5-29-2017

Is Ecotourism an Outdated Solution to Orangutan Conservation in Sabah, Malaysian Borneo?

Ellis E. Thompson
Portland State University

Is ecotourism an outdated solution to orangutan conservation in Sabah, Malaysian Borneo?

by

Ellis E. Thompson

An undergraduate honors thesis submitted in partial fulfillment of the

requirements for the degree of

Bachelor of Science

in

University Honors

and

Biology

Thesis Adviser

Luis A. Ruedas, PhD

Portland State University

2017

Table of Contents

Abstract

Since its inception, ecotourism has been presented as an ideal way to raise money and awareness for conservation while at the same time benefitting local communities. In the early 1960's, orangutan rehabilitation centers in Malaysia and Indonesia began to integrate tourism into their fundraising efforts in order to reintroduce ex-captive orangutans back into the wild and provide education on the conservation of the species. This early integration of tourism led to a widely popular industry that today is thriving. The present research provides a review of the history and current perspectives of traditional orangutan tourism and the more novel wild orangutan ecotourism in the state of Sabah, Malaysian Borneo, to assess whether ecotourism is an appropriate future solution to orangutan conservation. Due to a lack of evidence supporting claims that ecotourism is a panacea for conservation, it is suggested that further research be carried out on the ecological role that orangutans play in their habitats as seed dispersers, and that educational programs surrounding orangutans' ecological roles may provide a more sustainable method of promoting conservation.

Introduction

It is an inarguable fact that the human population has been growing, and continues to grow, to a point that has put extreme pressures on the environment (Ehrlich 1968). According to the 2015 Revision of the United Nations World Population Prospects, the human population is over 7.3 billion, and it is projected to be over 9.7 billion in the year 2050 (United Nations 2015). The recent and rapid increase in the human population, together with the development of urbanized societies, has led to huge changes in the earth's ecosystems that have resulted in a loss

in biodiversity (Ancrenaz et al. 2007). This is largely a result of the land use changes that have occurred as a consequence of the growing population expanding into natural areas and the increased consumption of agricultural goods and forestry products (Turner II et al. 1994). Many scientists agree that we are currently witnessing a mass extinction event that could cause an estimated 67% of wildlife species to go extinct by 2020 (WWF 2016).

In response to this global decline in biodiversity, the scientific community has developed the relatively new field of conservation biology. It is multidisciplinary, involving members of the natural science community, economists, anthropologists, sociologists, philosophers, and members of numerous, other theoretically- and management-based disciplines (Meffe et al. 2006).

To date, most global conservation efforts have focused on creating protected areas that are largely uninhabited by humans (Hockings et al. 2006; Ancrenaz et al. 2007).
One of the biggest hurdles to overcome in conservation efforts around the world, particularly in developing countries, is the immense cost of preserving areas under a protection regime (Bednar–Friedl et al. 2012). Ecotourism provides a method of funding conservation initiatives that also has the potential of benefitting the community in which the tourism program is located (Cater 1994; Krüger 2005; Muehlenbein et al. 2012; Tisdell & Wilson 2012). To be successful and sustainable, a conservation project requires support from the local community. To achieve this, the host population needs to see the value of preserving a piece of land, and they ideally should benefit economically from said area (Ancrenaz et al. 2007; Bednar-Friedl et al. 2012; Tisdell & Wilson 2012). The sustainability of each individual ecotourism organization relies on the continual satisfaction and flow of income from tourists and the environmental health of the protected area (Cater 1994). Although ecotourism has much potential in aiding the conservation

of biodiversity, it also presents some possible concerns, such as the degradation of ecosystems and negative effects on wildlife caused by disturbance (Boyle & Samson 1985; Blanc et al. 2006; Muehlenbein et al. 2012; Buckley et al. 2016).

Scholars in general agree that the negative effects on wildlife must be studied on a case–by–case basis (Cater 1994; Tisdell & Wilson 2012; Buckley et al. 2016), and that the most sustainable ecotourism enterprises often involve charismatic species (Krüger 2005; Tisdell & Wilson 2012). Among the most iconic species in Southeast Asia are the Bornean and Sumatran orangutan, *Pongo pygmaeus* and *Pongo abelii*. Both species are classified in the "critically endangered" category of the 2016 IUCN (International Union for Conservation of Nature) Red List of Threatened Species due to the loss of their habitat in the region's lowland tropical rainforests (Ancrenaz et al. 2007). The uniqueness of these two species presents an attraction for tourists to visit the areas they inhabit in the hope of seeing an orangutan in the wild. This can result in a dilemma: although these species can benefit from ecotourism because it protects what little habitat that they have left, it might also cause individuals to have elevated stress levels (Muehlenbein et al. 2012), become habituated to disturbances by people—making them more vulnerable to poaching (Blanc et al. 2006; Muehlenbein et al. 2012), and it has the potential to expose them to human diseases (Muehlenbein et al. 2010).

