Unpacking the Red List: Use (and Misuse?) of Expertise, Knowledge, and Power

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Abstract
The IUCN Red List of Threatened Species™ is arguably the most widely recognised tool for assessing species’ global conservation status. Given the potential social impact of Red Lists, this research aimed at understanding which kinds of data and expertise flow into the assessments, and what role they play in the process. Informed by theoretical approaches from political ecology and science and technology studies, two recently compiled Red Lists were examined as a case, directly interviewing and surveying the central actors of the Red List process, i.e. scientific experts. By adopting a broad definition of expertise, this study showed that a variety of local expertise (local resource users, resident professionals, and citizen scientists) contributes to Red List assessments, but in a less evident way, and always hierarchically following validation by scientific experts. Resident professionals provided crucial information on all aspects of the Red List; local resource users and citizen scientists played a minor role, except for information regarding plant use and species distribution, respectively. Interviews revealed existing hierarchies of knowledge, in which experts with natural science backgrounds decide over what counts as evidence and whose knowledge counts. Recommendations are made on how local expertise can meaningfully contribute to Red Lists.

Keywords: Local knowledge, biodiversity assessments, IUCN Red List, hierarchies of knowledge

INTRODUCTION
Awareness about the need to broaden the knowledge base that global environmental governance draws upon is increasing (Jasanoff and Martello 2004). Science is losing its legitimacy as the only provider of environmental knowledge and while it remains central to natural resource management, it is becoming just one contribution among many others (Waterton and Wynne 2004). More local(ised) knowledge holders and systems are gaining relevance (Lawrence 2010). The need to involve local knowledge holders in conservation issues is acknowledged by the scientific community (Tengö et al. 2014), as well as international policy platforms such as the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) (Turnhout et al. 2012). Despite this general trend towards the opening up of knowledge systems, one of the most widely relied-upon tools in conservation planning, the IUCN Red List of Threatened Species™, remains hesitant to formally open up to multiple knowledges. Red List assessments are produced by scientific expert networks collaborating with the International Union for Conservation of Nature (IUCN) to provide scientifically rigorous, quantitative estimates of the global conservation status of species in terms of their extinction risk (Butchart et al. 2007). This research aimed at understanding which kinds of data and expertise flow into these assessments in practice, and which role they play in the process. Scientific experts are at the core of the IUCN Red List process, contributing their knowledge and experience and selecting the materials to be considered for an assessment.
When empirical data is missing, expert judgement often constitutes the best available evidence (Fazey et al. 2006). The conventional definition of experts takes into consideration their qualifications, professional standing, and experience (Burgman et al. 2011). However, expertise goes beyond conventional qualifications or membership of social and professional groups and such a narrow definition may exclude people with relevant knowledge. A broader definition sees experts as “persons of whom it is assumed that, based on their routine contact with specific topics, they have accumulated experience in contexts relevant for taking action, and thus enjoy both trust and social respect” (Stehr and Grundmann, 2011; p.X). By this definition, not only high-profile scientific advisers, but also local residents, resource users or volunteer data recorders with ‘local’ or ‘lay’ knowledge may be regarded as experts (Gregory et al. 2006). It is in the context of this broader view of expertise that this study paid particular attention to the contribution of different kinds of local expertise to Red Lists.

Two major debates support the general emerging trend of including local expertise in environmental governance: a normative and a pragmatic one.

The normative perspective links to notions of equity and active citizenship (Reed 2008). It sees local stakeholder engagement as a question of democratic rights to self-determination in conservation initiatives and policy processes that affect them, their livelihoods and cultural identities. Inclusion of multiple and local voices may favour the participation of marginalised groups, empower stakeholders through the co-production of knowledge, promote social learning and increase public trust in environmental decisions (Reed 2008).

Pragmatic arguments, on the other hand, argue that involving local stakeholders leads to greater quality and durability of decisions, by increasing acceptance and support for management decisions and reducing implementation costs. Local expertise is seen as having important insights to contribute to decision-making in conservation which should not be overlooked, allowing for more complete information input and better adaptation to locally specific socio-environmental conditions (Reed 2008). For species and areas for which information is lacking, local stakeholder engagement is seen as particularly useful (O’Donnell et al. 2010). Nevertheless, both the normative and the pragmatic rationale for including local expertise are currently absent from the Red List, except for the recognition that gaining local stakeholder support may improve conservation outcomes (IUCN Red List Committee, 2013).

Theories from political ecology and Science and Technology studies (STS) present a critical lens through which Red Lists may be seen. Political ecology argues in favour of a plurality of environmental knowledge and of alternative local understandings as opposed to science as the only legitimate source of knowledge. STS then questions the presentation of science as a ‘monolithic’ model of objectivity, exposing the value-laden debates among scientific experts behind scientific knowledge claims (Campbell 2011). Value-neutrality and objectivity are among the most central characteristics scientists evoke to distinguish scientific knowledge from other forms of knowledge and claim its superiority. To recognise that scientific knowledge production, including red-listing, is never value-neutral is thus not only important for guiding transparent decision-making, but also paves the way towards a more equal exchange with multiple knowledges and expertise.

