Chapter 1

Biocultural collections: needs, ethics and goals

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Biocultural collections are ethnobiological specimens, artefacts and documents — plant, animal and cultural — that represent dynamic relationships among peoples, biota, and environments (Ethnobiology Working Group, 2003). When thinking about Biocultural Collections, we must think broadly, considering ethnobiology, economic botany, ethnography, archaeology, geography, agriculture, medicine, linguistics, history, art and so on; we must think of large institutional collections and small local collections. It is important to stress that ethnobiology is a dynamic field in which processes, transformations and associations are central. For example, rice is more than a grain: it is planted, grown, domesticated, harvested, selected, cooked, eaten, made into paper, used as symbols and in ritual, and central cosmologically to many cultures. Capturing these dynamic relationships requires more than the collection of objects: documentation of their provenance, language, images, use, processing and ethnographic context — or metadata — are also crucial components.

Biocultural collections are numerous, diverse, and consummately useful, varying widely in size and scope from a few hundred specimens comprising the personal collection of a field ethnobotanist, to institutional collections containing hundreds of thousands of accessions. They include valuable botanical, zoological and ethnographic objects such as biological specimens, natural products and cultural artefacts from around the world, yet they are often neglected, deteriorating, orphaned and inaccessible. Many institutions have inadequate information and equipment to deal with the special curatorial needs of biocultural collections. Their collections languish in old cardboard boxes, abandoned in the back of herbaria or in storage rooms. (For example, The New York Botanical Garden's (NY) Henry Hurd Rusby collection suffered in this way before it was recently curated; Chapter 4.)

The amount of attention and resources devoted to biocultural collections is thus in stark contrast to their immense value. Historical collections form a kind of 'time capsule', preserving evidence of technologies, cultivars, uses and traditional knowledge that are changing or no longer extant, and often otherwise undocumented. Magnificent personal collections are routinely left undocumented and orphaned upon the retirement or death of the collector, and historically valuable biocultural collections rapidly deteriorate if left uncurated (cf. Kautz, 2000). For example, the Hugh Cutler (1912–1998) collection of some 12,000 corn cobs at Missouri Botanical Garden (MO) had been reduced to less than half its original size after sequential transfers among foster institutions.

WHAT ARE BIOCULTURAL COLLECTIONS?

Briefly summarised, biocultural collections are repositories for plants and animals used by people, products made from them, and/or information and archives about them. They include any object made from plant and/or animal material, and especially those with a specific cultural connotation

or use. Also included is any object not made from plant or animal material but used in processing these materials (e.g. agricultural tools). Such objects often show informative signs of use and wear and can provide information about the plant or animal species for which they were used; they should be connected with records of observations regarding their use (Chapter 12). Any object used in spiritual or religious rituals that are associated with biological processes (e.g. rain dances for crop fertility, healing rituals, burial practices and so on) might be preserved as a biocultural collection. Representations in arts and crafts are also included. Additionally, any information or archives relating to the culture, language, creation, processing, or use of an object within a biocultural collection are essential data, which should be recorded in a way that connects it to that object.

Biocultural collections include:

- **Herbarium, xylarium and zoological specimens** with label information on use, preparation, common name or other cultural and linguistic information. Biocultural vouchers (specimens such as herbarium sheets that enable identifications to be verified) ensure identity and reproducibility, foundations of the scientific method (see Bye 1986, Chapter 22) that enable knowledge of plant and animal uses and processing to be preserved, maintained, and/or renovated.
- **Unprocessed economically useful plant and animal parts:** plant seeds, fruits, roots, leaves, flowers, bark, tubers and so on; animal horn, bone, skin, hair, gut and so on.
- **Plant and animal products and processes** from art, clothing, and commercial food and medicine products to tools, religious artefacts, toys or even refuse. Such objects include: plant and animal fibres (wood, paper, cloth, skin and so on); plant and animal extracts (varnish, starch, latex, resins, waxes, oils, essential oils and so on); processes and tools that transform raw plants and animals into finished products; and medicinal plant and animal products from unprocessed materials to herbal supplements and patented medicines.
- **Ethnographic materials and cultural artefacts** from buttons to boats, items made from or used in processing plant and animal materials, and information regarding an object's cultural or religious context.
- **DNA collections:** frozen tissue or extracted DNA samples from useful plants and animals and their wild relatives.
- **Live collections:** *in situ* and *ex situ* collections of useful plants and animals, including germplasm, tissue in culture, seeds and semen.
- **Palaeoethnobotanical and zoological materials:** archaeological plant and animal remains and modern reference collections.
- **Biocultural documentation:** libraries and archives including cultural texts, research field notes, maps (geographic information system (GIS), electronic or paper), audio and linguistic collections, photo and video archives, ethnobiological prints, and any illustrative materials that depict the products or processing of raw plant or animal materials (books, photographs, prints, drawings, paintings, models, digital images, audio and video).