The present research is focused on protected populations of the subspecies *Pongo pygmaeus morio*, the orangutans of Northeast Borneo—specifically populations found in the Malaysian state of Sabah in Southeast Asia. The definition of ecotourism that will be used in this research is that promoted by The International Ecotourism Society: "responsible travel to natural areas that conserves the environment, sustains the well-being of the local people, and involves interpretation and education" (TIES 2015). The questions driving this research are: 1) what

efforts have been made to conserve this subspecies of orangutans; 2) what role has traditional orangutan tourism played in these efforts; 3) what has wild orangutan ecotourism brought to the table in recent years; and 4) is ecotourism an appropriate method of conservation moving forward? My purpose is not to provide a complete review of all the literature pertaining to the topic, but to frame the history and current situation in Sabah, Malaysian Borneo, of conservation of orangutans and their role in traditional tourism and ecotourism, and to assess the effectiveness of these industries in conservation efforts.

Methods

A review of the literature on how orangutans are being affected by ecotourism and conservation initiatives in Malaysian Borneo, both negatively and positively, was conducted using various search engines. Key words in the searches included: ecotourism AND orangutan, "nature-based tourism" AND orangutan, orangutan AND conservation, orangutan AND conservation AND ecotourism, orangutan AND "population ecology", orangutan AND ecotourism AND Sabah, orangutan AND Kinabatangan, and tourism AND Sepilok. Resources used for this thesis are peer-reviewed articles in the domains of Conservation Biology, Anthropology, Environmental Economics, Ecology, Political Science, and Environmental Science. In addition, data were obtained from the 2015 Revision of the United Nations World Population Prospects and the 2016 IUCN Red List of Threatened Species.

Literature Review

Conservation

In our rapidly developing world, demand for natural resources is rising every day. As the human population increases, so does its need for land and natural resources. It is imperative that scientists and politicians work together to determine what areas need to be protected in order to safeguard representatives of diverse ecosystem types, of vital biological processes such as gene flow and succession, and what is left of our rapidly disappearing natural resources (Kiss 2004). Today, many of the last pristine places on earth, and those with the highest biodiversity and conservation value, are in developing countries. Scientists and others who value conservation run into numerous ethical issues in these areas; issues that have a huge impact on the practice of conservation because one must consider the lives of the people in these places, particularly indigenous and impoverished peoples (Buckley 2011). Malaysia, and Malaysian Borneo in particular, is one of these countries, touted by Mittermeier and Werner (1990) and Gössling (1999) alike as a "megadiversity country".

When selecting a location for protection, scientists suggest prioritization of areas that contain rare or endangered species and/or their ecological support systems, exhibit high levels of biodiversity, are in pristine condition, and encompass ecosystems not yet represented in protected areas (Buckley 1985). In Malaysian Borneo, one of the most iconic, and at the same time critically endangered species, is the orangutan. Their endangerment is largely due to the amount of land conversion that has taken place. In 2010, the percentage of intact forest area in the Malaysian state of Sabah was only 19.1% (Gaveau et al. 2014). The forests have been logged to harvest timber, and more recently and extensively to make room for oil palm plantations, tree plantations for paper products, community agriculture, and mining. These activities have all

played a part in forest fragmentation and increased human-orangutan conflict. As a result, it has been estimated using population genetics that the orangutan population has declined by ca. 50-90% in the past 100 years (Meijaard et al. 2012). Most of the orangutans in Sabah today live in the eastern part of the state, where hunting is less prevalent due to the overwhelmingly large Muslim population. One of the larger remaining orangutan populations in eastern Sabah can be found along the lower stretch of the Kinabatangan River. Through genetic analysis, scientists have determined that before the land was largely converted to agriculture, there were over 4,000 orangutans in the Lower Kinabatangan. In 2014, there were only about 800 remaining (Ancrenaz et al. 2015). Goossens et al. (2006) estimated the decline to be even greater; a decrease of over 95% in the last 100 years.

Although scientists have concluded that populations of Northeast Bornean orangutans are declining rapidly (IUCN 2016), the conservation of this taxon is proving no small feat. Much of the challenge in determining conservation objectives for this taxon comes from the fact that, due to the remoteness of their habitats, it is extremely difficult to get accurate population estimates, which are necessary for monitoring efforts, as well as determining at what density a population must be to avoid the deleterious effects of inbreeding depression (Aveling & Mitchell 1982; Ancrenaz et al. 2004; Meijaard et al. 2012).

Orangutan Conservation Efforts

The earliest legal effort to protect orangutans took place in 1924 in what is now Indonesia (Meijaard et al. 2012). In 1963, the Fauna Conservation Ordinance declared that it was illegal to capture, keep, or kill, an orangutan in Sabah, Malaysia (Aveling & Mitchell 1982). Since then, the international trade of orangutans has also become illegal under CITES (the Convention on International Trade in Endangered Species of Wild Fauna and Flora), and protected areas have

been established in an effort to maintain current populations. However, many researchers have argued that a large number of these areas are too small, too fragmented, or too degraded, to ensure the survival of the species (Tisdell & Swarna Nantha 2008). Today, only 13% of the land in Sabah is under protection, and while 80% of orangutans in the state inhabit protected areas, populations are still declining due to continuing habitat fragmentation resulting from agriculture and development (Bruford et al. 2010). When planning projects to preserve the species, conservationists need to recognize the needs of communities and their development, and work with them to come up with solutions (Ancrenaz et al. 2007).