Informed by theoretical approaches from political ecology and STS, this study aimed at unpacking the Red List process and the role of various types of expertise, ranging from local to abstract. This paper argues that local(ised) expertise may contribute to conservation policy in both normative and instrumental ways. Predominant global narratives failing to acknowledge alternative local understandings of the environment risk leading to social injustice and environmental degradation (Forsyth 2003). By offering opportunities for rightful inclusion for local stakeholders and for relevant knowledge to enter Red List assessments, Red List claims could avoid remaining a global/abstract decision made by scientific experts without consideration for the local/contextualised management of natural resources and their users. Taking two recently compiled European plant Red Lists as a case, this study focussed on the central actors of the process, i.e. the scientific experts, by interviewing and surveying them directly. Before going into the details of the case, the following sections look at how Red List status matters for conservation practices on the ground (section 1.1), at what counts as authoritative knowledge in the process (section 1.2) and at how social dimensions influence expert negotiations (section 1.3).

### IUCN Red Lists as authoritative lists

Claims made by international organisations on the state of the environment guide governments and NGOs’ actions, thereby impacting local communities’ access to resources (Goldman and Turner 2011). Endangered species lists are a powerful conveyor of such claims. In the context of limited resources for conservation interventions they provide a concise summarising label indicating which species are under the greatest threat of extinction and require urgent attention (Mrosovsky 2003). IUCN stresses that its Red Lists have no legal implications and that they are meant as a scientifically objective tool to inform rather than dictate conservation measures (Campbell 2012). At the same time, IUCN works to present the Red List as policy-relevant information, wishing that conservation actions such as implementation of protected areas, stricter trade regulation, or limits on harvesting ensue (e.g. IUCN 2014). It has been shown that assessment of threat status and conservation action have often been conflated in calls for increased species protection (Mrosovsky 2003). It is, in fact, unrealistic for an environmental knowledge organisation to provide objective information in a policy-useful format without having a socio-political agent in mind who can – and will – use the information it produced (Waterton and Wynne 2004).

It is thus only natural that, as an authoritative list, the Red List inevitably is linked to policy and legislation, despite not being directly conceived for this purpose (Possingham et al. 2002). Placing a species on a Red List gives a powerful signal and may
have several consequences. Listings inform recommendations for species action plans (Rodrigues et al. 2006); guide priority setting for protected area design (Rodrigues et al. 2004); feed into or even substitute national designations where countries lack their own (Campbell 2012); and inform legally binding international trade agreements, such as the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (IUCN 2015). When (mis-)use of Red List status leads to its incorporation in regulatory frameworks and thus to legal implications, local livelihoods may suffer from restricted access to trade opportunities (e.g. Christie et al. 2011). Governments may equally be impacted when an important share of the national economy is based on wildlife trade, e.g. the ivory trade for Southern African States (Thompson 2004). Local people’s land rights and their sense of identity may also be impacted with the establishment of protected areas informed by Red List status (Matose 2014). In the context of African protected areas it has been shown that these impose global values about nature, biodiversity, and wilderness which appear to be more important than local people’s access rights to their own environment ( Büscher 2012). Despite these potential consequences, neither livelihoods nor access rights are mentioned in the Red List as something the listing could have an impact on; on the contrary, they are often cited as one of the main causes of species decline, thus needing intervention.

The politics of knowledge and the Red List

The making of endangered species lists is a struggle between competing knowledge forms. In the production of what counts as science hierarchies of knowledge are established (Raffles 2002). This has political consequences determining which types of nature conservation outcomes are pursued, how species are managed and, ultimately, whose knowledge counts and who holds power. In the field of nature conservation the knowledge hierarchy has consistently been in favour of the quantified, decontextualised, and ‘objective’ knowledge produced by Western scientists. Subordinate groups have been disempowered, and their understandings of nature presented as non-scientific and biased (Goldman and Turner 2011). Experts are expected to summarise and reduce the complexity of information available (Stehr and Grundmann 2011). In the Red List process, science is invoked as the most authoritative knowledge. The Red List is presented as a scientific product, but the many debates among scientific experts leading to a listing are rarely presented (Campbell 2011). A number of scholars have worked to open the ‘black box’ of scientific knowledge production, exposing the social processes behind authoritative claims on environmental issues (e.g. Sismondo 2010). Such claims are often presented as a finished product which can be readily used without necessarily knowing how it came about: usually through a messy process of piecing together information from dispersed sources (Goldstein 2010). In fact, biodiversity assessments remain human processes, in which the data cannot be separated from the value-laden negotiations in which they are situated (Lawrence 2010). Studying the red-listing of marine turtles, Campbell (2011, 2012) showed how political, economic, and value-based dimensions inevitably enter the knowledge exchanges behind assessments, in which scientific experts work to distinguish between ‘good’ and ‘bad’ science, between facts and values. The author argued that despite a promising population trend for some populations of marine turtles, both economic and non-economic values held by assessment experts were central to the conclusion that the species were categorised as ‘non-use’ species needing strict protection rather than a resource that can be (sustainably) used and managed (Campbell 2011). In the same contested listing on marine turtles, Mrosovsky (2003) identified precautionary rather than evidentiary attitudes to uncertainty, arguing that in some cases these have led to incorrect listings.

