethnographies of powerful actors, of urban groups and communities, of scientific laboratories, of Western bureaucracies, of hospitals, of transnational NGOs, and so on. Another form of modern ethnography is the autoethnography. For example, Davi Kopenawa, well-known Yanomami activist and shaman, recently wrote an ethnography of his people in collaboration with French anthropologist Bruce Albert.


**Participatory mapping**


**Market ethnobotany**


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**Botanical methods**

**Red-listing**


Communications


Resources

Ethics

International Agreements on Indigenous Peoples’ Rights

United Nations Declaration on the Rights of Indigenous Peoples

International Labour Organisation Convention 169 on Indigenous and Tribal Peoples of Independent Countries

Convention on Biological Diversity

An Activist’s Guide to the Convention on Biological Diversity


Convention on Biological Diversity Nagoya Protocol On Access To Genetic Resources And The Fair And Equitable Sharing Of Benefits Arising From Their Utilization

Convention on Biological Diversity Sustaining Life on Earth
http://www.cbd.int/convention/guide/
Conducting and Communicating Ethnobotanical Research

Convention on Biological Diversity Introduction to Access and Benefit-sharing


Collaborative research (or co-enquiry)


The websites of Peter Reason (www.peterreason.eu) and John Heron (www.human-inquiry.org) are excellent primary sources of information on co-enquiry.

John Heron’s annotated bibliography (www.human-inquiry.com/doculist.htm) provides a particularly rich list of documents and downloadable files. Peter Reason also provides an extensive list of downloadable publications (www.peterreason.eu/Papers_list).

The website of the Durham Community Research Team, Centre for Social Justice and Community Action, Durham University, who have pioneered research on the co-enquiry approach (www.dur.ac.uk/beacon/socialjustice/)

Other resources


Anthropological Methods

www.osea-cite.org

www.qualitative-research.net

On Grounded Theory

http://www.methods.manchester.ac.uk/events/whatis/gt.pdf

http://www.analytictech.com/mb870/introgt.htm

http://www.groundedtheory.com/

Botanical Methods

Collecting and preserving plant specimens, a manual by Tony Bean, Queensland Herbarium.

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BRAHMS Training Guide by Denis Filer, Department of Plant Sciences, Oxford University.
http://herbaria.plants.ox.ac.uk/bol/Content/Groups/brahms/Resources/BRAHMStraining2013.pdf

IUCN Guidelines for using the Red List Categories and Criteria.

Communications

Ruth Krause’s presentation at the 2014 MedPlant Summer School can be found here:
https://prezi.com/t_gidnmbatdb/copy-of-communicating-science-through-the-lens/

Smartphone video production gear and tutorials
http://www.webvideochefs.com/mobile-gear/
https://www.linkedin.com/pulse/article/20121113131235-5214630-6-tips-for-shooting-great-video-with-your-smartphone