The breadth and diversity of the biocultural collections described above can provide us with a great wealth of knowledge and documentation about animals and plants and the human cultural practices surrounding their use. However, variety in form and function also creates difficulties in curating, databasing and accessing these materials. A single institution may include some or all types of biocultural collections, each of which is curated differently.

IMPACTS OF BIOCULTURAL COLLECTIONS

Plants, fungi and animals that have diverse subsistence, cultural, religious and historical uses are the foundation of biocultural collections, and thus biocultural collections have value for a community of users that extends far beyond those involved in basic scientific research. These collections can also be employed in many forms of applied research, including the conservation of plants, animals, and traditional knowledge, natural resource management, and economic and social development, education and community service.

- **Scientific research.** Biocultural collections are used in the biological sciences for taxonomic, morphological, molecular, population, ecological, and global-change research. Additionally, they are used in anthropology, archaeology, chemistry, history, philosophy and other research fields (Chapter 21).
- **Applied research.** Biocultural collections are of vital importance in the applied fields of agriculture, medicine, chemistry, nutrition and horticulture, among others. They provide a valuable record of human innovations in these fields across space and time, and enable cross-cultural perspectives on the value of plants in human societies. Biocultural collection vouchers ensure identity and reproducibility, foundations of the scientific method that enable knowledge of plant and animal uses to be preserved and maintained (Chapter 22).
- **Conservation.** Ethnobiology is a powerful tool, both in conservation (Chapter 23) and for cultural survival (e.g. Redford & Padoch, 1992; Salick & Moseley, 2012). Biocultural collections document local traditions, practices and knowledge, while simultaneously demonstrating the value of particular species. The conservation of useful plants is a major issue of two-fold importance: first, many useful plants are threatened by over-harvesting (e.g. Charron & Gagnon, 1991), and second, people easily understand that the conservation of useful plants is important, thus increasing overall concern for plant and animal conservation. Many collections are historical, they can be used to trace changes in plant and animal populations, patterns of use or landraces (Chapters 21–23). *In situ* and *ex situ* conservation of genetic resources and associated vouchers also play major roles in biocultural collections (Chapters 7, 8 and 10).
- **Natural resource management and development.** New crop development, crop improvement, public health, horticulture and natural resource management often deal with biocultural collections, either by depositing vouchers or by documenting information on indigenous practices and traditional knowledge. Plant genetic resources are components of biocultural collections and the backbone of the development of improved crops, horticultural plants and pharmaceutical products.
- **Education and training.** Today, ethnobiology is a very popular area of study, both with the general public and in academia (Chapter 24). Institutions that house biocultural collections continually receive students at all levels (from children in kindergarten to post-doctoral fellows) and teachers, who visit collections to look for information and investigate research topics. Biocultural materials are extremely valuable in teaching. Students understand the importance of natural resources more easily when they can appreciate their benefits to people as sources of food, fibre, and medicine.
- **Community service.** Local communities relate strongly to ethnobiology, expressing interest both in the study of indigenous peoples and their uses of plants and in local applications for gardening, horticulture and grocery-store botany. Ethnobiological collections, displays, and gardens have high rates of visitation by the community, and biocultural collections materials are in constant use for public programming (Chapter 10).

• **Preservation and restitution of traditional knowledge.** Biocultural collections are host to plants and animals, and materials and objects made from them, that have disappeared from their source communities. Their recovery forms a key part of many initiatives aimed at protecting and reviving the culture, landscape and economy of indigenous societies. Museums, genebanks and other repositories have responded through many changes to curatorial and access policies in the last two decades; more remains to be done (Chapters 17–20).

TRANSFORMING BIOCULTURAL COLLECTIONS

Biocultural Collections Group

More than a decade ago, we set up the Biocultural Collections Group to conserve, protect and strengthen biocultural collections. Starting in 2001, individual curators and institutional representatives began to organise meetings within and among many societies and institutions (Table 1). These meetings have explored many topics of concern to those working with biocultural collections in order to identify and discuss our common needs and goals. Our aims include identifying and characterising collections, setting standards for and educating others about collection curation and databasing, communicating ethical standards for collection and curation, funding collections, identifying collection curators and scientists, initiating collaboration among existing collections, and facilitating the identification of threatened and orphaned collections and their transfer into active collections.