Especially before more quantitative criteria were developed in the 1990s, the Red List has been criticised for being too subjective. Although it has moved away from being based exclusively on the experience and common sense of scientific experts, the latter remain central actors in the process of compiling and reviewing the data (Rodrigues et al. 2006). Experts are expected to summarise and reduce the complexity of information available (Stehr and Grundmann 2011). In doing so, they are sensitive to context and not exempt from subjective biases (Burgman et al. 2011). Especially in the absence of quantitative information, Red List assessments may reflect the expert judgment of individual Specialist Group members or external experts (European Commission 2014). Experts assume an authoritative position through membership and status and their opinions are not only rarely critically examined, but also presented as objective
and value-free, thus hampering transparent decision-making (Burgman et al. 2011).

MATERIALS AND METHODS

Conceptual framework and definitions

Building on the broad definition of expertise discussed in the introduction (Stehr and Grundmann 2011), this paper aimed at highlighting the contributions of different kinds of (local) expertise in the Red List process. A clear distinction between local or indigenous and scientific expertise is, however, neither realistic nor desirable, at least as long as scientific knowledge is taken as the standard (Agrawal 2002). According to STS scholars, all knowledge is essentially local in origin; situated, partial, intimate, and relational (Haraway 1988; Raffles 2002), so that any attempt at categorising knowledge stands on shaky ground. Science also builds on local innovations, attempting to translate them into a global language, while local knowledge is also mobile and travels beyond the local (Watson-Verran and Turnbull 1995). Similarly, scientific and non-scientific knowledge traditions are both heterogeneous and dynamic in nature and often overlap and interact (Lawrence 2010). This means that scientific experts may have large amounts of high-quality, ordinary knowledge, in addition to their scientifically verified knowledge, and hybrid knowledges are possible (Fischer 2000).

Some scholars maintain that it is more productive to focus on differences and symmetries within knowledge categories (Agrawal 1995), as well as on the knowledge actors who hold, update, and share the knowledge and in what way (van der Velden 2010). For the purpose of this study, local expertise was seen as holding primarily locally specific knowledge which tends to remain contextualised in the area where it was produced; scientific expertise we considered as characterised by building on locally based knowledge from many places, summarising and integrating the information, i.e. de-contextualising it from the place where it was produced.

As a starting point for a typology of expertise relevant to Red Lists, this research built on the framework developed by Danielsen et al. (2009) which characterises the degree of local participation in designing, executing, and analysing community-based monitoring programmes. The framework identifies five monitoring schemes, ranging from locally driven and executed monitoring to entirely scientific expert-based approaches. For each of these categories, one kind of expertise can be seen as the protagonist (Figure 1). Here, emphasis was placed on their knowledge, observations, and skills rather than on their level of engagement.

The following forms of expertise were considered:

1. Scientific expertise represented by scientific experts, here defined as persons with specialised technical knowledge obtained through formal training and long-term experience and a proven ability to apply this knowledge effectively, validated through formal qualifications given by Western science-based institutions (Burgman et al. 2011). Their knowledge is framed by the Western scientific knowledge system, on which the Red List is based.

2. Local expertise represented by citizen scientists, i.e. (volunteer) enumerators and amateur naturalists collecting data on environmental observations.

![Figure 1](Types of Expertise)  
*Adapted from the framework of natural resource monitoring programmes developed by Danielsen et al. (2009)
according to predefined scientific methods and protocols, e.g. carrying out species counts (Brandon et al. 2003). A significant portion of biodiversity data is produced by this group and feeds into global databases (Lawrence and Turnhout 2010). Citizen scientists may be highly specialised. Their knowledge is framed by the Western scientific knowledge system, within which they collect data. Nevertheless, citizen science data is often not trusted by scientists due to perceived lack of control.

3. Local expertise represented by **resident professionals**, such as local government staff, civil servants involved in natural resource management, local botanists, plant collectors and conservation practitioners. In the literature, the term ‘lay’ expertise has often been used to designate this kind of expertise (Burgman et al. 2011). They hold locally based knowledge developed through both direct experience and access to technical knowledge, without necessarily having any formal qualifications (Cook et al. 2014). The knowledge they produce often fits both scientific and local framings.

