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Case studies

Unexpected and undesired conservation outcomes of wildlife trade bans—An emerging problem for stakeholders?

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A B S T R A C T

CITES regulates international trade with the goal of preventing over-exploitation, thus the survival of species are not jeopardized from trade practices; however it has been used recently in nontrade conservation measures. As an example, the US proposed to up-list polar bears under CITES Appendix I, despite that the species did not conform to the biological criteria. Polar bears were listed as 'threatened' under US ESA in 2008, in response to loss of sea-ice and warming temperatures. In Nunavut, where most of Canada's polar bears are harvested, the resulting trade ban did not decrease total harvest after the ESA listing but reduced US hunter participation and the proportion of quotas taken by sport hunters from specific populations. Consequently, the import ban impacted livelihoods of Arctic indigenous communities with negative conservation — reduced tolerance for dangerous fauna and affected local participation in shared management initiatives. The polar bear may be the exemplar of an emerging problem: the use of trade bans in place of action for non-trade threats, e.g., climate change. Conservation prospects for this species and other climate-sensitive wildlife will likely diminish if the increasing use of trade bans to combat non-trade issues cause stakeholders to lose faith in participatory management.

1. Introduction

The Convention on the International Trade in Endangered Species of Wild Fauna and Flora (CITES) addresses complex wildlife trafficking/trade issues, which are often controversial. However, the CITES conservation convention does not

Abbreviations: ACPB, Agreement for the Conservation of Polar Bears and Their Habitat; CBC, Community-based conservation; CBNRM, Community-based natural resource management; CBO, Community-based organization; CITES, Convention on the International Trade in Endangered Species of Wild Fauna and Flora; ESA, Endangered Species Act; HTO, Hunter and Trapper Organization; IQ, Inuit *Qaujimajatuqangit*; PBSG, IUCN/SSC Polar Bear Specialist Group; MMPA, Marine Mammal Protection Act; NLCA, Nunavut Land Claims Agreement; TAH, Total Allowable Harvest; TEK, Traditional Ecological Knowledge; US, United States of America.

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concentrate on one of the most consequential threats to endangered species overall, i.e. habitat loss. Rather, efforts are directed towards commercial trade, which from a global perspective in today's world is not as imminent in its impact as habitat loss (du Plessis, 2000) is for most species. This adds to the difficulty when evaluating whether particular CITES efforts are effective, unproductive or at times harmful (see also Blundell and Mascia, 2005; Reeve, 2006; McAllister et al., 2009; Phelps et al., 2010). Some species are at great risk from poaching and illegal wildlife trade (Yi-Ming et al., 2000; Leader-Williams, 2003; Sodhi et al., 2004; Galster et al., 2010; Michel, 2010; Rosen and Smith, 2010; Underwood et al., 2013; UNEP, 2013; Mondol et al., 2014; Tella and Hiraldo, 2014; Wittemyer et al., 2014; Nijman and Shepherd, 2015) and it is these species that CITES was designed to protect and should do so with fervor. However, there is a viewpoint, notably in developed countries, that the goal should be to stop all trade, regardless of substance, cultural, and economic needs of local communities (see Dickson, 2003).

Here, we briefly review the original goal of CITES – control of international wildlife trade – and the increasing use of CITES as a primary conservation or political measure. CITES actions have been suggested to be a prelude to successful conservation despite really being a '*tool*' for conservation endeavors rather than the end product (Huxley, 2000). We suggest trade bans may not always correspond with the goal to preserve wildlife. Moreover, it is important for successful preservation of species to avoid short-term management strategies and instead promote and enhance the involvement of people living in the region where they can be part of community-based conservation. With this frame of reference, our goal of this paper is to present the polar bear as a timely exemplar of the more general problem, i.e., use of CITES for non-trade threats and the relative effectiveness of trade bans in biodiversity conservation.

1.1. CITES

CITES was developed to control international wildlife trade with the goal of preventing overexploitation of designated species. Every three years, the CITES Parties' meet to review various types of proposals, including possible listing/up-listing for species of concern under Appendices I, II, or III. Appendix III addresses trade jointly controlled by more than one party and/or restrained exploitation (CITES, 1975, 2013a). Appendix II includes species potentially threatened with extinction *if* trade is not stringently controlled. Appendix I lists species considered to be threatened with extinction *and* currently or likely to become impacted by trade. CITES suggests the criterion for a marked recent rate of decline is 50% or more over three generations or ten years (CITES, 2013a).

Listing species not threatened or endangered sets a problematic precedent because instituting restrictions can (i) affect the economies of communities and (developing) countries, which are often economically depressed, (ii) drive trade onto the black market, which would then be harder to monitor, (iii) put at risk the legitimacy and conservation abilities of CITES to address trade controversies, and (iv) affect the overall perception of CITES (du Plessis, 2000; Gehring and Ruffing, 2008; Conrad, 2012). Proposals have been put forward to list species as a conservation attempt rather than protection from detrimental trade (Moyle, 2003; Dickson, 2003)—"an instrument for environmental protection" (Epstein, 2006; USFWS, 2012). Instead of controlling wildlife trade between importing/exporting countries to ensure a species has sufficient numbers in the wild for survival, there has been an increasing trend to view actual Appendix I listings, or at least attempts (e.g., USFWS, 2012), as successful conservation measures (Huxley, 2000) despite the presence of CITES Review of Significant Trade (CITES, 2013b). In addition, a plan of action focused on primarily up-listing a species to Appendix I does not guarantee that the result will be recovery for the species once trade and poaching cease, as observed in rhinos (Family Rhinocerotidae) (Leader-Williams, 2003) and African elephants (*Loxodonta africana*) (Jachmann, 2003).