Locating biocultural collections and their curators

Until recently, there has been no inventory of biocultural collections. Aside from prominent collections with active researchers, we often do not know where biocultural collections are, what they contain, or who are the associated researchers and curators. There is nothing equivalent to *Index*

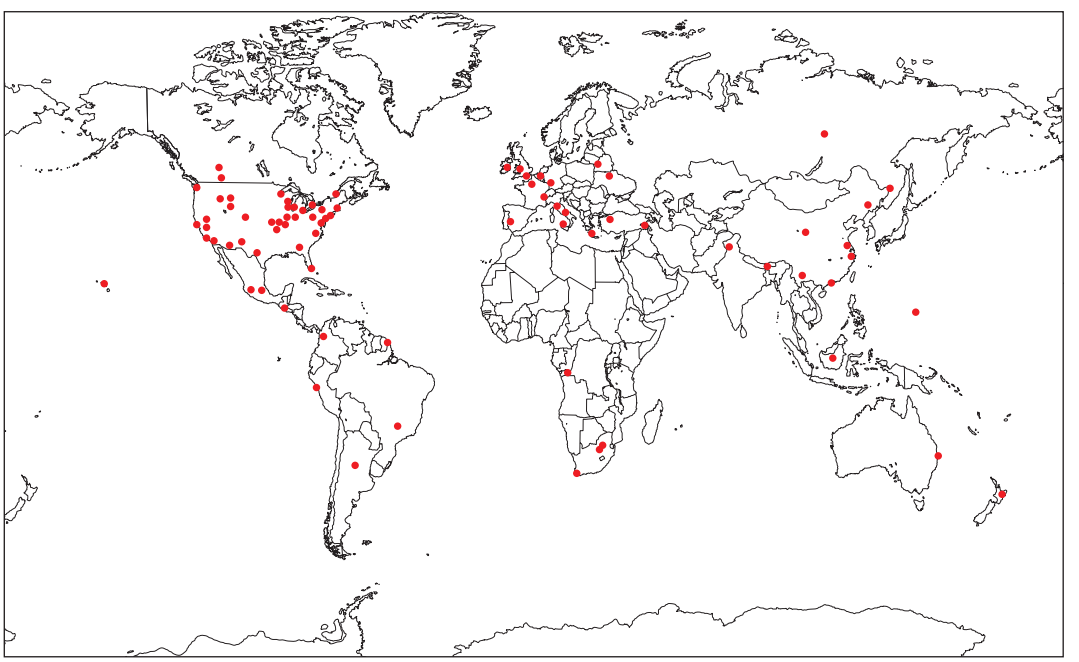

Figure 1. Locations of institutions listed in *Index Ethnobotanices*.

Herbariorum (Thiers, n.d.) for biocultural collections, and this limits researchers' abilities to find, study and reference collections. It also limits the capability of curators to address common problems of biocultural collections jointly. Recently, we have been trying to meet this need by constructing *Index Ethnobotanices*, a resource analogous to *Index Herbariorum*. Data are generated from the institutions and people who participate in meetings (see Table 1) and by emails to workers at collections listed in *Index Herbariorum* asking about their existing biocultural collections, what kinds of collections they have, where they are located, and who is in charge of curation. A preliminary database, *Index Ethnobotanices*, is now available; it includes an index of institutions housing biocultural collections and a directory of experts.

TABLE 1

Meetings of the Biocultural Collections Group 2001–2014

Initials in brackets indicate the *Index Herbariorum* code of the host institution (where applicable).