4. Local expertise represented by **local resources users**, who derive their knowledge from detailed observation, management practices, and other human-environment interactions over a long period of time. This group may include plant harvesters or traders, herbal medicine practitioners or holders of traditional knowledge. In the literature, terms such as ‘traditional ecological knowledge’ (TEK) or ‘indigenous knowledge’ (IK) have been used to refer to this set of knowledge, skills, and observations (Berkes and Folke 2002). These may be part of a tradition and/or include more recently developed knowledge, or knowledge held by non-indigenous groups (Huntington 2000). Their knowledge is often framed in traditional and indigenous knowledge systems with their own world view and values, mostly perceived as incompatible with the scientific knowledge framing and thus often seen as not credible by scientific experts.

These categories are useful for our analysis, but in practice, elements of one category flow into another, implying that scientific experts may also hold local knowledge and may be resident professionals, local resource users, or citizen scientists at the same time, and vice versa.

**The case: IUCN Red Lists**

IUCN Red List assessments are evaluations of the extinction risk of taxa, generally on a global level, but they also find application at regional and local scales. Assessments are prepared by Species Survival Commission Specialist Groups, Red List Authorities, and a global network of scientific experts. Building on all data currently available for the taxon to be assessed; species are assigned to one of seven threat categories. Information about taxonomy, species distribution, population size and trends form the basis, accompanied by supporting information such as maps of extent of occurrence, list of major habitats, threats, conservation actions and utilisation. To ensure accuracy, consistency and transparency of data sources, scientific consensus is sought and submitted assessments are peer-reviewed by evaluators from the designated Red List Authority.

Experts can take one or more of the following roles:
- assessor: author of the assessment coordinating decisions, providing data, contacting relevant experts and applying the IUCN Red List categories and criteria (C&C);
- contributor: sharing data and knowledge for consideration in the assessment;
- compiler/facilitator: assisting with data compilation and drafting reports; or
- reviewer: responsible of consistency checks and approval of the final assessment.

The red-listing process is generally divided into five steps (Figure 2a). Assessments can be challenged by handing in a formal petition to the Red List Authority in charge. Local expertise may enter in the first two phases, either indirectly through cited literature or directly through contacts with local experts by phone, e-mail, **ad hoc** field surveys or by inviting them to assessment workshops. However, the process is missing a formal feedback loop back to local knowledge holders.

The two Red Lists chosen as cases, the European Red List of vascular plants (Bilz et al. 2011) and the European Red List of medicinal plants (Allen et al. 2014) (Figure 2b) were selected for their following characteristics:

1. Their regional character and their focus on plants which are of particular value to people (e.g. for medicines, food, cosmetics or trade). These elements were hypothesised to increase the likelihood for local expertise to be involved;
2. Their relatively recent compilation, to reduce recall bias among interviewees;
3. Their partially overlapping assessments. One-third of the species included in the medicinal plant Red List were initially assessed as part of the previous Red List of vascular plants and directly taken over adding information on medicinal uses.

**Data collection**

Data collection followed the following specific aims:

1. Which forms of data and expertise are Red List assessments based on;
2. What kinds of local expertise are consulted and to what end;
3. How scientific experts value local expertise; and
4. How scientific expertise is organised.

The most up-to-date versions of all available IUCN documents on rules, regulations, and guidelines were reviewed focusing on the steps in the red-listing process in which local expertise was most likely to enter (http://www.iucnredlist.
Open-ended, semi-structured interviews (face-to-face, via phone or e-mail) were carried out with nine IUCN Red List experts identified through snowball sampling starting from the network of the Institute of Food and Resource Economics of the University of Copenhagen. A questionnaire was developed, team reviewed and pretested by consulting questionnaire design and subject experts and was piloted with five Red List experts with similar characteristics to the target population. The pilot phase allowed assessing readability and clarity of wording, ensuring that respondents understood questions in a consistent way. A total of 291 experts were cited in the acknowledgement sections of both Red Lists as having contributed to the process. Valid e-mails were retrieved for 191 experts to whom the questionnaire was sent and 93 experts responded, resulting in a response rate of 49%. Over the course of the questionnaire, 32% of respondents gradually dropped out, with 63 experts completing the whole questionnaire.

**Data analysis**

Data analysis included process-oriented analysis of IUCN documents and thematic content analysis of semi-structured interviews (Burnard et al. 2008); focusing on notions of scientific and local expertise, hierarchies of knowledge and power. Descriptive statistics of the survey data was carried out in STATA13, detailing for each question the number of respondents who completed it. Unless otherwise specified, the percentages in brackets in the following sections show the proportion of survey respondents indicating the same answer.