The traditional (and ideological) method of conservation is to create protected areas devoid of human residents. However, in such an already fragmented landscape, with development and consumerism at such elevated rates, it is impossible to undertake protection in the absence of humans. It also is unethical to push indigenous peoples out of their homes to make room for an animal species that many people in Borneo and Sumatra deem today as "just another monkey" (Meijaard et al. 2012). There is currently a push for landscape-level conservation; that would encompass both wildlife habitat and its human cohabitants (Ancrenaz et al. 2007). As of now however, strategies for orangutan conservation are as follows: managing protected orangutan habitat, developing orangutan-friendly management in unprotected areas, continuing to combat illegal killing and trade, and the rehabilitation and reintroduction into the wild of formerly captive individuals (Meijaard et al. 2012). The primary goals of these conservation strategies are to reduce unnatural deaths and manage both protected and unprotected areas in order to maximize suitable habitat (Meijaard et al. 2012).

However, there is hope for the Northeast Bornean orangutan. Although the lowland forests in Sabah are regarded as the lowest quality habitat with the scarcest resources, high

densities of orangutans remain, particularly in the Kinabatangan region (Meijaard et al. 2012, Loken et al. 2013). According to researchers, *P. p. morio* seems to have adapted to the conditions in which they live by acquiring smaller brain sizes, shorter interbirth intervals, and stronger jaws (Loken et al. 2013). Research also has shown that orangutans are more resilient to anthropogenic disturbance than we once thought (Meijaard et al. 2012; Loken et al. 2013). According to eyewitness accounts, orangutans even have been seen in oil palm plantations, which suggests that these areas may still be able to act as corridors if there is suitable forest habitat nearby, and that orangutans can persist in ecologically mixed landscapes (Ancrenaz et al. 2010; Meijaard et al. 2010; Meijaard et al. 2012; Loken et al. 2013). These discoveries have brought to light the struggle between personal motives for conservation and scientific knowledge (Sheil & Meijaard 2010).

However, other studies have come to a different conclusion: that orangutans require primary forest, and that disturbance is always deleterious. Sheil and Meijaard (2010) surmised that many conservation biologists develop motivations based on emotion and intuition, and subsequently use science to support their feelings. Notwithstanding, the fact remains that orangutans will not survive if the only method of conservation is the management of protected areas (Meijaard et al. 2012). In order to learn how to better manage orangutan habitat, protected and unprotected, scientists need to work to understand the impacts of roads and plantations on orangutan dispersal, the causes and possible solutions of human-orangutan conflicts, the survival of orangutans in plantations and agroforestry landscapes, the importance of corridor development for orangutan meta-population dynamics, and the effectiveness of different already existing conservation strategies (Meijaard et al. 2012). The latter has proven to be especially difficult, due to the lack of established scientific methods to assess the success of conservation projects.

Today, many projects claiming to be successful have only anecdotal evidence in support of their claims (Schoneveld-de Lange et al. 2016).

Even if an abundance of studies are carried out on the topics outlined above, there are still many requirements for orangutan conservation. These additional requirements involve societal, political, and economic barriers. In many cases, conservation is not the most economical use of land. In these cases, when more consumptive land uses have the potential to be more profitable, the choice to protect an area would involve giving up certain opportunities for income; conservation would thus become more of an ethical action, rather than an economic one (Swarna Nantha & Tisdell 2008; Meijaard et al. 2012). After setting aside the land to be protected, laws must be enforced, but must also meet the approval of society or risk being rejected wholesale (Meijaard et al. 2012). Therefore, it is in the best interest of conservation to be able to generate revenues that can to some extent counteract other profitable consumptive land uses (Swarna Nantha & Tisdell 2008).

Currently, most funding and political pressure to conserve orangutans in their natural habitats comes from non-governmental organizations (NGOs) outside of Borneo and Sumatra, such as the World Wildlife Fund (WWF) and the Orangutan Foundation International, which suggests that the residents of Borneo do not place the same value on orangutan conservation as does much of the Western world (Tisdell & Swarna Nantha 2008). For many communities in Borneo, development is their primary objective, and awareness and knowledge of the environment and how ecosystems function is not as widespread (Ancrenaz et al. 2007; Tisdell & Swarna Nantha 2008). In some areas of Borneo, primates are still killed for food and other uses, although this is less common in Muslim-dominated Sabah, where eating primates is forbidden. However, there are no rules in the Muslim religion that prohibit the killing of orangutans, so

human-orangutan conflicts still occur, even if they are not well documented (Tisdell & Swarna Nantha 2008). As land use changes have continued to reduce and fragment orangutan habitat, these animals have been forced to rely more on human food sources, which has increased their terrestrial locomotion and led to conflicts with humans, not to mention a greater susceptibility to hunting and diseases (Lackman-Ancrenaz et al. 2001; Ancrenaz et al. 2015). Orangutans used to carry cultural value in some indigenous tribes, but are now often considered pests (Lackman-Ancrenaz et al. 2001; Meijaard et al. 2012). Conservationists run into social issues when residents perceive conservationists' efforts as taking away their land and giving it to "the monkeys" while they are struggling to obtain resources to survive and develop (Lackman-Ancrenaz et al. 2001).