- First Annual Biocultural Collections Meeting, Bishop Museum (BISH), Hawai'i, USA, 2001.
- Ethnobiologia, Open Forum on Collections for Ethno- and Economic Botany, Naples, Italy, 2001.
- NSF Workshop 'Intellectual Imperatives in Ethnobiology', Missouri Botanical Garden (MO), USA, 2002.
- Second Annual Biocultural Collections Meeting, American Museum of Natural History, New York, USA, 2002.
- Natural Science Collections Alliance Annual Meeting, Washington DC, USA, 2002 (special session on biocultural collections).
- Third Annual Biocultural Collections Meeting, Arizona Sonora Desert Museum (ASDM), Tucson, USA, 2003.
- Fourth Annual Biocultural Collections Meeting, Royal Botanic Gardens, Kew (K), United Kingdom, 2004 (with the International Society of Ethnobiology, Kent).
- Fifth Annual Biocultural Collections Meeting, Chiang Mai, Thailand, 2005 (with the Society of Economic Botany).
- Sixth Annual Biocultural Collections Meeting, Field Museum (F) in Chicago, USA, 2007.
- Seventh Annual Biocultural Collections Meeting, Fayetteville, Arkansas, USA, 2008 (with the Society of Ethnobiology).
- IUBS Committee on Biology & Traditional Knowledge, Missouri Botanical Garden (MO), USA, 2009.
- Eighth Annual Biocultural Collections Meeting, British Columbia Provincial Museum (V), Canada, 2010 (with the International Society of Ethnobiology, Victoria, British Columbia).
- Ninth Annual Biocultural Collections Meeting, St. Louis (MO), USA, 2011 (Botanical Society of America and Society for Economic Botany).
- Tenth Annual Biocultural Collections Meeting, Herbiers de l'Institut Botanique de Montpellier (MPU), France, 2012 (with the International Congress of Ethnobiology).
- Biocultural Collections Workshop on Citizen Science at Society of Ethnobiology meeting, University of North Texas (NTSC), USA, 2013.
- Eleventh Annual Biocultural Collections Meeting, Royal Botanic Gardens, Kew (K), United Kingdom, 2013 (with the Society for Economic Botany meeting at the Eden Project and in Plymouth).
- Twelfth Annual Biocultural Collections Meeting, National Biodiversity Centre, Thimphu (THIM), Bhutan, 2014 (with the International Congress of Ethnobiology, Bhutan).

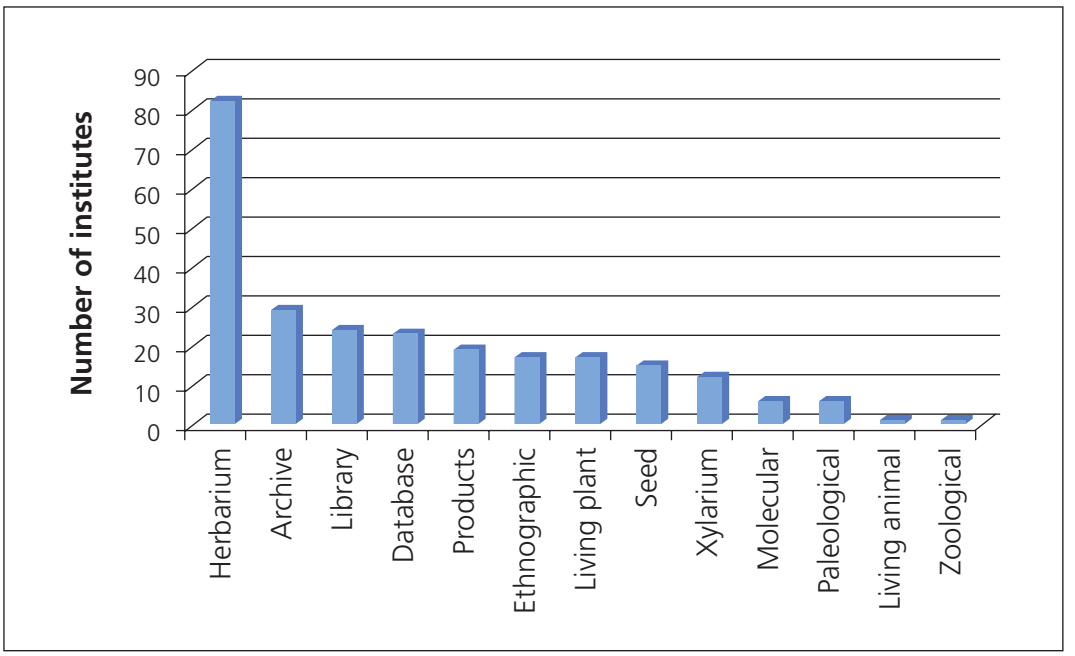

Figure 2. Types of biocultural collections in 112 participating institutes surveyed from 2007 to 2009 for *Index Ethnobotanices*. The predominance of herbarium collections is the result of using *Index Herbariorum* to identify potential holdings.