## RESULTS

Among survey respondents, the majority contributed directly to the Vascular Plant Red List (78%), while only 5% exclusively worked on the Medicinal Plant Red List. An additional 17% contributed indirectly by collaborating in national-scale and taxon-level Red Lists feeding mainly into the Vascular Red List (n=84). Forty percent of respondents participated in the role of data and knowledge contributor, while 60% held a decontextualising expert role (assessor, reviewer or compiler), summarising and integrating pieces of locally based information to produce a final outcome on a higher scale. Most respondents worked in research institutions (73%) and had a
Informants from the semi-structured interview sample had red-listing experience in several countries (in Europe, South and North America) and species (plants, birds, and fungi assessments). Two-thirds held a natural science degree in biology or ecology, while one-third also had a social science background.

Data sources

Survey respondents reported that they obtained the data used in the assessments through desk-based literature review (81%), fieldwork-based research carried out independently of the assessment (71%), collegial networks (56%) or internet database searches (47%) (n=77). The main data types and sources used are shown in Figure 3, with flora publications and experts’ personal observations ranking highest (71%). Ninety-four percent of survey respondents (n=70) consulted some form of local expertise. Resident professional knowledge was by far the most consulted kind of local expertise (89%), while local resource users and citizen scientists were involved by 54% and 47% of survey respondents, respectively.

Integration of local knowledge into the assessment happened mainly by directly interviewing, informally talking to or emailing local stakeholders (63%), while in 50% of cases it was data collected by citizen scientists being part of the evidence base (n=68). In some cases, local resource users and resident professionals were directly invited to assessment workshops (22%). Four respondents (6%) consulted traditional oral histories (myths, songs, or stories), while 4% included local knowledge indirectly by using literature that was partly based on it. As one survey respondent specified:

“As we collected national information to be combined in a European assessment, we were in many cases one step removed from local knowledge. But I imagine that it played a role indirectly by finding its way into the information sources we used for the assessments such as journal articles or national red lists or databases” (S55).

Almost 50% of respondents (n=68) reported that when local expertise was included, it was also referenced in the assessment, mainly citing involved individuals as contributors to the Red List assessment (35%), naming them in the acknowledgement section (25%) or as co-authors (16%) of peer-reviewed articles and reports underlying the assessment.
Twenty-eight percent said it was not referenced, while 22% were unaware of the issue.

“Everyone talks to local people”: who is consulted and to what end

Survey results showed that the three groups of local expertise played different roles for the different aspects of the Red List (Figure 4). Resident professionals were consulted by at least 50% of respondents in all aspects of the assessments, except for the plant use category, in which local resource users were consulted more frequently (by 43% of respondents). Local resource users were otherwise rarely consulted (between 6-20% of cases). Similarly, citizen scientists were involved according to 9-24% of respondents, ranking highest for the species distribution aspect (26%).

A more detailed picture emerged from the semi-structured interviews. Informants confirmed that they usually closely collaborate with resident professionals of their network:

“Local knowledge [of resident professionals] is very important, as many Red List assessment experts may have a general, national overview but may need local expertise to fulfil the most correct assessment of the species in question. Normally the national Red List assessment expert knows all the local practitioners who can contribute to the Red List assessment of the species” (I6).

In the understanding of interviewees, resident professionals were mostly defined as local botanists, protected area staff or herbarium plant collectors whose knowledge about specific species in an area was crucial for the assessments. As one expert put it:

“When the plant collectors are participants in the assessment workshops, they can provide a great deal more information than is recorded on the specimen labels, and we try to involve as many resident observers as possible from the areas where the species being assessed grow in order to give us just such local knowledge” (I5).

How resource users could contribute to the assessments was much less clear. Some informants considered their knowledge as a useful and valid source of information during field excursions, to give directions to sites of occurrence: “In the field, local knowledge is crucial, one talks to local farmers who will indicate areas where plants occur. [...] everyone talks to local people” (I2). Others appreciated it to provide information on present and past species distribution, use and trade:

“Local knowledge certainly plays a great role in the assessment process. The label data from herbarium specimens contain a great amount of observations and information recorded from inhabitants of the area in question (e.g. “This tree used to be more common but has been cut down except in sacred groves like this one where it is protected for the sake of our ancestors”), and the plant collectors often come from the area where they are working, making them local informants as well as scientific recorders” (I5).

However, informants maintained that the amount and quality of local knowledge relevant for assessments was culture-dependent, species and region specific. Survey results
showed that this was seen as the biggest challenge to the use and integration of local knowledge (63%), followed by the difficulty accessing it (34%) (n=68). This expert explained:

“The knowledge people hold about their environment varies a lot in different cultures. In Colombia, I did not find much knowledge, but in Peru there was a lot - although more qualitative than quantitative. But in Iceland, people know all the birds and local names: almost every farmer published a book. So there is a strong story-telling tradition. They have been collecting duck nests for over 100 years and have counted the eggs. Of course, Icelandic researchers have used these statistics [...]” (I3).

When assessing rare species or species that are not locally utilised, informants felt no need to consult local inhabitants. “People don’t know much about where plants grow if they don’t use them. But of course you are in contact with resident professionals, for example National Park or Nature reserve staff.” (I9).