Whereas it seems natural in the Western world to have the desire to conserve such a charismatic species, scientists and NGOs from that part of the world need to be aware of their personal motivations for working to conserve forests in tropical countries, and be able to understand the motivations of these nations' residents and why the latter might choose other land use options (Sheil & Meijaard 2010). The Western image of nature, one of picturesque forests and cute animals that are valued almost higher than humans, is not universal (Meijaard & Sheil 2008). Ideas about the environment and development are not the same around the world (Cater 2006). If conservation goals and projects are planned without collaborating with local people and listening to their goals and motivations, Westerners run the risk of making conservation into the "new colonialism" (Meijaard & Sheil 2008; Sheil & Meijaard 2010). Sheil & Meijaard (2010) warned that "hammering our Western views onto tropical countries often does not convince but antagonizes". In order to therefore implement effective conservation strategies in Southeast Asia, and other developing nations across the world, scientists need to work with these countries'

citizens to devise projects that are more suited to the cultural and local conditions and motivations (Cater 2006). Instead of putting efforts into changing attitudes based on Western ideals and morals, researchers must take the time to understand how and why orangutans may be valued in Borneo.

While Western culture puts emphasis on non-use or passive values, such as existence value (the value in simply knowing something exists) or bequest value (the value of being able to pass something on to future generations), most communities in Borneo may find more importance in use-values of orangutans (Swarna Nantha & Tisdell 2008; Tisdell & Swarna Nantha 2008). That is because developing countries do not receive economic returns from conservation that are greater than what they would receive from investing land and money into tradable commodities such as palm oil (Swarna Nantha & Tisdell 2008). The first use-values that come to mind for most people when it comes to great apes tend to be consumptive uses, such as hunting orangutans for food and poaching for the wildlife trade. However, there might be promise in environmental education regarding the ecological use-value of orangutans. Capitalizing on these values provides a promising option for orangutan conservation. Orangutans eat a variety of fruits in the tropical rainforest and are able to travel long distances, thereby contributing to seed dispersal, which in turn may contribute to the diversity and the health of the forest (Caldecott & Miles 2005; Ancrenaz et al. 2006; Swarna Nantha & Tisdell 2008; Meijaard et al. 2012). Healthy forests generate ecosystem services that people rely on for survival; services such as clean air and clean water, and building materials (Swarna Nantha & Tisdell 2008). On a global scale, rainforests play a huge role in carbon sequestration and storage, which helps regulate climate (Swarna Nantha & Tisdell 2008). Educating people about how they directly benefit from the forest and its ecological services may be a more effective method of bringing

awareness to the need for conservation than just focusing on orangutans (Schoneveld-de Lange et al. 2016). Or, if orangutans are to be kept as a focus, another use of orangutans lies in ecotourism (Swarna Nantha & Tisdell 2008; Meijaard et al. 2012).

Ecotourism

Not only is the human population growing rapidly, but we are also seeing more people investing in higher education, leading to rising incomes, more leisure time, and a greater demand for travel (Isaacs 2000; Tisdell 2005). Additionally, as more people are becoming educated, we have been seeing attitudes in the Western world shift in favor of higher environmental quality, and there appears to be an increased interest in the conservation of biodiversity, which has led to the growth in popularity of ecotourism (Isaacs 2000; Tisdell 2005).

Ecotourism has many competing definitions. It began as "tourism that involves travelling to relatively undisturbed or uncontaminated natural areas with the specific objective of studying, admiring, and enjoying the scenery and its wild plants and animals" (Ceballos–Lascuráin 1987). Then it expanded beyond a focus on the natural environment to encompass social, cultural, and economic sustainability (Weaver 2005). In the 1980's, we saw the emergence of community-based ecotourism (CBE) that made it its purpose to ensure that host populations were the primary beneficiaries (Weaver 2005). Ecotourism is not to be confused with nature-based tourism; although they are often used interchangeably, they have drastically different definitions. Nature-based tourism refers to travel to natural areas, without the goals of preserving the environment or benefitting the local people (Kiss 2004).

The prospect of ecotourism being able to concurrently reduce poverty and conserve biodiversity, by providing financial incentives for host populations to choose conservation over consumptive land uses, is enticing (Kiss 2004; Krüger 2005). However, many tourism projects

that label themselves as "ecotourism" do not follow all of the principles laid out by The International Ecotourism Society (King & Nair 2013). These principles are: 1) to minimize negative physical, social, behavioral, and psychological impacts; 2) build an awareness and respect of the environment and local culture; 3) provide positive experiences for hosts and visitors alike; 4) provide direct financial benefits for conservation; 5) create financial benefits for the local people; 6) foster educational experiences for the visitor that raise their sensitivity to the environmental, social, and political issues in the host country, 7) utilize low-impact facilities; and 8) respect the rights and beliefs of the local people and to work in partnership with them (TIES 2015).