We can see that the distribution of biocultural collections listed in *Index Ethnobotanices* to date is worldwide (Figure 1) but far from complete. Additionally, we can glimpse the wide variety of collection types housed at these institutions (Figure 2). Collections are biased towards herbarium specimens because we contacted institutions through *Index Herbariorum*. In the future, we hope that the websites of biocultural collections and the institutions that house them, curator and researcher web pages and email contacts (with prior informed consent), and online databases and images will be linked to an operational *Index Ethnobotanices*. Please encourage your colleagues and institutions to join our Index online.

KEY ISSUES FOR BIOCULTURAL COLLECTIONS

During meetings of the Biocultural Collections Group and in editing this book, we have identified several cross-cutting issues that limit biocultural collections: curation standards, databasing and digitisation of images, access and use, ethics, collaboration with indigenous or source communities, funding and staff. Each of these is central to the chapters in this book; here, we draw together these themes, and set out some aspirations for biocultural collections in the near future.

Curation standards

Because of the varied physical and digital formats they must encompass, and because of the rich data and variety of specimens that can be associated with ethnobiological collections, standard herbarium or zoological curation methods are insufficient for biocultural collections. They require their own curatorial standards, collated from the curation protocols of many other collection types (e.g. McGuire et al., 1993). This book draws from a variety of resources to cover, for example, ethnographic and archaeological artefacts characteristic of biocultural collections (Chapters 2, 5, 6). There are many

curation manuals for the cultural museum sector, many available online, and an important function of this book is to summarise and draw attention to these resources.

Responsibility for improved curation does not lie with curators alone. Collectors must also pay closer attention to the fate of their specimens, to access protocols and permissions and to the sustainability of curation. Sometimes, ethnobiological materials can be collected in multiples, so it is possible to choose multiple depositories to meet varying needs. The well-known ethnobiologists Brent and Elois Berlin are a positive example: recently, they donated their archives and 25,000 voucher specimens to the Smithsonian Institution (US).

Databases and images

Biocultural collections need to be inventoried and stored electronically; common database terminology needs to be used for cross referencing among collections. Now, inter-operable software and Application Programming Interfaces (APIs) make it possible to search disparate biocultural collections simultaneously across multiple databases. However, biocultural-collection databases first need to be reviewed to implement common standards where possible, and tables of equivalencies should be defined when required (Chapter 11). Databasing and digitisation are a vital element of increased access and use. Searches across multiple collection databases have the potential to virtually reunite dispersed collections, and to reveal unexpected intersections of specimen data and themes among museums and across disciplines.

Few websites have images of their biocultural collections online, but when such resources exist, they are visited frequently. At Missouri Botanical Garden, for example, a website that includes historical images of useful plants has received over 9 million hits per year (www.botanicus.org) and sales of historical images of useful plants are brisk. People are using images of useful plants and animals in all walks of life for education, publication, advertisement, demonstration and decoration, as well as in scientific and humanities research. Biocultural collections and individual ethnobotanists have huge collections of useful plant and animal images, yet these are overwhelmingly unavailable and undocumented.

Access and use

Underused collections are the most vulnerable, both because it is difficult to make a good case for sustained funding and because when damage occurs to specimens, for example through attack by pests, it will not be noticed until too late. The disadvantage that biocultural collections often suffer in not fitting within narrowly defined institutional missions is also their strength: as an archive of specimens that represent human–nature relationships, they appeal to highly diverse audiences, both in terms of academic disciplines and in terms of background. The key to unlocking these uses and engaging new audiences is collaboration with academic researchers from multiple disciplines, teachers, artists, volunteers and source communities. Our experience is that ethnobiological specimens, particularly artefacts, and the stories that underlie their creation, are charismatic and well able to attract new users. Improving user access to collections, however, requires consideration of artefact preservation (Chapter 2), user safety (Chapter 4), and ethics (Chapters 17–19).

Ethics

Biocultural collections face special problems of intellectual property that must be addressed before these collections are put into broad usage (Ethnobiology Working Group, 2003; Simmonds, 2009; Chapter 16). Two valuable reviews of ethics in ethnobiology are those by Hardison & Bannister (2011)

and Gilmore & Eshbaugh (2011). The latter propose five critical questions that every ethnobiologist — and, we would argue, every curator — should ask themselves:

1. Have you received proper permission to conduct and publish your research?
2. Have you thought about and incorporated local needs, challenges and priorities into the research project?
3. Who is benefitting from the research and how are collaborating communities and individuals being compensated?
4. How will the results of the research project be shared and used?
5. Are the interests of collaborating communities and individuals being acknowledged and protected when disseminating research results?