CITES has benefited some species but these usually included the development of a recovery plan that had the involvement of local communities or range states (Hutton and Webb, 2003; Leader-Williams, 2003; Frisina and Tareen, 2009; McAllister et al., 2009; Larriera et al., 2010; Lichtenstein, 2010). However, CITES has not been overtly successful in "*saving species*", often only tracking over-exploitation or extinction but not in tackling issues causing declines. After species are listed on CITES, they often continue to decline rather than have a dramatic recovery (Kievit, 2000; Martin, 2000; 't Sas-Rolfes, 2010, 2012); as noted in a study where only two of 12 regulated species showed recovery (ERM, 1996; Martin, 2000; Dickson, 2003). There are potentially a number of reasons why CITES has not had overwhelming success at 'saving species', e.g., lack of compliance by those involved, both at the international level and the national level (Vasquez, 2003) and those that are not parties to the convention (Leader-Williams, 2003). One of the potential reasons for lack of compliance is a feeling of disenfranchisement (see Section 1.3) by those that view the Parties to the Convention "impose their perceived conservation solutions on (to) other Parties" (Martin, 2000). Huxley (2000) suggests the lack of success at saving species is because CITES uses the tactic of prohibition and ultimately compels adoption of solutions rather than promoting the viewpoint of sustainable use by managing legal trade. This attitude draws from a Westernized protectionist viewpoint that tends to undervalue or minimize the ideology of sustainable wildlife use (Kievit, 2000).

CITES does not consider that trade regulations may not always be the best approach to mitigate threats faced by certain species (Dickson, 2003). Trade bans can work in the short term, in effect *buying the species/population time* while an action plan is developed. However, without long term action plans, conventional restrictions can encourage black-market international trade, leading to unsustainable illegal harvesting (Hutton and Webb, 2003; Conrad, 2012). In a sense illegal wildlife trade is a monopoly protected from competition (Conrad, 2012; 't Sas-Rolfes, 2012). In addition, there is often a lack of sufficient detection, enforcement, or repercussions for violating the trade ban (Hayman and Brack, 2002; TRAFFIC, 2008; Wasser et al., 2008; Tilson et al., 2010; Rosen and Smith, 2010; Conrad, 2012; Bennett, 2014; Lawson and Vines, 2014; Nijman and Shepherd, 2015). Furthermore, CITES restrictions/trade regulations may not always be the best approach because they do not address domestic trade, which occurs at higher levels than international trade (du Plessis, 2000; Nijman, 2010; Tilson et al., 2010). Strong domestic enforcement combined with increased awareness and understanding by those locally involved can reduce trade on endangered species, as observed with babirusas (*Babyrousa babyrussa*) (Milner-Gulland and Clayton, 2002) and other species (Jachmann, 2003; Lee et al., 2005).

1.2. Trade bans

International trade bans on the trade of wildlife parts or products are used to address population declines of endangered species. While this may appear as an elegant solution, in reality bans are complicated, often ineffective, and not a universal panacea (Dickson, 2003; Moyle, 2003; Cooney and Jepson, 2006; Moore, 2011; Bowman, 2013; Briggs et al., 2013; Couzens, 2013). The implementation of the same general solution will not work for all circumstances as cultural practices/beliefs, economic situations of people involved, and perceived value of wildlife by communities need to be taken into account (Hutton, 2011; Briggs et al., 2013; Cooney and Abensperg-Traun, 2013).

By removing legal trade, incentives to preserve wildlife may diminish; this can push trade 'underground' where it is unmonitored, uncontrolled, and ultimately the preservation of a species can be ineffective and lost (Martin, 2000; Dickson, 2003; Leader-Williams, 2003). In past situations, CITES has effectively led to a reduction in illegal trade by advancing legal, well-controlled, and strongly enforced trade, ultimately promoting sustainable wildlife use (Huxley, 2000; TRAFFIC, 2008; McAllister et al., 2009). Viable populations in the wild can have an economic value to local communities (Kievit, 2000; Abensperg-Traun, 2009; McAllister et al., 2009; Larriera et al., 2010; Lichtenstein, 2010; Nijman, 2010) and thus an economic incentive to maintain healthy population sizes. The Nile crocodile (*Crocodylus niloticus*) in parts of Africa (Kievit, 2000; Martin, 2000; Hutton and Webb, 2003) and the broad-snouted caiman (*Caiman latirostris*) in Argentina (Larriera et al., 2010) are examples of this, i.e., a shift in a trade restriction policy to trade as a conservation solution prevented further decline of the species. Both species were originally listed under CITES Appendix I but specific populations were transferred to Appendix II under the Ranching Resolution of CITES (Garrison, 1994; Kievit, 2000; Larriera et al., 2010).