‘Soft’ versus ‘hard’ data: how scientific experts value local knowledge

The knowledge provided by the resident professionals who were part of the scientific experts’ network was more easily valued as valid data for Red List assessments. Local resource users’ knowledge, on the other hand, was considered as a source of (anecdotal) information, rather than (systematic) data. In this expert’s experience, “[...] Local knowledge of campesinos is not quantifiable or quantifiable, so it will enter the assessment only if it corroborates the rest of the data. It is considered ‘soft data’, as opposed to ‘hard data’ which are herbaria specimens” (I2). The notion of ‘soft’ data also resonates in other comments: “Local inhabitants usually tend to have too ‘narrow’ [a] geographical view or not so well argued opinions, which is requisite in this kind of assessment” (S71). Hence the reticence to include local resource user information without it either being already part of the accessible literature: “Knowledge of local inhabitants is incorporated only when it has been published or incorporated into e.g. a national Red List assessment, and is therefore available to the information compiler, assessor and reviewer via literature search.” (S5); or without validation through a scientific authority: “[...] ‘Local knowledge’ is difficult to ‘cite’ and use in an assessment if it is not given by a taxon expert or scientific authority” (S110). In the interviewees’ perception, knowledge provided by local inhabitants was not a significant part of the evidence base behind an assessment that could truly influence its outcome: “Knowledge of local inhabitants is largely related to use and trade, which, unless it qualifies as a significant threat, does not influence the determination of conservation status” (S5).

Scientific expertise: organisation and role

Informants confirmed that scientific experts participating in Red List assessments are organised in network groups according to species and/or region, which they enter by invitation. Experts are selected based on their taxonomic or regional expertise. In many cases, there are designated national, or it is those experts who are most active in raising conservation concerns that are most likely to be invited to participate in the assessment process. Expertise is often narrow: “Experts knew a lot about one or two species, they are usually experts for a few species or a genus.” (I1). Their willingness to participate is also crucial, as their contribution is largely voluntary, but paid off by the feeling to be contributing to the conservation of species of their interest and the prestige of being part of the network. In the opinion of this expert:

“[...] The assessment process that has proven to be very time consuming. Often the Red List assessment of the particular group of species has been done voluntarily because the expert is very interested in doing the best for the group that he or she has been working with for many years” (I6).

Group membership is dealt with individually by each network group, which for some species groups or regions is small, so “the choice [of experts] is simple” (I6).

According to the interviewees, Red List assessments rely on scientific experts to bring together the best information available and discuss it to reach an informed decision. In the words of an informant: “The IUCN Red List process is expert based. They bring their collective decades of experience and knowledge of the literature on the species concerned [...] if you have the right people in the room, they know a huge amount” (I4). The experts’ role is crucial: they select the species to assess and the materials to consult; bring their personal observations and experience, agree on how much is enough data; and define – following IUCN guidelines – which sources of information are deemed reliable:

“Any reliable source of information that yields the kinds of data needed to apply these criteria is acceptable [...] Of course the definition of “reliable” information is subjective, and the judgement of the reliability of data is ultimately up to the Red List Authority/Specialist Group etc. responsible for performing the assessment” (I5).

A number of experts expressed that for many species only limited data is available and the assessment group has to deal with knowledge gaps: “IUCN works with the best available knowledge, which is different from ‘ideal’ knowledge. Often the assessments are just educated guesses” (I2). In situations of data uncertainty and projections of future trends and risks, there is room for speculation: “If nothing else is there, expert opinions can have a lot of power” (I1). Some informants pointed towards the influential role of scientific experts in the Red List process:

“[The Red List process] is sometimes criticised for being “too subjective” – i.e., a different group of assessors could look at the same information and reach a different conclusion – but for me the documentation of that information is the real point [...]” (I5).
DISCUSSION

Data sources: the ‘invisible’ contribution of local expertise to the Red Lists

The results of this study confirm the core role played by scientific experts in all steps of the red-listing process. Survey results showed that their personal knowledge was as important for red-listing as scientifically verified data found in floras and distribution maps. This resonates with results from studies of marine turtle assessments, in which 68-80% of references fell into the category of personal communications or grey literature (Seminoff and Shanker 2008; Campbell 2012). IUCN recognises the value of personal observations by scientific experts for inferences of past population levels, when quantitative information is missing (IUCN 2011). Given the paucity of quantitative data for many species and regions, critics of the Red Lists have repeatedly advocated for more room for qualitative assessments (Mrosovsky 2003), highlighting that more transparency is needed to meaningfully incorporate personal observations and increase accountability of scientific experts (Mrosovsky and Godfrey 2008).