ETHICAL STANDARDS IN ETHNOBIOLOGY

Ethical Standards in Ethnobiology is a collaborative statement of the Ethnobiology Working Group (2003) and was generated during the National Science Foundation Biocomplexity Workshop 'Intellectual Imperatives in Ethnobiology'.

When scientists who are located at different institutions choose to conduct collaborative research, they commonly develop a written agreement outlining the elements of the collaboration including responsibilities, potential benefits, intellectual property agreements, and distribution of results. These agreements are usually intended to protect institutional, individual and collective intellectual property that is developed or identified within the context of the collaboration. This is a crucial and complex requirement of research in general, and of ethnobiology research in particular.

Even the most theoretical, intellectual and non-commercial ethnobiology researcher cannot escape the fact that their research impinges on the local people with whom they work. Researchers working with local or traditional peoples are in a position of trust at the interface between cultures. Ethnobiologists therefore find themselves in a position where the research process of gathering and publishing data raises many ethical questions. In some cases, ethnobiological knowledge is only obtained from traditional specialists after the ethnobiologist has established credibility within that community and with the specialists concerned. Detailed information can often only be obtained after an extended period of interaction. Researchers inescapably must earn trust to do their work, as ethnobiology is not only the study of people and their relationship to the natural world, but also a field of study that involves local people as colleagues, teachers and research participants. We consequently enter into 'collaborations' in which academic institutions and individual researchers form agreements with modern or customary governments, organisations, local communities or corporations that secure the value of intellectual property generated by or identified through the collaborative research process. Recognition of the unique intellectual contributions made by international research colleagues and their extended communities is a central theme in the ethical standards and unique perspectives of ethnobiologists. Ethical standards have also been widely recognised by groups of indigenous and local peoples as a necessary component of collaboration.

In the past, research has sometimes been undertaken without the sanction or prior consent of indigenous and traditional peoples, resulting in wrongful expropriation of cultural and intellectual heritage, and causing harm to and violation of rights of the affected peoples. The research process has often failed to build the capacity of traditional communities and collaborating countries. Aims, products, and local benefits of the research must be defined with local or indigenous communities so that the overall research will include issues of relevance to the community. In addition, research findings are often inaccessible to the indigenous or traditional peoples who provided the original data and knowledge, and benefit-sharing mechanisms for the commercial use of such knowledge or research findings are often lacking.

Researchers in ethnobiology need to encourage actively:

- **recognition of the intellectual contribution** made by local or indigenous communities and specialists — such as herbalists, beekeepers and skilled fishermen — in the development, identification and conservation of crop land races, new natural products and environmental services;
- **equitable distribution of benefits** obtained from the use of their resources (including genetic or chemical structure), to assist local communities and the conservation of biodiversity in their environment; and
- **technology transfer, infrastructure development, capacity building, community-based education programs, policy dialogue and local organisations** to better enable the development of crop varieties and natural products for the benefit of local and indigenous communities.

Codes of ethics, professional standards and research guidelines have been developed by professional societies in response to the problems that can arise in the research process. These include guidelines for best practice developed by the American Anthropological Association (AAA), the International Society of Ethnobiology (ISE), the Society for Economic Botany (SEB) and the Society for Ethnobiology (SE). Specific guidelines have also been developed by regional networks, such as the Manila Declaration developed by natural products chemists from the Asia-Pacific region and indigenous communities. Guidelines for codes of practice and for international agreements have also been developed; adherence to these codes is pivotal in peer-reviewed evaluation of research efforts.

The need for adherence to these professional standards has been recognised by national and international programs. This is a critical requirement if collaboration between international and traditional peoples is to take place. In addition, unless research is linked to the nationally defined priorities of partner countries and institutions, it is bound to be viewed with suspicion by both scientists and politicians in developing countries. For this reason, even when ethnobiology research has a theoretical focus, it is important to involve international partner research organisations and communities in the process of developing research objectives, to ensure that these goals address local needs and issues. In addition, research results need to be returned to research partners in an appropriate manner.