Crocodile (i.e., *C. niloticus*) harvest has been a sustainable managed program in multiple African countries but the species was split-listed, meaning that populations not threatened could be used providing the take remained sustainable (Garrison, 1994; Kievit, 2000; Hutton and Webb, 2003). After the 1980's, trade in the Nile crocodile was predominantly in ranched/captive-bred individuals in these countries. Working with CITES, certain African countries developed sustainable use programs, involving stakeholders, i.e., governments, nongovernmental organizations (NGOs), and private commercial entities. This constituency developed a vested interest in eradicating illegal harvest of the Nile crocodile, which is believed to have stopped in the 1990s (Hutton and Webb, 2003). The sustainable harvest of the caiman, *C. latirostris*, is considered successful because incentives were created to give the preservation of the species an economic value for the local people (Larriera et al., 2010). Other crocodilian species and populations have not been so fortunate (see Freire et al., 2010; Shirley, 2010). It is important to find and implement *successful methods* to prevent further declines in population sizes of species previously (or currently) under exploitation as other types of biological impacts can manifest themselves in the species/population (see Bishop et al., 2009; Bishop et al., 2010).

In some cases bans have reduced trade, allowing populations to recover (Carpenter et al., 2005; Lemieux and Clarke, 2009; McAllister et al., 2009), but this usually occurs over the long-term (Cole, 2012). Within the conservation and academic communities there is an ongoing debate about sustainable use and the effectiveness of CITES and trade bans (Garrison, 1994; Martin, 2000; Kievit, 2000; Reeve, 2006; Rivalan et al., 2007; Santos et al., 2011; Abensperg-Traun, 2009; 't Sas-Rolfes, 2010; Cole, 2012; Conrad, 2012; 't Sas-Rolfes, 2012; Di Minin et al., 2014; Lawson and Vines, 2014; Li and Jiang, 2014). If all trade is banned, there is little incentive to protect and preserve wildlife. Some argue trade bans are ineffective, lack a direct benefit to the species, and instead increase exploitation and affect survival (Khanna and Hartford, 1996; 't Sas-Rolfes, 2000; Rivalan et al., 2007; Santos et al., 2011). A more balanced approach is for trade to be limited as a short-term management strategy (Hutton and Webb, 2003). If trade is strongly regulated and enforced with set sustainable limits, then combined with increased awareness (Milner-Gulland and Clayton, 2002; Lee et al., 2005; TRAFFIC, 2008; Frisina and Tareen, 2009; McAllister et al., 2009) and a focus on community-based conservation (CBC), depletion of species can be avoided.

1.3. Community-based natural resource management

Community-based natural resource management (CBNRM; or community based conservation) combines conservation and development goals focusing on local participation in developing sustainable use of natural resources while striving to conserve biodiversity. Different countries have used variations of CBNRM (Frisina and Tareen, 2009; McAllister et al., 2009; Lichtenstein, 2010) and this has been well documented in southern Africa (Fabricius et al., 2004; Nelson and Agrawal, 2008; Jones and Weaver, 2009; Monjane, 2010). Botswana, for example, with more than a quarter of the sub-Saharan elephant population, was ideal for CBNRM implementation in the 1980s because the government was stable and emphasized sustainable development and decentralization (Rihoy and Maguranyanga, 2010). Communities incorporated into community-based organizations (CBOs) gained a wildlife quota for local utilization rights, which could be expanded to include commercial activities (i.e., tourism and hunting). In the 1990s, an excess of 100 000 people from over 60 CBOs participated, revenues approached US$200 000 annually, and Botswana was considered a CBNRM success. Those CBOs engaged in sport hunting tourism generated the highest revenues, an important consideration for the case on polar bear management in Nunavut, Canada discussed below.

The CBO program continues in Botswana but unfortunately it is no longer viewed as a participatory conservation initiative, lacking local, governmental, and international support. Rihoy and Maguranyanga (2010) suggest this formally successful CBNRM failed because of (i) a shift towards protectionist conservation and governmental suspicions about sustainable use, (ii) the program was dominated by foreign ideas (poignantly illustrated by CBNRM being referred to as '*dilo tsa makgoa*', ('something for white people')), and (iii) the lack of local participation in setting of quotas and management.

Despite unsuccessful cases (Blaikie, 2006; Berkes, 2007) from flawed implementation, CBNRM has been shown to be an important conservation tactic, e.g., vicuña (*Vicugna vicugna*), Suleiman markhor (*Capra falconeri jerdoni*), Afghan urial (*Ovis orientalis cycloceros*) (Frisina and Tareen, 2009; McAllister et al., 2009). However, benefits need to be equitable among stakeholders for it to be successful in the long-term (Lichtenstein, 2010). The focus in many countries on development goals in conjunction with conservation lends itself to CBNRM, because of predominantly rural populations and charismatic megafauna. These regions also incorporate trophy hunting into their conservation initiatives (Rosser et al., 2005; Frisina and Tareen, 2009) making them apt comparisons with polar bear management. Trophy hunting was one of the pivotal issues highlighting the need for an international treaty dealing with trade, which then became CITES, but with time it was realized that this activity could be beneficial for conservation because revenues generated provided incentive and ability to invest in conservation, especially for areas that are underdeveloped (Huxley, 2000; Rosser et al., 2005; Frisina and Tareen, 2009).