Orangutan Tourism

Different orangutan tourism opportunities generally fall into one of two categories: traditional orangutan tourism and ecotourism. In traditional tourism involving orangutans, there is a focus on animals in rehabilitation centers (Orams 1995; Honey & Stewart 2002; Weaver 2002; Fennell & Weaver 2005). In these centers, tourists pay a small fee to observe daily feedings of rehabilitant orangutans that have been rescued from the illegal wildlife trade and in some locations, walk through the adjacent forest to view habituated free-ranging orangutans that have already been released into the wild (Russon & Susilo 2014). Wild orangutan ecotourism, on the other hand, usually involves guided tours through the tropical rainforest to observe the species in its natural habitat, as well as the flora and fauna they share it with.

Traditional Orangutan Tourism

Orangutan tourism began in the 1960's with a focus on rehabilitated individuals, as a response to the growing fear that orangutans were going extinct (Harrisson 1962; Caldecott & Miles 2005; Muehlenbein & Ancrenaz 2009). At the time, researchers thought that ex-captive

orangutans could be successfully rehabilitated to enter back into the wild and replenish declining populations, and that tourism at these rehabilitation centers could help fund these projects as well as the conservation of wild orangutans (Dellatore et al. 2014; Russon & Susilo 2014). It was also a hope that tourism would bring about an awareness of the wild orangutans' situation, and in turn bring attention to the global loss in biodiversity and convince governments to act (Rijksen & Meijaard 1999; Schoneveld-de Lange et al. 2016).

The Sepilok Orangutan Rehabilitation Centre in Sabah is the most frequented wildlife tourism destination in Asia (Muehlenbein & Ancrenaz 2009). This orangutan sanctuary was established in 1964 in the Sepilok Forest Reserve, near the town of Sandakan, with the goal of rehabilitating orphaned, injured, and other confiscated orangutans for release back into the wild (Harrisson 1965; Muehlenbein et al. 2008). Tourism was brought to the center to facilitate education and raise funds to return rehabilitated orangutans to their natural habitats (Muehlenbein et al. 2008; Russon & Susilo 2014). When centers such as Sepilok were established, not much was known at that time about the requirements for successful rehabilitation, and how tourism could negatively impact conservation efforts (Caldecott & Miles 2005).

In the late 1970's, researchers began to realize that tourism involving rehabilitating orangutans was not without its own problems. Excessive close contact between rehabilitant orangutans and visitors had become the norm, exposing both parties to diseases from the other (Russon & Susilo 2014). Researchers have found that orangutans are susceptible to human pathogens, such as the Epstein-Barr virus, mumps, dengue fever, Japanese encephalitis, as well as numerous intestinal parasites (Muehlenbein et al. 2008). There was also concern that stress from these close encounters could reduce their disease resistance (Russon & Susilo 2014).

Another issue was that after reintroduction to the forest, these now human-dependent orangutans were encouraged to stay near the rehabilitation centers to continue to amuse visitors (Russon & Susilo 2014). In some cases, centers failed to release orangutans that had been deemed ready to be reintroduced for the wild, instead keeping them in captivity to attract more tourists (Rijksen & Meijaard 1999). Although some researchers (e.g., Aveling 1982; Frey 1978) have stated that rehabilitant tourism had been managed effectively to bring in money and educate visitors, others argued that these benefits did not offset the negative effects on the orangutans' health and rehabilitation (MacKinnon 1977; Rijksen 1982; Schoneveld-de Lange et al. 2016). Many experts recommended for wholesale changes to be made, starting with prohibiting tourist-orangutan contact (Rijksen & Rijksen-Graatsma 1975; MacKinnon 1977; Aveling & Mitchell 1982, Rijksen 1982). In addition, it was recommended that tourism not be allowed at centers with orangutans who are eligible for release back into the wild, or in natural areas with reintroduced rehabilitant orangutans (Caldecott & Miles 2005).

Instead of following these recommendations, rehabilitant orangutan tourism soared in the 1980's. Annual visitors to Sepilok went from 17,000 in the late 1970's to 89,600 by the turn of the century (Caldecott & Miles 2005; Russon & Susilo 2014). Malaysia's 1990 tourist campaign promoted orangutans as one of their main attractions, which was likely a major contributor to the boom in orangutan tourism (Russon & Susilo 2014). This occurred one year after the country made the orangutan its mascot, an event that was announced by the Minister of Culture and Tourism (Russon & Susilo 2014). Efforts to discontinue tourism at certain rehabilitation centers were unsuccessful because communities had begun to heavily rely on the revenues (Caldecott & Miles 2005; Russon & Susilo 2014; Schoneveld-de Lange et al. 2016). This was problematic,

because it meant that the driving force for rehabilitating orangutans wasn't about conservation anymore, but instead about economics (Caldecott & Miles 2005).