Both survey and interview results revealed that local expertise was also part of the process, with more than 90% of scientific experts consulting at least one group of local expertise. This figure seems surprisingly high, given the lack of a clear official positioning and guidance by IUCN on the role of local knowledge in the Red-List process. Furthermore, it is most likely a conservative estimate, because the full extent of local knowledge contribution to the Red Lists is difficult to assess. For example, the absence of a review workshop for the medicinal plant Red List represents a missed opportunity for local expertise to enter.

In addition, a wide array of data sources is used as evidence base for the listings (e.g. checklists, databases, or national Red Data Books), the creation of which is unclear (Turnhout and Boonman-Berson 2011) and may have involved some form of local expertise. For instance, 64% of European citizen science projects make their data available to the Global Biodiversity Information Facility (GBIF), a widely consulted tool for Red List assessments (Chandler et al. 2017).

In the case of the Red List, the inclusion of local expertise is stated as an ongoing strategic target: “Local support for the IUCN Red List is mobilised by ensuring that local traditional knowledge is included in assessments” (IUCN Red List Committee 2013:17), and a workshop on this topic was held at the IUCN World Conservation Congress in September 2016 (Cross and Cooney 2016). In practice, however, the contribution of local expertise to assessments is, at present, neither readily visible nor reported in a systematic manner, leading to questions of transparency and recognition. Selecting experts in an inclusive and transparent manner, avoiding sharp delineations of expertise, and including a critical examination of knowledge claims may represent a way forward (Burgman et al. 2011).

Kinds of local expertise entering the Red Lists

Some forms of local expertise entered the listing process more easily than others. Resident professionals were routinely consulted, followed by citizen scientists for data collection, leaving local resource users as the least consulted group. This result is not surprising and finds an explanation in the way the knowledge contributions are framed, with similar or compatible epistemologies being naturally easier to integrate. Having access to both local experience and more technical knowledge, resident professionals such as local conservation practitioners are often able to provide locally based information, i.e. day-to-day personal observations from their management practices, in a language that fits the scientific framing of the Red List. They are thus more easily recognised as valid knowledge producers for Red List assessments and have elsewhere been recognised as key actors in conservation (Fazey et al. 2006). This form of local expertise could be defined as ‘boundary spanner’, a term originally used in the business management literature, which has been used to characterise individuals able to communicate and build links across knowledge systems and overcoming problems of trust (Löfmark and Lidskog 2017).

Data collected by citizen scientists is not knowledge generation per se and is already framed as scientific because it is gathered according to predefined scientific protocols, usually after training was provided. Although citizen science data is thus more easily integrated into assessments, it is often perceived as unreliable from the perspective of scientists who remain sceptical about the quality of the data (Bonney et al. 2014). Increasing evidence suggests that citizen scientists can generate data comparable to those collected by scientists (Danielsen et al. 2014). Problems of trust may arise also on the side of data enumerators, who can fear their data might be used against them, so that it is important that they are able to access and understand it (Lawrence 2010).

Local resource users appeared to be least involved in the Red List process. This is despite growing evidence that community members hold more than ethnobotanical knowledge on plant use (Staddon et al. 2014): they may constitute the only monitors of remote populations where scientific studies are considered impractical or too expensive (Gilchrist et al. 2005) or provide key natural knowledge when living in a strategic location for the species in question (Löfmark and Lidskog 2017). Within the field of ecosystem monitoring, an extensive body of literature shows the usefulness of locally based knowledge (Berkes and Folke 2002). Despite this wide acknowledgement of the usefulness of local resource users’ expertise in natural resource management, it comes as no surprise that it is less consulted for Red List assessments, considering that the knowledge it contributes is often anchored in knowledge systems very different from the scientific framing in which the Red List operates. Its respectful incorporation still has limited success – even in an expert organisation such as IPBES, which represents one of the most ambitious projects to create links between scientific and non-scientific knowledge systems (Tengö et al. 2014).
‘Soft’ versus ‘hard’ data: hierarchies of knowledge in the Red Lists

Interview results revealed the hierarchies of knowledge playing out in the Red List process: any knowledge enters the assessment hierarchically through contributors to assessors. Local knowledge is considered as less legitimate and is expected to enter the scientific frame, thereby requiring mobilisation and translation from local contexts, and stabilisation into unchangeable units which can then easily be combined with other collected knowledge (Löfmarck and Lindskog 2017) – a process that Agrawal (2002) has defined as ‘scientisation’. Informants perceived that local resource users’ knowledge needed scientific validation to be useful for assessments. The practice of “testing” local knowledge against scientific approaches has been both supported (Gilchrist and Mallory 2007) and criticised (Brook and McLachlan 2005), because it implies that the scientific framework should be the standard to follow. Validating knowledge claims from one knowledge system with the methods of another system carries a risk of losing valid knowledge because its quality and integrity are not duly recognised (Löfmarck and Lindskog 2017). It is suggested that meaningful participation at all stages of the process is necessary to overcome inequalities between knowledge systems (Tengö et al. 2017).