In contrast to CBNRM, 'centralized fortress conservation' (i.e., national parks) idealized 'untamed wilderness', subsequently minimizing humans as part of the environment and ignoring local people participation (Berkes, 2007). Political, commercial, and conservation interests prefer centralized resource management (Nelson, 2010), thus CBNRM is rarely applied effectively and often results in failed conservation initiatives because local communities become alienated and disenfranchised (Kellert et al., 2000; Ribbot, 2004; Nelson and Agrawal, 2008; Marks, 2014). Nevertheless, there are success stories of CBNRM preventing species decline by local communities sharing the benefits of being invested in the conservation efforts. The efficacy of incentivizing conservation was demonstrated with the Suleiman markhor and the Afghan urial in Pakistan (Woodford et al., 2004; Rosser et al., 2005; Frisina and Tareen, 2009), which stands in contrast to the outcomes for populations of these species in Tajikistan that did not have conservation incentives (Michel, 2010).

2. Case study: the polar bear

International polar bear (*Ursus maritimus*) management has been considered an effective conservation regime for a large carnivore (Fikkan et al., 1993; Wenzel, 2005; Freeman and Wenzel, 2006; Larsen and Stirling, 2009). Polar bear conservation and management in Canada's territories has been successful at implementing a co-management framework, coupling ecological and socioeconomic goals, and decentralizing authority (e.g., Brower et al., 2002). This is not to say current management is perfect; much of this relative success is related to the specifics of the socioecological Arctic environment. However, exploring the Nunavut system in depth, particularly within the context of the global movement against polar bear sport hunting, offers unique insights into CBNRM and wildlife trade bans. Currently, polar bears in Canada are not experiencing illegal trade (Obbard et al., 2010) but this could change if key Aboriginal stakeholders become disenfranchised (Nirlungayuk and Lee, 2009). Legal trade in polar bear products did not give added commercial value to the species because there is no poaching and polar bear take is highly regulated and monitored by the Canadian Government, the Government of Nunavut (GN), and local communities (Environment Canada, 2010).

There is a growing international movement to increase polar bear conservation regulations, driven by climate change advocates/concerns and opposition to sport hunting. This movement recently focused on international trade, resulting in the 2008 listing of polar bears as 'threatened' under the US ESA and two failed attempts in 2009 and 2013 to up-list polar bears to CITES Appendix I. The conservation success over the last 40 years could be undermined by continuing proposals to up-list polar bears under Appendix I. Pushes towards more restrictive legislation for trade bans will likely continue despite indigenous people, scientists, governmental officials, and some NGOs making arguments that trade itself is not the current threat to polar bear survival and therefore trade bans are not an appropriate course of action. Current international discourse surrounding polar bear conservation, trade, and sport hunting is situated within broader international discussions over CITES, effectiveness of trade bans, and importance of local people-inclusive conservation initiatives. Yet the issue of polar bear conservation has not really been compared to other conservation programs or put into the context of international conservation debates. It is our opinion that the case of polar bear management in Nunavut, Canada should be considered within these wider contexts as it has important insights to offer to the global conservation field. Importantly, there are multiple reasons to expect that an international trade ban on polar bear parts/products via CITES would actually weaken polar bear conservation, as indigenous Inuit communities are increasingly becoming marginalized with the management system.

2.1. Polar bear management and hunting

Nunavut, Canada's newest territory, has management jurisdiction for 50%–60% of the world's polar bears, and is where most bears are harvested (Obbard et al., 2010). In brief, harvest is managed by a quota system in which each subpopulation is assessed and then communities within it are given tags to ensure sustainable harvest. One tag allows one bear to be taken whether for subsistence or sport hunt purposes.

The *Nunavut Land Claims Agreement* (NLCA) provides a co-management system that is used to determine the sustainable total allowable harvest (TAH) for each polar bear subpopulation using scientific methods (e.g., capture–mark–recapture surveys, population modeling) and Inuit observations (NTI, 1993). This system incorporates scientific knowledge and Inuit *Qaujimajatuqangit* (IQ), which is cultural, political, and spiritual knowledge combined with traditional ecological knowledge (TEK) (Wenzel, 2004). TEK integrates observations of natural phenomena with local information about ecosystems obtained by the culture over time (Usher, 2000). Inuit cultural, political, and spiritual knowledge includes customs, worldview, language, life skills, perceptions, and expectations, all of which change over time making IQ a dynamic system of knowledge (Wenzel, 2004).

In Nunavut, polar bears can be legally harvested by Inuit (e.g., regular hunts) and non-Inuit (i.e., Inuit-guided sport hunts) following a sex-selective (e.g., 2 males for every female) flexible quota system based on sustainable yield (Taylor et al., 2008) that ensures populations remain healthy and productive. The built-in flexibility allows communities to accumulate male and female credits from unused tags (i.e., an unharvested bear), which can be used to cover a possible overharvest or for additional seasonal tags (Dowsley, 2010). In other words, communities can accrue credits either when the annually allotted quota is not entirely used by the community, or through a credit exchange with another community that also harvests from the same population in order to restore the full community quota in case of an overharvest. Community credit exchanges, or use of credits to increase the seasonal take follow a strict protocol, and includes organizations that are involved in wildlife management under the NLCA. When an overharvest takes place and no credits exist, the next year's quota will be reduced taking into account the gender-specific over-harvest that occurred.

To determine TAH levels, biologists for the GN assess boundaries (e.g., Taylor et al., 2001) and demography of each polar bear subpopulation in regular intervals (Dowsley and Wenzel, 2008). The subpopulation TAH is distributed between hunter and trapper organizations (HTOs) of the communities that hunt within that subpopulation. A memorandum of understanding (MOU) is developed that describes a 15-year research/management plan that includes subpopulation target size, TAH and determination method, harvest monitoring methods, governmental regulations, and local hunter rules.