Prior to the conclusion of most collaborative research efforts, there are three important procedural steps. The first step is the verification of research results among the collaborators. The second step is determination of the final disposition of results (publication) and assignment of collective or individual intellectual property (authorship). Ethnobiologists approach the first step in two ways: first, international and local colleagues confirm the results and review final drafts of documents, and then the resulting documents are distributed within the communities in which information has been collected. Typically, special documents are generated that are suitable for local education efforts, are written in local languages, and contain information of interest to local communities, which might be of marginal interest to scientific communities. Approval to publish results is acquired from all knowledge stakeholders and any information that is considered to be sensitive, personal or socially controversial or derisive is deleted. The intellectual property rights of publications are assigned through co-authorship, major acknowledgement of contributions, or receipt of patents, trademarks, copyrights or other warrants of value recognised by the international community. In some cases, ethnobiologists may also need to honour local cultural traditions of intellectual property rights management and ownership in ways that may seem to be inconsistent with Western traditions. When in conflict, ethnobiologists are ethically obligated to honour the viewpoints of their host cultures and colleagues above those of their own cultures or institutions.

CODES OF ETHICS

The following codes of ethics are essential resources:

American Alliance of Museums. Code of Ethics for Museums. www.aam-us.org/resources/ethics-standards-and-best-practices/code-of-ethics-for-museums

American Anthropological Association. Code of Ethics. www.aaanet.org/issues/policy-advocacy/upload/AAA-Ethics-Code-2009.pdf

International Society of Ethnobiology. Code of Ethics. http://ethnobiology.net/code-of-ethics/

Museums Association. Code of Ethics for Museums. www.museumsassociation.org/ethics

Society for Economic Botany. Guidelines of Professional Ethics. www.econbot.org/_about_/index.php?sm=03

For biocultural collections that are generated by fieldwork, questions about the collection, deposition and dissemination of specimens and data should have answers before collecting begins. Such agreements must be safely filed and should form part of a specimen's metadata. Access to some data may be limited (Chapter 11); for example, in order to avoid 'biopiracy', some communities and governments choose to limit access to use data. The chapters on indigenous perspectives in this volume (Chapters 17, 18 and 19) are a reminder to all curators and field workers of the necessity of listening to indigenous communities and working in true partnerships. Ethical collecting requires both meeting the legal requirements set out by international treaties (such as the Convention on Biological Diversity) and national legislation (Chapter 16), and the requirements set out by ethical codes (see Box 'Ethical standards in ethnobiology').

In the case of old specimens, an ethical perspective requires that we research and share their history, both for what it tells us about the circumstances of collection and because it allows specimens to be viewed in their cultural and biological context (Chapter 20). Here, as with new fieldwork, collaboration with source or indigenous communities is essential.

Collaboration with indigenous peoples

Biocultural collections are obtained, housed and studied internationally; they are often collected from indigenous groups and may be utilised by indigenous groups as well as by scientific researchers and the public to document and preserve traditional knowledge. Equitable partnerships between indigenous groups and international institutions are crucial to the conscientious maintenance, improvement and repatriation (whether in virtual or physical form) of biocultural collections. Many cultural museums, particularly those with ethnographic collections, have actively engaged with indigenous peoples in recent times, leading to a rich body of experience that will assist biocultural collections in ethical behaviour and effective collaborations (see Chapters 17–19) (Kreps, 2009; Peers & Brown, 2003; Sullivan & Edwards, 2003; Sully, 2007).

Funds and staff

A final issue that faces almost all biocultural collections is funding to pay for curation and curatorial staff. Biocultural collections are seldom mainstream institutional priorities, and so they seldom have a dependable funding stream. Our own initiatives are supported by individual grants that are intermittently funded and by individual commitments superseded by mainstream duties. We cannot curate collections only when funding is available. We find ourselves locked into a chicken and egg conundrum: it is difficult to collect and curate without funding or staff, but funding is not available until we have well-curated collections that demonstrate their utility. Our hope is that funding can be facilitated by collaboration; at any one institution we are a minority, but among multiple institutions and across many disciplines, many people are working with biocultural collections. If proposals are presented by a multitude of biocultural collections, the potential for funding might be increased.

The lessons of this experience are that those involved with biocultural collections must engage in a series of challenging partnerships: curators have obligations to the wider public, to trustees and to professional ethics; community representatives have obligations to represent their broader community, kinship and culture. We must require just and equitable material transfer agreements and intellectual knowledge partnerships between biocultural collections and indigenous groups worldwide in order to facilitate strong, collaborative and continuing relationships.