One of the primary arguments in support of rehabilitant orangutan tourism is that the economic gains from the industry give justification for the preservation of natural areas (Sherman & Dixon 1991; Steele 1995; Freese 1998; Butler & Boyd 2000; Russon & Susilo 2014). This has largely been found to be true. It has been shown that there has been less illegal logging in forests surrounding rehabilitation centers open to tourists than around centers closed to tourism (Russon & Susilo 1999). However, the claim that the money gained is being used to support conservation is questionable. In the late 1990's, annual revenues from Sepilok were about $100,000 USD (Russon & Susilo 2014). While rehabilitant orangutan tourism can create a large amount of revenue, this requires that the center bring in a large number of visitors, because entry fees for individuals are so low (Corpuz 2004). For one foreign adult to enter the Sepilok Orangutan Rehabilitation Centre in 2004, the cost was $10 USD (Russon & Susilo 2014). Relying on large visitor numbers to generate enough revenue to keep the rehabilitation center running properly can hinder, or even eliminate, the chances of rehabilitation (Corpuz 2004).

Tourism advocates recognized that the industry was not exactly compatible with rehabilitation in the 1990's, but it has persisted under the notion that if it is controlled, it need not interfere with the conservation of the species (Payne & Andau 1989; Galdikas 1991; Galdikas 1995). Today, rehabilitant orangutan tourism continues to increase, and many of the disputes over the management of these centers and tourist-rehabilitant interactions likewise continue (Russon & Susilo 2014). Although touching and feeding the orangutans is prohibited, it still occurs from time to time in Sepilok (Muehlenbein 2017).

Sabah still promotes tourism at its orangutan rehabilitation centers, despite IUCN workshops and recommendations that tourism be prohibited at centers with rehabilitant orangutans eligible for reintroduction into the wild, or already released into the nearby forest (Rosen & Byers 2002; Macfie & Williamson 2010; Russon & Susilo 2014). Even some resorts in Malaysia hold ex-captive orangutans for the public to view (Russon & Susilo 2014). Until April 2016, the Shangri-La's Rasa Ria Resort in Kota Kinabalu, Sabah, ran a rehabilitation center out of their nature reserve for what some called "two decades of exploitation by the hotel of orphaned orangutans under the pretense of 'conservationism'" (Clean Malaysia 2016). The stated purpose of the resort's program was to provide a place for recently-rescued ex-captives before translocating them to the Sepilok Orangutan Rehabilitation Center, where they would eventually be released into the adjacent Kabili Sepilok Forest Reserve (Rasa Ria Resort 2016).

It is thought that many of these issues persist because it is extremely easy to begin to prioritize the economic value gained through tourism over the value of conservation. It is not in the best interests of the people working at rehabilitation centers, especially if they are given low wages, to restrict tourist behavior or prevent close interactions, when visitors are willing to tip workers for those same close encounters (Russon & Susilo 2014). Corpuz (2004) suggested that some tourists come into these areas feeling that they ought to have a close encounter with an orangutan, after having spent so much money on airfare and tour tickets. Once experts began to realize that priorities were shifting away from conservation, tourism involving wild orangutans was suggested as an alternative, providing good management was possible (Caldecott & Miles 2005).

Wild Orangutan Ecotourism

During the onset of orangutan tourism in the 1960's and 70's, it was thought that wild orangutans should be left alone due to their endangered status, and that they had little appeal to tourists anyway, given the fact that they are so solitary and it is difficult to detect them in the wild, making them unlikely to generate high revenues (Frey 1978; Aveling 1982; Aveling & Mitchell 1982; Rijksen 1982; Russon & Susilo 2014; Schoneveld-de Lange et al. 2016).

Despite these early views, wild orangutan ecotourism has become a growing industry since the mid 1980's (Russon & Susilo 2014). In a study identifying and studying orangutan tourism ventures in Borneo, 42% of advertised tours involved a wild orangutan experience in 2005; by 2012, the number had grown to 62% (Russon & Susilo 2014). Globally, there seems to be a growing desire to visit places and interact with the natural environment, which has led to an increase in value of experiences with wild animals, rather than captives or habituated ex-captives (Reynolds & Braithwaite 2001). While these tours appear to be better controlled than rehabilitant tours because of smaller numbers of visitors, there is very little knowledge about what impacts, positive or negative, these types of ventures are having on conservation (Russon & Susilo 2014).

As of 2012, tourists could visit wild orangutans in four different sites in Malaysian Borneo (Russon & Susilo 2014). Most wild orangutan ecotourism opportunities involve booking guided tours that take visitors boating and trekking through the tropical rainforest to view the natural flora and fauna, as well as indigenous people. Catching a glimpse of a wild orangutan is listed as a possible—but not guaranteed—occurrence (Russon & Susilo 2014). One such ecotourism venture is the Red Ape Encounter, through Terra Incognita Ecotours (Terra Incognita Ecotours 2017). Terra Incognita Ecotours is a business based in Tampa, Florida, that provides guided ecotourism experiences all over the world. According to their website, they follow the

principles laid out by The International Ecotourism Society (TIES 2015). Their Red Ape Encounter ecotour takes tourists to the state of Sabah. It begins with an overnight stay in the luxurious Shangri-La's Rasa Ria Resort Hotel in Kota Kinabalu (discussed above). Then the group is taken to Sepilok to visit the rehabilitating orangutans housed therein, followed by boating and trekking experiences in the Lower Kinabatangan Conservation Area to view wild animals, including orangutans, elephants, and proboscis monkeys. The trip winds down with an excursion to an island for snorkeling and diving before returning to the Rasa Ria Resort Hotel (Terra Incognita Ecotours 2017). The cost per person for this trip is $6,799 USD, presumably not including airfare, and is restricted to 16 people per group. The experience is marketed as "an Ecotour that will make a difference to you, and to the areas we visit" (Terra Incognita Ecotours 2017).