The sport hunt system and distribution of sport hunt tags vary by community. Sport hunt tags may be retained by HTOs, sold to southern outfitters or community outfitters, or distributed to hunters through a lottery (Dowsley and Wenzel, 2008; Dowsley, 2010). HTOs collectively allocate polar bear tags based on community needs, i.e., subsistence tags are distributed to community hunters. HTOs acting as outfitters may hold sport hunt tags and sell them directly to the sport hunter or give them to Inuit hunters to sell to the sport hunter. All non-Inuit sport hunters must hire either a HTO outfitter or a private Inuit-owned one. Private outfitters may buy sport hunt tags from the HTO or individual tag-holding hunters.

Polar bear subsistence and sport hunts are heavily regulated, i.e., subsistence hunters can use snowmobiles and motorboats (no helicopters) but sport hunts must be guided by Inuit hunters using dogsled (Lentfer, 1974). Neither type of hunt can take female bears constructing a den, are denning, or accompanied by cubs. Killing a polar bear is not guaranteed; meaning sport hunters are paying for an Inuit hunting experience that may not procure a trophy. Should a sport hunt be unsuccessful, the tag can neither be used for another sport hunter nor reallocated to subsistence hunting but it can offset a bear killed by the community in defense of life or property (Dowsley, 2010).

2.2. US Endangered Species Act (ESA) and Marine Mammal Protection Act (MMPA)

The 2008 US ESA proposal to list the polar bear was intended to address harmful effects of climate change (Morath, 2008) by using the broad definition of 'take' in ESA that includes 'harm' defined as "significant habitat modification or degradation where it actually kills or injures wildlife…" (Parenteau, 2010, p.147). This definition of 'harm' was intended to regulate US greenhouse gas (GHG) emissions (US Federal Register, 2008a; Buck et al., 2009) however; a special rule attached to the listing blocked these attempts (Morath, 2008; US Federal Register, 2008b). Thus, the main purpose for the ESA listing (Buck, 2007)– to mitigate the primary threat to polar bear survival, i.e., loss of sea-ice and warming temperatures from climate change (Stirling and Derocher, 2012) – was nullified (Meek, 2011). Instead, the ESA listing targeted polar bear sport hunting in Canada by preventing the import of polar bear trophies and hides into the US.

The total number of polar bear tags (one tag allows one bear to be taken whether for subsistence or sport hunt) allocated in Nunavut did not decrease substantially after the initiation of ESA in 2008 (Fig. 1). From 1995 to 2008, US hunters accounted for 68%–100% of all sport hunts in the subpopulations approved by the US MMPA (Figs. 2(a), 3(a)). The MMPA established which polar bear subpopulations ("subpopulation" refers to local management units, the '19 subpopulations' Aars et al., 2006) were designated as biologically stable under MMPA criteria; therefore 'approved' to be hunted for importable trophies into the US (Fig. 3) (Wenzel, 2008). For a subpopulation to be MMPA 'approved' it must have (i) a monitored and enforced sport hunting program, (ii) quotas based on scientifically-sound data ensuring sustainability, (iii) export and import admissible under CITES, and (iv) transactions not deemed to contribute to illegal trade in polar bear parts (Lunn et al., 2002). However, the 2008 ESA listing took legal precedence over MMPA and prevented polar bear trophies from being imported into the US. The ESA listing notably decreased US hunter involvement in the Nunavut sport hunt (see Figs. 2 and 3 for an overview of different time periods and examples of annual variations) and though more hunters from other countries became engaged (Fig. 2(b), Fig. 3(b)) they did not compensate financially to the communities for the missing US hunters (pers. knowledge, MD). The ESA polar bear import restrictions diminished incentives for US citizens to participate in a $10 000–30 000 CAN

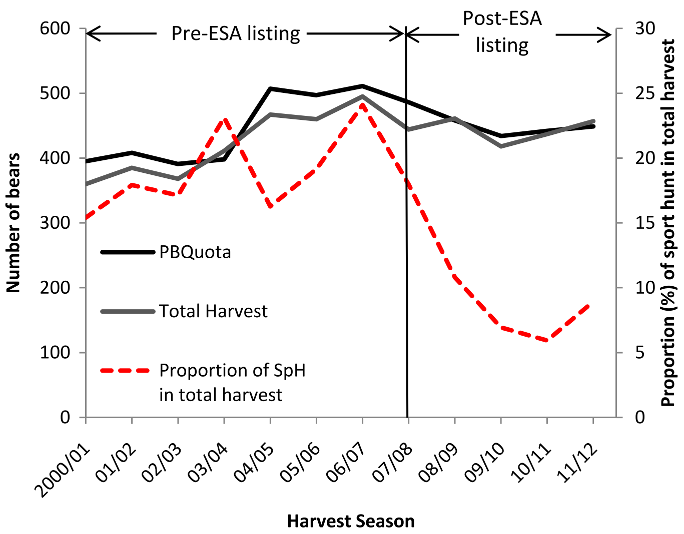

Fig. 1. Total Nunavut polar bear harvest. Polar bears were listed under the US ESA in 2008 however; the Nunavut polar bear quota (black solid line) (i.e., the number of polar bear tags allocated in Nunavut) and the total actual harvest (gray solid line) did not decrease substantially after the initiation of ESA. The proportion (%) of sport hunts (SpH) in the total harvest (right axis) for the harvest seasons (1 July–30 June) 2000/2001 through 2011/12 (dotted line by season) varied over time but did not decrease the actual total harvest of polar bears after they were listed in 2008.