Abstraction and de-contextualisation of observations is considered essential for results to be seen as scientifically valid, but may be disrespectful to data providers (Turnhout and Boonman-Berson 2011). Taking local knowledge out of its context separates it from its “situated intimacy” (Raffles 2002:326) and may create disincentives for knowledge and data contribution to conservation assessments (Agrawal 2002). An example with citizen scientists in Europe showed that these were likely to withhold data if they did not trust the ways it was used by governments (Lawrence and Turnhout 2010). Local resource users, whose livelihoods and land rights may be negatively impacted by conservation assessments, present a particular case. Some argue that they should, in fact, not engage with scientific biodiversity assessments, as this would mean relinquishing power and maintaining the power balance in favour of the scientists (Bohensky and Maru 2011). Local knowledge consultation has often been purely extractive, ‘mining’ local knowledge as a resource to fill knowledge gaps, increase efficiency and decrease costs in conservation, instead of feeding results back to communities and data providers and offering them as tools for local conservation priorities (Brosius 2004). To respect the rights of communities to their knowledge and natural resources, scholars have pointed towards the need for guidelines on how to include detailed, contextual and applied aspects linked to local knowledge systems in order to consider them within their wider socio-ecological context (Agrawal 2002).

Scientific expertise: organisation and role

The Red List experts surveyed and interviewed in this study form an exclusive network of scientists biased in their scientific representation. A prevalence of natural scientists with degrees in biological science has been found in other IUCN Specialist Groups (Campbell 2011) and other IUCN Commissions (MacDonald 2003), as well as in other expert-based organisations such as the Intergovernmental Panel on Climate Change (IPCC) (Corbera et al. 2015) or IPBES (Morin et al. 2016). In the context of the Red List, the lack of social scientists in the listing process suggests that social dimensions of potential regulations flowing from the Red List are not part of the discussion and that listings are rather the result of a ‘pure’ conservation debate. Within IUCN, a Social Policy group had been created in the 1990s to work towards increased participation of indigenous communities in conservation initiatives, but it was dismantled, leaving this task to a less focussed specialist network (MacDonald 2003). With the absence of interpretative social science backgrounds there is also a risk for the Red List to not be reflexive and self-critical about the assessment process in general and about what counts as valid knowledge or who is seen as valid knowledge holder (c.f. Löfmarck and Lindskog 2017).

Interviews also revealed that when dealing with lacking or contradictory empirical evidence, scientific experts have an influential role on assessment outcomes. In situations of scientific uncertainty, an expert group may claim a range of views are supported by the available estimates and may easily maintain a discourse whose evidence base is ‘black-boxed’ (Kamelarczyk and Smith-Hall 2014). This is especially true for Red Lists, in which the process of documenting the available information stands in the background and is overshadowed by a powerful one or two word status listing (Seminoff and Shanker 2008). Facts are said to become ‘harder’ the further away they are taken from specialist groups (van Bommel 2008), so that decision-makers hardly ever have the time to look beyond summarising labels and read the detailed documentation behind them. More often, Red List status is taken at face value and conservation actions planned as a consequence, regardless of what IUCN originally intended. This, once more, points to the importance of transparency and accountability in the Red List process.

CONCLUSION

By adopting a broad definition of expertise, this study showed that a variety of different forms of expertise contribute to Red List assessments at varying levels. Existing hierarchies of knowledge were highlighted, with scientific experts from the natural sciences being at the core of the assessment process and deciding over what counts as evidence and whose knowledge counts. Scientific empirical evidence is seen as the most legitimate knowledge source and assessment results are cast as a product of scientific evidence. However, a variety of more locally based expertise finds its way into the assessment, albeit in a non-structured, non-transparent way, and always hierarchically following validation by scientific experts. Involvement of local expertise in assessments is stated as a strategic Red List target, but no practical guidelines are in place on how to overcome
issues of data validity and trust towards a meaningful integration of differing knowledge sources and systems. As IUCN needs to make informed decisions and policies on the development of the Red List, the question is how local expertise can meaningfully contribute to Red List assessments. The Red List may continue along its exclusive approach, ignoring the normative call for local knowledge integration and leaving this to platforms such as IPBES, while working complementary to them as a science-based tool which gives voice to the species it aims to protect. Scientific and local knowledge are, however, difficult to separate in practice, and local expertise is already part of the Red List process. Thus, IUCN may counteract its scepticism and formally open the red-listing process to local expertise. The parallel aims of such an inclusive stance are both normative, i.e. to ensure local stakeholders’ rights to involvement in policy development, and pragmatic, i.e. to achieve better conservation outcomes. In this case, emphasis would need to be placed on ensuring that inclusion of local knowledge is a systematic and transparent process, finding options for maintaining its socio-ecological context and for feeding knowledge back to local communities – an approach likely to require a radical rethinking of the Red List; in terms of who it is produced for and whose knowledge it aims to reflect.

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