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A Call for Conservation Scientists to Empirically Study the Effects of Human Population Policies on Biodiversity Loss

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Abstract

The world is changing more quickly now than it ever has before, predominantly due to our large consumption rates and population size. Despite this epoch being well-accepted as the "Anthropocene", it is surprising that there is still a lack of willingness by many conservation scientists to engage with the consequences of human population dynamics on biodiversity. We highlight the importance of addressing the effects of our population abundance, density and growth rate on conservation and note that environmental organisations are beginning to embrace this problem but the take-up amongst conservation researchers to empirically study their effect on biodiversity is slow. We argue that the lack of published research may partly be because the topic is still considered taboo. We therefore urge conservation scientists to direct more of their research efforts on this issue, particularly to examples that highlight the effects of Population, Health and Environment (PHE) projects and female education initiatives on biodiversity.

Keywords: family planning, fertility, overconsumption, overpopulation, population growth, population health and environment

Earth has entered a new era dominated by humans, the "Anthropocene" (Crutzen and Stoermer, 2000; Steffen, Crutzen, and McNeill, 2007; Corlett, 2015). It is estimated that over three-quarters of the world's ice-free land has now been altered in some way by people (Ellis and Ramankutty 2008; Caro et al. 2012), we are already overstepping our planetary boundaries – which are defined as a safe operating space for humanity (Steffen et al. 2015), and our actions are causing climate change (Huber and Knutti 2012; Intergovernmental Panel on Climate Change 2014) and the sixth mass extinction (Barnosky et al., 2011). Current projections indicate that the number of threatened bird and mammal species will rise 14% by 2050 due to human population growth alone (McKee et al. 2013), this is on top of the 52% of vertebrate population abundance that has already been lost only in the last four decades (WWF 2014).

Conservation scientists studying the drivers of biodiversity loss are aware of the oft-cited reasons for human-influenced species declines: habitat loss and fragmentation (Tilman et al. 1994), climate change (Cahill et al. 2013), overharvesting (Price and Gittleman 2007), alien species (Dextrase and Mandrak 2006), disease (Rödder et al. 2009) and pollution (Bobbink et al. 1998). But these are proximate rather than ultimate drivers of global change; our consumption and population size, density and growth underlie these all.

Lack of research on the effects of human population dynamics on biodiversity loss

Only 13 years ago, the human population size was 6 billion (Lutz et al. 2001); just 7 years later, it reached 7 billion and, if predictions are correct, by 2100 it could be as high as 12.3 billion (Gerland et al. 2014). The absolute size of the human population greatly influences our environment (Ehrlich and Ehrlich, 1990), as does our density (Stallings 2009; Brewer et al. 2013; Thompson and Jones 1999) and population growth rate (Jha and Bawa 2006). High human population density and size are linked with increased numbers of threatened and introduced species, species extinctions, reduced areas under protection and a lower abundance of individual species (Luck 2007; Brashares et al. 2001; McKinney 2001; Parks and Harcourt 2002). We also now know that the average American woman increases

her carbon emissions by almost 6-fold with each child she produces (Murtaugh and Schlax 2009) and that fertility rates decline the longer females spend in education (Rindfuss et al. 1980). It is estimated that improved female education has the potential to decrease the birth rate by 1 billion people by 2050 (Lutz et al. 2014). However, despite this evidence, there is still a dearth of research on the effects of improved female education levels and reduced fertility rates on biodiversity degradation by conservation scientists.

There have been some exceptions to this rule, particularly during the 1990s–2000s in the journal Conservation Biology (e.g. Gehrt, 1996; Kay, 1997; Meffe, Ehrlich, and Ehrenfeld, 1993; Meffe, 1994; Pletscher and Schwartz, 2000; Sieving et al., 1994). However, these articles were not empirical research papers detailing novel scientific findings, but were instead opinion pieces on the topic. Addressing this topic is rare in our discipline: for example, we searched the 5 highest-ranking conservation journals listed in Google Scholar Metrics between January 1989 and September 2014 (using the keywords "overpopulation" OR "human population" OR "population growth" AND "human"), we retrieved only 18 articles, which equated to 0.00077% of all articles published in this time period for these journals. While it is necessary that we, as conservation scientists, engage in this conversation, particularly in the public forum, there is a dire need for further quantitative research in this field.

For instance, although we can estimate the effects of human population size, growth, migration and density (hereafter called "human population dynamics") on the planet, it is less clear what are the most effective interventions to reduce our impact on the planet. Available knowledge on how population policies affect biodiversity is very limited and we are equally naïve, for example, to the effects of cultural shifts in contraceptive use on conservation. Furthermore, with a few notable exceptions (e.g. Chown and Rensburg 2003; Dietz et al. 2007; Limburg et al. 2011), the empirical articles that have considered the effects of human population dynamics on the planet do not make any recommendations to change social norms about large families, nor to recommend providing access to affordable family planning and/or female education to those in need (e.g. Burgess et al. 2007; Wittemyer et al. 2008; Cinner et al. 2009; Estes et al. 2012; Mackenzie and Hartter 2013; Brewer et al. 2013; Bulte and Horan 2015).

It is not just conservation academics that have shied away from this topic. International conservation policies too, such as the Convention on Biological Diversity (CBD Secretariat, 2013), do not address human population dynamics in their manifesto despite indicating clear links between overconsumption and biodiversity loss. This is in stark contrast to the Millennium Development Goals (MDGs) for which nearly all of the targets set for 2015 were associated in some way to reducing human population growth (World Health Organization, 2008).