polar bear sport hunt where the trophy had to be left behind (Fig. 3(b)) (Wenzel, 2005; Freeman and Wenzel, 2006). This regulation left remaining hunters (US or otherwise) with little to no incentive to hunt within those MMPA subpopulations (Fig. 3) deemed biologically stable (Slavik, 2009). ESA regulations only affect US hunters and are irrelevant to hunters from outside the US. If there is an Inuit guide and an outfitter to lead a sport hunt in the subpopulation, then hunters from other countries can hunt where they want (Fig. 3) and return with their trophy depending on their country of origin's import regulations.

The MMPA regulation had provided indirect protection to polar bear subpopulations because the largest group of sport hunters were American and could only hunt in MMPA approved populations. In effect, MMPA only allowed trophy import by US hunters where hunting was sustainable and it restricted trophy imports where insufficient evidence was provided for a population to be approved under the MMPA criteria. Now, after the change in the ESA listing, sport hunting still continues but by hunters from other countries, at depressed quantities, and in any subpopulation (Figs. 2 and 3). Furthermore, any US hunters (they can still hunt as before but just not import the trophy into the US) could choose any subpopulation where sport hunts are offered (Fig. 3(b)) (following jurisdictional regulations and the Nunavut Land Claims Agreement), whether the subpopulation is deemed sustainable by MMPA standards or not.

Sport hunting is not considered a serious threat to the viability of the polar bear subpopulations and is expected to continue to be sustainable (Freeman and Wenzel, 2006; TRAFFIC, 2008). Polar bear subpopulations in Nunavut are carefully monitored, and harvest levels are adjusted as needed to maintain viable and healthy subpopulations (e.g., Taylor et al., 2006; Stapleton et al., 2012; Peacock et al., 2013; Obbard et al., 2013; Stapleton et al., 2014). Sport hunting contributes economically to indigenous communities by supporting conservation-oriented polar bear management. Employment is scarce and sport hunts provide the Inuit jobs as guides and assistants, infusing income into Nunavut for equipment and supplies that enable subsistence activities (Wenzel, 2005; Freeman and Wenzel, 2006; Tyrrell, 2009). Unlike revenue earned through subsistence hunting and fur trade, the sale of a sport hunt does not necessarily result in the take of a bear because hunters pay for an experience but not a guaranteed trophy (Freeman and Wenzel, 2006). Each polar bear sport hunt can yield $10 000–30 000 CAN plus gratuities and resulting meat to the Inuit community, which is equivalent to the sale of at least five to seven polar bear hides collected through subsistence hunting (Wenzel, 2005; Dowsley, 2010). Sport hunts maintain social and cultural traditions by providing resources for subsistence hunters that can be shared with the community (Freeman and Wenzel, 2006; Tyrrell, 2009). The overall benefit obtained from sport hunts encourages Inuit to be invested in polar bear conservation, management, and a sustainable harvest by providing community livelihoods.

2.3. CITES and the polar bear

The polar bear was listed in 1975 under CITES Appendix II, as a species that was not directly threatened by extinction, but could be if not protected. Past global population size estimates are difficult to substantiate but ranged likely between 5000 and 19 000 before the 1970s (Larsen and Stirling, 2009). Today, the global population is estimated to be 20,000–25,000, which has remained constant for over a decade (Aars et al., 2006; Obbard et al., 2010; PBSG, 2013). In fact, Nunavut-resident IQ affirms that there are more bears now than there were 40 or 50 years ago (Government of Nunavut, unpublished).