In their review of ecotourism businesses like Terra Incognita Ecotours, Russon and Susilo (2014) found that many of these vendors advertise that they donate proceeds to orangutan conservation. However, very few indicate the amounts that they donate. For example, according to their website, Terra Incognita donates money from the Red Ape Encounter tour package to the EcoHealth Alliance Borneo Project, but the amount of these proceeds is not stated (Terra Incognita Ecotours 2017). Typically, most of the money gained from ecotourism ventures goes to larger corporations—such as airlines, hotels, and businesses selling tour packages (Bandy 1996; Goodwin 1996; Lindberg 1998; Russon and Susilo 2014).

Other concerns with wild orangutan ecotourism include the degradation of the environment and the negative effects of disturbance on wildlife. Part of the attraction of ecotourism is the fact that it typically occurs in areas visitors would consider as pristine, which are often remote and ecologically sensitive (Gössling 1999). While trekking through the tropical

rainforest on a guided tour, tourists can erode the soil or trample on vegetation, which can cause altered plant composition, reduced plant production, and compaction of the soil—all of which can lead to possible local habitat change (Boyle & Samson 1985; Reynolds & Braithwaite 2001; Tisdell 2005; Blanc et al. 2006; Bednar-Friedl et al. 2012). Even if there are pathways set out, there will always be tourists that do not follow the rules and step off the path (Isaacs 2000).

Although there has been limited research done on possible economic losses due to the deterioration of the environment, too many visitors and poor management can lower the quality of a tourism experience, and eventually compromise it, as well as reduce the carrying capacity for the wildlife that inhabit the impacted environment (Tisdell 2005; Buckley 2011; Bednar-Friedl et al. 2012; Russon & Susilo 2014). Tourist activity can also pose threats to wildlife through flash photography, close encounters, and noise disturbance from boats, vehicles, and tourists trekking through the forest (Bednar-Friedl et al. 2012). These interactions can cause increased heart rates and heightened stress hormone levels in wildlife, which may or may not become chronic (Buckley 2011; Russon & Susilo 2014). In a study on stress responses following tourist exposure in two wild habituated orangutans and four wild unhabituated orangutans in the Lower Kinabatangan Wildlife Sanctuary of Sabah, Muehlenbein et al. (2012) found that although fecal glucocorticoid metabolite levels (indicative of elevated cortisol production) increased after tourist visitation, levels dropped back down to normal, leading the researchers to conclude that the wild orangutans in the sanctuary were not chronically stressed. While it is possible that low levels of disturbance may have very little physiological impact on orangutans, this study only looked at short-term effects of tourist visitation on a small number of individuals. Most of our current knowledge of short-term impacts on wildlife are from qualitative data from anecdotal accounts of isolated incidents of disturbance or mortality, or observational studies (Boyle &

Samson 1985; Russell & Ankenman 1996; Blanc 2006; Bednar-Friedl et al. 2012). What is lacking in ecotourism research are more controlled quantitative assessments of short-term effects, and studies that look at long-term effects on survival and reproduction, as well as population dynamics (Boyle & Samson 1985; Blanc 2006; Buckley 2011; Bednar-Friedl et al. 2012).

Conclusion

Orangutan tourism, although potentially economically profitable and having helped to preserve habitat for habituated individuals, has largely been unsuccessful in generating the educational and economic benefits for conservation that were expected when the industry began in the 1960's (Russon and Susilo 2014). A large portion of the money involved does not go directly into conservation, and changed attitudes from educational experiences on a tour do not always translate into changing one's behavior to contribute to conservation efforts (Rijksen & Meijaard 1999; Dellatore et al. 2014). However, this type of experience is still being marketed to tourists as an important contribution to help the conservation of the species.

Notwithstanding, for better or for worse, orangutan tourism has been very successful in terms of growth. So much so that experts are becoming concerned that if the number of tourists continues to increase annually, it will lead to massive degradation of the environment and an eventual loss of the tourism opportunity (Rijksen & Meijaard 1999; Bednar-Friedl et al. 2012; Russon and Susilo 2014). This is especially concerning considering that the issues surrounding rehabilitant tourism and wild orangutan ecotourism have not been resolved despite repeated assessments and recommendations to change for the past 40 years (Russon and Susilo 2014). However, eliminating tourism is not a viable option (Dellatore et al. 2014). Since the industry is

growing and providing income for communities, even if the economic benefit is lower for them than for larger corporations involved, the question is no longer whether or not ecotourism should be banned in rehabilitation centers or in wild orangutan habitat, but how scientists and tour operators can continue to work to lessen its negative impacts (Caldecott & Miles 2005; Bednar-Friedl et al. 2012).