Why do conservation researchers ignore this topic? It could be that they believe that the topic is still taboo (King and Elliott 1997; Butler 2004; Maher 1997) or that some believe that even talking about human population could lead people to associate them with coercive population policies similar to those used in China (All Party Parliamentary Group on Population Development and Reproductive Health 2007). Another possible non-mutually exclusive reason for the lack of research could also be that the effects of human population dynamics on the planet are difficult to understand because of the many variables that must be taken into consideration, such as socio-economic and environmental factors that influence biodiversity loss and make it difficult to prove direct causation. Regardless of the challenges, we must not be dissuaded from trying to unravel this complex web of interactions.

A call for research

We therefore call for urgent further research into this topic with specific reference to empirical studies on the effects of altered human population dynamics on biodiversity. Emphasis could, for example, be placed on studies that test the effect of the accessibility of family planning and female education on conservation outcomes. We do not have to wait long to see the benefits of directing our focus towards family planning: payoffs can materialise within a generation. For example, between 1960-2000, use of contraceptives in married women in developing nations increased from 10% to 60% and reduced the average number of children per woman from six to three (United Nations 2004). The time is now to embrace this area of conservation research.

Action is already taking place amongst conservation NGOs

Although it is important to raise awareness to the effects of human population dynamics on biodiversity (Holl, Daily, Daily, Ehrlich, and Bassin, 1999; Meffe, 1994),

research must be coupled with action, particularly by conservation practitioners. For instance, a small but growing number of NGOs around the world are beginning to embrace the challenge of integrating biodiversity conservation with family planning. Similarly, The Wildlife Society, American Fisheries Society and The Audubon Society are some of the few environmental organisations with position statements on human population. Other NGOs are taking it a step further: Blue Ventures, a marine conservation organisation in Madagascar, has trained local women to provide contraception in rural villages close to protected areas. In three years, the project reduced the community's ecological footprint by 267 global hectares purely by providing access to family planning (Harris et al. 2012). A slightly different approach was taken by The Center for Biological Diversity, which distributed condoms wrapped in packaging depicting endangered species with catchy slogans such as "Wrap with care, save the polar bear" (Bernstein 2014). Whilst this may have been considered a publicity stunt during the World Population Day on July 11th 2014, the organisation handed out 40,000 of these condoms to areas in the United States. It is unclear whether this type of approach has any effect on human behaviour, but the emphasis on providing contraception to a developed country with a high consumption rate is commendable, given the typical focus on stemming population growth only in developing countries.

A more holistic avenue taken by the Population, Health and Environment (PHE) initiative appreciates the intertwined links between human population abundance, health and the effects we have on the environment. This combines family planning provision and other healthcare services along with alternative livelihood options and has been implemented in some key areas high in biodiversity and with an unmet need for contraception and healthcare. In one case study in Nepal, the program led to an increased uptake in condom use coupled with a reduction in wood fuel equivalent to saving nearly 9,000 trees annually (Hahn 2011). Understanding the effectiveness of projects like PHE schemes on biodiversity is essential to gain new insights on the potential of interventions such as family planning access for biodiversity conservation.

Challenges to overcome

The effects of human populations on the planet are complex areas to understand and act upon, involving complicated religious, cultural and economic barriers. For instance, 20% of women worldwide have an unmet need for modern

contraception – with this as high as 60% in developing countries (Darroch and Singh 2013) and there is an increasing gap between support for provision and demand for contraception (Ross and Bulatao 2001). Furthermore, fulfilling the unmet need for family planning across developing countries would cost US $8.1 billion annually (Susheela Singh and Darroch 2012); finding this amount of money will clearly be challenging.

Female education and family planning are not only complex to address financially but also socially. For example, use of contraceptives (Srikanthan and Reid 2008) and female access to education (King and Hill 1993) are both affected by strong cultural and religious factors. Thus we cannot simply advocate for more access to family planning and education without addressing the barriers to their access (Cleland et al. 2006).

It would therefore be advisable to take a multidisciplinary approach to tackling this problem, where conservation scientists and practitioners form alliances with other sectors of society (All Party Parliamentary Group on Population Development and Reproductive Health 2007), such as reproductive choice and women's rights groups (Johns 2003). As NGOs often integrate educational aspects into their programs, it would not be difficult to direct further educational materials towards women and girls. However, funding interdisciplinary projects may also prove difficult (D. Johnson, personal communication) but it is worth noting that some grants are available from organizations such as USAID and Comic Relief.

We cannot pretend that these challenges will be easy to overcome. We therefore suggest that conservation researchers work closely with conservation NGOs to empirically study the effects of projects like PHE schemes on biodiversity. Findings from this type of research are essential to understand whether the above examples, showing that family planning access and provision of female education reduces environmental degradation, are exceptions or the norm. This will be important information for conservation practitioners to understand as it may highlight areas that should be focused on in future interventions. The outcomes will also be essential for policymakers to determine whether PHE schemes and others like this provide cost-effective win-win scenarios for people and biodiversity. If this is the case, they may prove essential for reaching MDGs and other national and international sustainability policies.

Conclusions

In summary, we now have evidence to show the links between human population size, growth and density on the environment, but we need to increase our research efforts on how population and female education policies affect biodiversity conservation. Conservation scientists cannot dismiss the direct effect of human consumption on natural resources, but likewise, we also cannot disregard the effect our sheer population size and growth has on the environment. We argue that a combination of effective social, political, technological and population changes are needed to overcome environmental problems effectively. Among these interventions, tackling unsustainable human population growth may be a relatively fast and cheap remedy for conservation, which concurrently reduces consumption and brings us closer to meeting the MDGs (Chown and Rensburg 2003; Cleland et al. 2006; Wire 2009; Allen 2007).

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