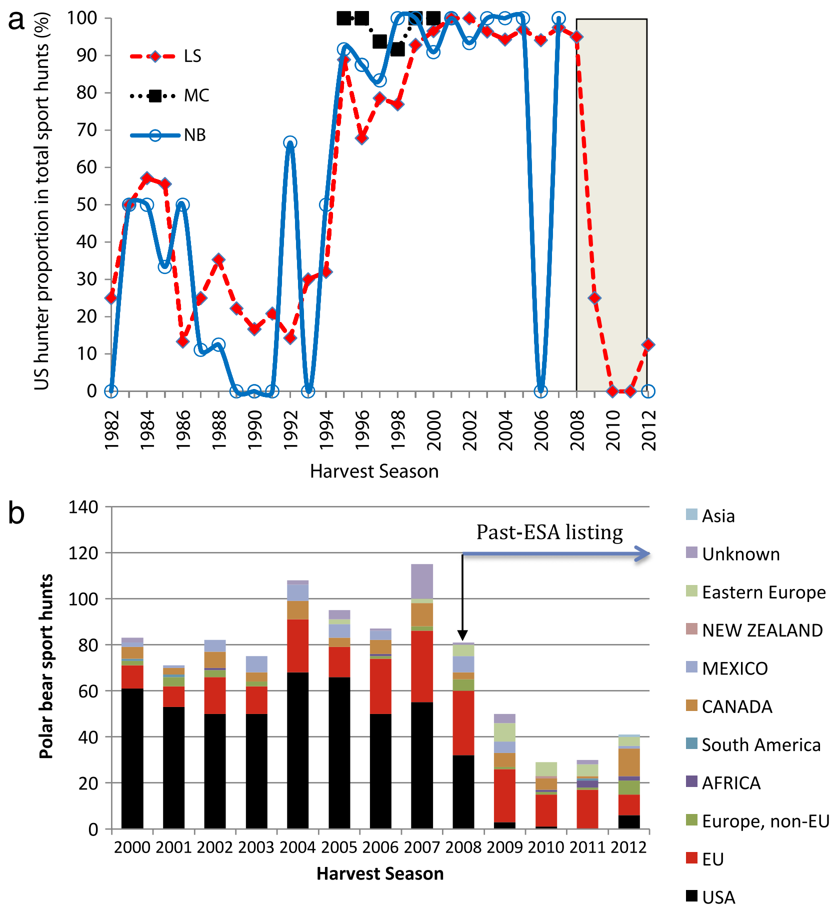

Fig. 2. Hunter participation in sport hunts by year. (a) The proportion of US hunters involved in Nunavut sport hunts (SpH) between 1982 and 2012 for the 3 US MMPA-approved polar bear populations Lancaster Sound (LS = red dashed line), M'Clintock Channel (MC = black dotted line with square boxes), and Northern Beaufort (NB = blue solid line). Prior to polar bears being listed under the US ESA in 2008, US hunters accounted for 68%–100% of all sport hunts in these three subpopulations approved by the US MMPA. Shaded area indicates past-ESA listing. (b) After the ESA listing in 2008, US hunter involvement (noted in black) in the Nunavut sport hunt notably decreased and more hunters from other countries became engaged. Number of Nunavut sport hunts between 2000 and 2012 are broken down by country or geographic region of origin of the hunter. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

US proposals to change the status to Appendix I, i.e., species nearest extinction, were unsuccessful because polar bears were deemed not to have satisfied the biological criteria needed for an Appendix I listing (Parsons and Cornick, 2011; PBSG, 2013). CITES defines the fundamental principle for an Appendix I species as "threatened with extinction which are or may be affected by trade" (CITES, 1975). Polar bears are in limited trade; and though conceivable that the species could be affected with unmanaged trade, the international management system implemented by the Agreement for the Conservation of Polar Bears and Their Habitat (ACPB) restricts detrimental impacts from trade (the quota system implemented by the Canadian Government and the Government of Nunavut is based on ACPB). The CITES criteria (*cf.* CITES, 2013a) that the US proposed the polar bear met was threatened with extinction and the population faces projected marked declines caused by decreases in habitat quality and area (USFWS, 2012). The 2009 IUCN/SSC Polar Bear Specialist Group (PBSG) report lists three stable, one increasing, eight declining, and seven data-deficient subpopulations and population estimates have not substantially varied over the past decade (Obbard et al., 2010). The rate of subpopulation decline has been slow and not demonstrated in overall population size changes, therefore does not fulfill a continuous decline specified for Appendix I listings (IUCN and TRAFFIC, 2010; PBSG, 2013). Currently, the species is not characterized by a small population size or threatened with extinction—in fact the species is still distributed across its entire historic range. The PBSG, IUCN, and TRAFFIC all concurred that currently, polar bears do not conform to the criteria for a CITES Appendix up-listing (PBSG, 2013).

2.4. Ineffectiveness of trade ban

A reduction in international trade of polar bear parts/products is not equivalent to a reduction in polar bear take or harvest. Polar bear harvest is primarily for subsistence, governed by a quota system, and a change to Appendix I would not reduce within-country quotas or harvest levels. Rather, an up-listing in the future would simply reduce the income

