Appendix 1

This appendix summarizes published literature relating to autonomous monitoring by people deriving their livelihood largely from wild species in tropical regions.

Our ISI keyword search (see methods) provided several hundred hits. Most dealt with healthcare or with citizen science within Western industrial societies and were thus excluded. When titles and abstracts were reviewed for possible relevant papers, 23 were examined in full text, with a further 33 texts of interest identified from the citations also examined. Only two of these 56 texts met our criteria by describing autonomous processes relevant to conservation in a tropical context. Of these, only one explicitly considers such monitoring in practice (LaRochelle and Berkes 2003) while the other recognizes their existence but lacks examples (Danielsen et al. 2009) but see also (Danielsen et al. 2014). From our own readings, and the suggestions of two reviewers, we have identified further cases that place our observations in a broader context. Most examples are implicit rather than explicit.

Several temperate or boreal examples do offer useful insights that may have wider applicability (Moller et al. 2004). However, these are mainly pre-occupied with collaboration and participatory approaches which is not our focus here.

Regulations, sanctions and self-policing are part of communal management and feature as a key element in the common property literature (Ostrom 1990, Ostrom et al. 1999, Berkes 2010). Studies indicate that autonomous policing and enforcement help avoid excessive exploitation of shared resources (Chhatre and Agrawal 2008, Rustagi et al. 2010) and that increased monitoring and sanctioning are associated with less resource degradation (Pagdee et al. 2006). Most discussion focuses on principles rather than the technical details that might normally be applied to discussions of monitoring. For example, members of some Swiss Alpine communities police common areas and can impose fines on other members when accepted rules are violated (Casari and Plott 2003).

Common-property self-monitoring can produce surprising implications. For example, in one case-study community members in Zimbabwe were concerned that valuable grass (used for commercial broom-making) was being degraded and overharvested.

The community themselves suggested, among other things, to increase, not decrease, the number of households accessing and thus benefitting from this declining resource – the view was that if more people benefitted there would be more observers intolerant of damaging practices (Vanclay 2010).

Outside the common property literature examples of autonomous monitoring practices are harder to find – largely because they are not readily identified with key words or summaries.

Pacific islanders often practice various measures to prevent the overharvesting of marine resources (Johannes 2002, Jupiter et al. 2014). Measures often include controlled access and the enforcement of no take zones and/or seasons. For example 27 out of 27 villages interviewed in Vanuatu prohibited exploitation of local marine resources by outsiders without permission, and many had established local bans on exploiting specific sites, or species, or using certain harvest methods (Johannes 1998). The effectiveness of these measures has led to recognition, encouragement, and renaissance in such management (Johannes 2002). Our own reading of this literature provides many examples of the principles being applied but few details of how rules are enforced.

We find examples in the literature that address monitoring without using the term. For example, in Seram, Indonesia, the forest is traditionally divided into parcels owned by families who have exclusive rights for gathering resources and hunting. The owners rest parcels when resources appear depleted. During these rest periods the parcel owners may observe evidence of illicit use (Sasaoka and Laumonier 2012). In these cases the land owner claims to know, based on the evidence, who is responsible. The alleged wrongdoer is not confronted, but the allegations are shared discreetly within the community, and any subsequent misfortune that befalls the purported perpetrator or their family is interpreted as supernatural punishment (Sasaoka and Laumonier 2012). While accurately described as an example of supernatural involvement in management (Sasaoka and Laumonier 2012), it also relies, albeit implicitly, on the repeated observations that lead to resting land and identifying illicit use.

A typical account of how resource users interact with their environment is provided by LaRochelle and Berkes (2003) who studied the management of wild forest food plants by the Raramuri people of Chihuahua State in Mexico and commented that resource monitoring was part of “daily activities, such as gathering livestock, collecting fuel wood, or harvesting plants … participants noted that to monitor the state of edible plants, people must harvest and use them”.

Another example: in the deserts of Western Australia the aboriginal “Spinifex People” considered land to be sacred. Each community member learned the complex mythology tying them and their ancestors to specific locations and territories with associated rules, roles, rights and responsibilities. Only close family freely enter another’s territory without permission. Roles and responsibilities include site protection (Cane 2002). For example, certain waterholes can only be accessed by specific men who manage the surrounding vegetation and keep the water clean (no one else can draw water, but in droughts they may gain permission to camp nearby and have water carried to them). Punishments for transgressions were historically severe, but for most the fear and shame were sufficient deterrent. Local knowledge, tracking skills and rapid action provided effective control over a vast region: in 1995 for example, some elders intercepted a group of unauthorized geologists who were guided off the territory and told not to return (Cane 2002). Again nothing in this account identified the activities as monitoring.

Evolutionary psychology suggests that self-policing has molded our behaviors (Fehr and Gächter 2000, Rand and Nowak 2013). Examples include human interest in what others are doing, willingness to punish, and the influence of observation (Haley and Fessler 2005, Bernhard et al. 2006, Powell et al. 2012, Miyazaki 2013, Nettle et al. 2013).

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