The rewards in terms of shared learning and power are of great value to all parties, and usually lead to improved curation and displays and often to fresh collecting activities. Starting such collaboration

may be a daunting prospect for a small museum, or one that is far away from the source communities, but collaboration with larger museums that already have such programmes can ease the way.

SCOPE OF THIS BOOK

This book has grown out of a decade of meetings of the Biocultural Collections Group, during which we prioritised and ordered stages of a process into manageable projects. After identifying collections and curators, we turned to curation itself. As we can do little to improve biocultural collections until we know how to curate them, establishing standards for curation became our goal. This was the aim of the workshop, 'Biocultural Collections: Establishing Curation Standards' held 11 July 2011 at the joint Botanical Society of America and Society for Economic Botany meeting in St. Louis and funded by the National Science Foundation (NSF-BRC grant #1118808 awarded to Jan Salick, Missouri Botanical Garden).

It will be evident that none of the chapters stand alone but must be read in conjunction with others. Curation is a complex enterprise that requires familiarity with a wide range of topics. There is also substantial overlap between the role of, for example, botanic gardens and germplasm collections, or herbaria and artefact collections. In compiling this book, we strived to make the fundamentals of biocultural curation accessible in all their diversity to a wide audience. We are also aware of several biases in this book. Authors are naturally best informed about work within their own institution and their own country. We have worked with authors to broaden coverage, admittedly mainly drawing upon material in English language publications but also looking at work worldwide. We have sought to highlight the increasing recognition of biocultural collections from outside scientific institutions, for example in the form of community genebanks or amateur xylaria. Animals (Hunn, 2011) and fungi (Yamin-Pasternak, 2011) are under-represented in this volume, although much of the content is equally relevant to these important areas of study.

Our success in setting curation standards here will determine future funding. It is paramount that we dedicate ourselves to meeting the needs of biocultural collections. Setting and meeting rigorous standards at our participating institutions will immeasurably further our overarching goal of preserving, maintaining, and/or renovating our biocultural collections. It will enable us to take the next step in the process — collaborating among our biocultural collections to bring catalogues online, and to make them searchable from a joint website for world-wide use.

Practical curation of biocultural collections

Materials

The first chapters in this book (Chapters 2–10) are on the practical curation of physical collection materials. The great diversity of specimens and artefacts that make up biocultural collections present challenges for curation, including the provision of storage space and environmental conditions necessary for proper specimen preservation and accessibility. We asked authors to provide basic information and references relevant to the curation of each material type.

Reference materials and metadata

The second group of chapters (Chapters 11–16) concerns ethnobiological data and archives in the form of paper and electronic records. With the shift to digital formats for field notes, photographs, recordings and data cataloguing and analysis, there are both wider possibilities for data generation (digital photography costs a fraction of film) but also of data loss (as files become corrupt or obsolete).

Contexts and perspectives on biocultural collections

The third group of chapters (Chapters 17–20) presents and explores indigenous and western perspectives on biocultural collections. These are an important reminder that ethnobiological research is not neutral, but embodies conscious and unconscious biases in the observer. Much past research was carried out to appropriate knowledge and materials or to further an expansionist agenda that was actively harmful to the peoples studied. Modern ethnobiology takes place in partnership with indigenous peoples, but to achieve this, we must first acknowledge its history. Biocultural collections must also draw on the experience of ethnographic museums, which in recent times have entered into extensive partnerships with source communities, resulting both in better-curated and interpreted collections and in enhanced access by source communities to their cultural heritage.

Broader impacts of biocultural collections

The fourth set of chapters (Chapters 21–26) describes the broader impacts and value of biocultural collections for use in scientific research, conservation, education and exhibition.

Photo essays

An important role of this book is to showcase the diversity and potential of biocultural collections. We are grateful to many institutions and individuals who have freely provided photographs of their collections, featured both in chapters and as free-standing photo essays following this chapter.

CONCLUSIONS

It is no coincidence that it was an ethnobiological exhibition of plant-derived foods and materials from the Mancos Cañon, seen at the 1893 Chicago World's Fair, that led J. W. Harshberger (1896) to write his seminal paper coining the term 'ethnobotany' and setting a research and educational agenda that is still relevant today. Over one hundred years later, with renewed interest from researchers and indigenous peoples in modern ethnobiology and great public interest in traditional life ways and sustainable livelihoods, biocultural collections are again recognised as rich resources of ethnobiological data and cultural heritage. We hope this book will play its part in unlocking the inspirational potential of biocultural collections within the framework of modern ethical curatorial standards.

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