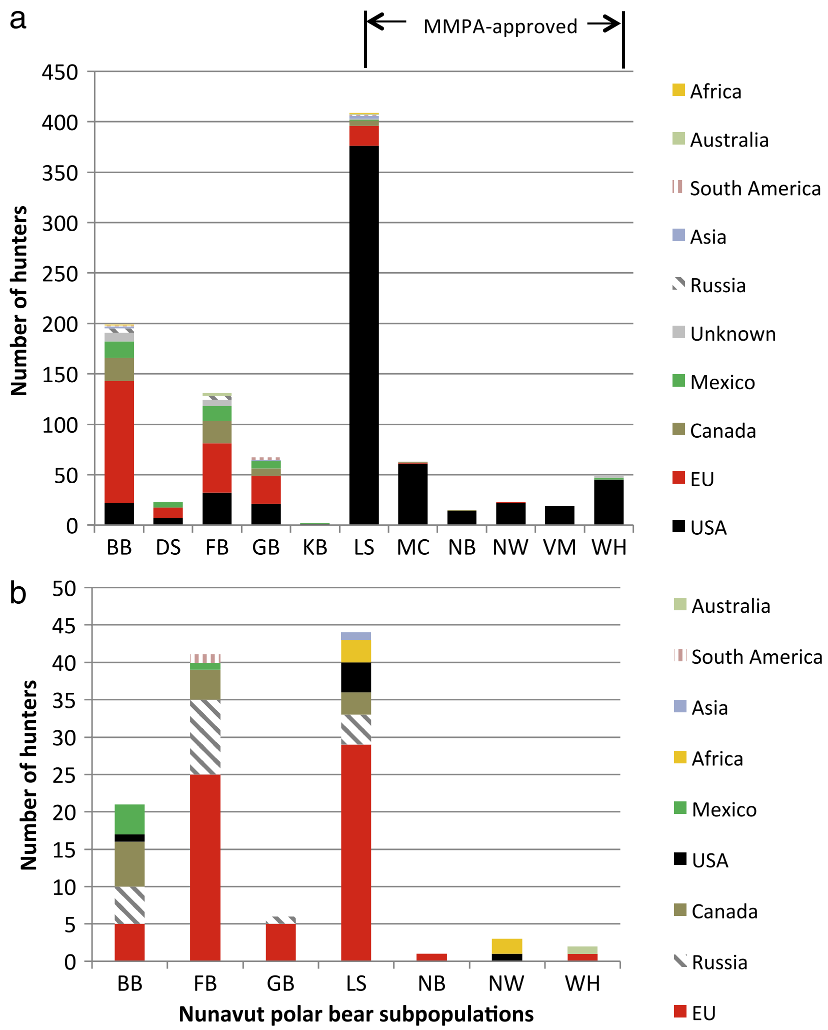

Fig. 3. Nunavut polar bear subpopulations with sport hunts. (a) Pre-ESA listing of polar bears in the United States: 1995–2008. Breakdown of Nunavut sport hunters and their country of origin by the Nunavut polar bear subpopulation where the hunt occurred for the periods 1995–2008. Under the MMPA, trophies from MMPA-approved subpopulations (right side of figure) were allowed to be imported into the US until polar bears were listed under ESA in 2008. US hunters dominated polar bear sport hunts pre-ESA listing ($n = 1000$; overall: 62%; MMPA-approved populations overall: 93%; LS: 92%; MC: 96.8%; NB: 93.3%; NW: 95.7%; VM: 100%; WH: 91.8%). (b) Post listing of polar bears under US ESA: 2009–2012. Breakdown of Nunavut sport hunters and their country of origin by the Nunavut polar bear subpopulation where the hunt occurred for the periods 2009–2012. US hunters diminished to miniscule numbers ($n = 118$; overall: 5%; MMPA-approved populations: 10%) and were replaced by hunters from the EU, Russia, and Canada. Sport-hunts disappeared in DS, KB, MC, and VM post-ESA listing. (NB: EU = European Union; BB = Baffin Bay; DS = Davis Strait; FB = Foxe Basin; GB = Gulf of Boothia; KB = Kane Basin; LS = Lancaster Sound; NB = Northern Beaufort Sea; NW = Norwegian Bay; MC = M'Clintock Channel; VM = Viscount Melville Sound; WH = western Hudson Bay.)

of indigenous communities generated through the international sale of by-products from subsistence harvest, including sport-hunt trophies (Clark et al., 2013; Tyrrell and Clark, 2014).

The number of polar bear tags did not substantially decrease after ESA commenced and if international trade is restricted, the actual take is unlikely to decrease. A curious and arguable subverted repercussion after ESA went into effect was that prices for polar bear pelts soared (News/North, 2012; PBSG, 2013), potentially from perceived restrictions on future supply and the fear that trade would be shut down. There is no poaching now in Canada because of high community compliance, self-regulation, high visibility of hunt outcomes (i.e., pelts are stretched and dried outside making them difficult to conceal), and general Inuit support for current management (Freeman and Wenzel, 2006; Wenzel, 2011). However, if polar bear pelts become an unobtainable commodity internationally and demand intensifies, prices could increase, encouraging the development of an illegal market. Therefore, a change in the CITES listing may reinforce the perception of future scarcity that already exists because of climate change and US ESA restrictions.

Under the current regime, it is unlikely polar bears will become extinct from trade or lack of trade control because the number of bears harvested each year is predetermined and numbers taken are not set according to demand for polar bear parts/products. Increasing international regulations may be seen as impositions by Inuit communities who already experience economic hardship from such restrictions (Wenzel, 2008; Clark et al., 2009). The Inuit may lose faith in sustainable polar bear management to the detriment of the polar bear.

3. Conclusion

This paper illuminates a specific problem: the use of trade bans as blunt instruments for conserving species that are not threatened by trade, but other threats such as climate change (Clark et al., 2013). Efforts to address specific ecological impacts of climate change appear to be failing, and instead generating contrary outcomes (Ascher, 2001), e.g., intensified value demands for *status quo* arrangements and increased polarization among stakeholders and decision-makers (Ostrom, 2010). The unilateral trade ban brought on by ESA has not provided the intended outcome of a reduction in polar bear mortality through sustainable harvest opportunities but rather contributed to a decline in economic opportunities for Arctic communities and co-management partners.

The polar bear case study highlights specific shortcomings a trade ban approach can have for species, especially those vulnerable to climate change. If CITES is used for tactics that are far-reaching beyond the convention principles, it may hamper global and regional conservation efforts. An international trade ban will not address real threats to polar bear survival (Clark et al., 2013; Weber et al., 2013), including loss and change in quality of sea-ice habitat from climate change effects (Derocher et al., 2004; Amstrup et al., 2010; Stirling and Derocher, 2012). The US ESA listing of the polar bear followed by its proposed uplisting to Appendix I under CITES is an example of where governments and nongovernmental organizations have sought to use CITES for "fix-its" rather than address the real problem, increasing GHG emissions conceivably causing earlier sea-ice breakup and later formation each year. None of these partial solutions, e.g. a change in the listing and ensuing trade bans, will guarantee the survival of polar bears if total sea-ice coverage continues to decline because of Arctic warming.

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