Recommendations for the future include finally discontinuing tourism with orangutans eligible for release back into the forest or individuals already released, implementing tourism management that ensures that the conservation of the species is the first priority, and promoting ecotourism ventures that emphasize viewing the natural environment and learning about the ecosystem and how all of its inhabitants interact rather than capitalizing on the "cuteness" of our primate cousins (Macfie & Williamson 2010; Dellatore et al. 2014; Russon and Susilo 2014). Some experts recommend further restrictions to minimize harmful effects, stating that bookings for tours should be made in advance, tourists should wait at least seven days after traveling from a foreign country before visiting orangutans, group sizes and the number of visitors allowed per day should be limited, and tourists with surgical masks should maintain at least a seven-meter distance from any orangutan—or ten meters without (Rijksen & Meijaard 1999; Rosen & Byers 2002; Macfie & Williamson 2010). The risk of creating such rigid guidelines is that these restrictions will cause the value of orangutan tourism to depreciate. A balance must be struck between maintaining the value of the experience for the tourist and protecting the orangutans and their habitats, so that the industry may continue.

There is much to be done to improve the methods and management of rehabilitant orangutan tourism and orangutan ecotourism, but it would be a mistake to view these industries as sustainable methods of meeting conservation goals (Isaacs 2000). Even if many of these

negative impacts are successfully minimized for the present levels of tourists, these levels will inevitably change over time as people's values and interests change (Duffus & Dearden 1990; Catlin et al. 2011; Russon & Susilo 2014).

The issue with bringing attention to, and attempting to fund conservation by making nature a commodity that can be bought and sold is that if the ecotourism venture fails, people in the host community might not see value in conserving the area anymore, and might convert the land for more consumptive uses such as logging or agriculture (Cater 2006; Isaacs 2000). One promising sustainable alternative for promoting conservation could involve educating communities in Borneo about the value of the ecological services healthy forests provide, and the potentially important role that orangutans play as seed dispersers in creating a species-rich forest. It is possible that without orangutans, already fragmented landscapes could change in species composition (Caldecott & Miles 2005). However, in order to provide accurate and convincing education on the subject, more research needs to be done to understand whether seed dispersal by orangutans is actually significant in comparison to the same service as provided by other frugivores in the ecological community, how the extinction of the Northeast Bornean orangutan could affect the spatial distribution of plant species, and how these changes might affect the ecosystem services upon which the people rely for survival and development (Caldecott & Miles 2005).

Although ecotourism is still providing justification for the protection of certain areas encompassing orangutan habitat, the sustainability of this method remains questionable: the idea of ecotourism being a panacea for conservation is an outdated view. Research has shown time and again that the benefits of the tourism industry do not outweigh the risks to orangutan health and rehabilitation, and wild orangutan populations continue to decline. While ecotourism

programs are likely to remain in practice for the foreseeable future because of the economic benefits they can offer to communities, and it is true that efforts could be made to potentially minimize their harmful effects, it is critically important for the well-being of all concerned that conservationists—and indeed, society at large—continue to look at other options to conserve this iconic species.

Acknowledgements

I would like to express my gratitude to my thesis advisor, Dr. Luis A. Ruedas, Professor of Biology at Portland State University, for his expert guidance during the development and culmination of this undergraduate thesis.

Literature Cited

Ancrenaz M, Ambu L, Sunjoto I, Ahmad E, Manokaran K, Meijaard E, Lackman I. 2010. Recent surveys in the forests of Ulu Segama Malua, Sabah, Malaysia, show that orang-utans (*P. p. morio*) can be maintained in slightly logged forests. PLOS ONE **5**(7):1-11.

Ancrenaz M, Dabek L, O'Neil S. 2007. The costs of exclusion: recognizing a role for local communities in biodiversity conservation. PLOS Biology **5**(11):2443-2448.

Ancrenaz M, Goossens B, Gimenez O, Sawang A, Lackman-Ancrenaz I. 2004. Determination of ape distribution and population size using ground and aerial surveys: a case study with orang-utans in Lower Kinabatangan, Sabah, Malaysia. Animal Conservation **7**(4):375–385.

Ancrenaz M, Lackman-Ancrenaz I, Elahan H. 2006. Seed spitting and seed swallowing by wild orang-utans (*Pongo Pygmaeus Morio*) in Sabah, Malaysia. Journal of Tropical Biology & Conservation **2**(1):65-70.

Ancrenaz M, Oram F, Ambu L, Lackman I, Ahmad E, Elahan H, Kler H, Abram NK, Meijaard E. 2015. Of *Pongo*, palms and perceptions: a multidisciplinary assessment of Bornean orang-utans *Pongo pygmaeus* in an oil palm context. Oryx **49**(3):465–472.

Aveling RJ. 1982. Orangutan conservation in Sumatra, by habitat protection and conservation education. Pages 299-315 in de Boer LEM, editor. The Orang Utan: Its Biology and Conservation. 1st edition. The Hague, Boston.

Aveling RJ, Mitchell A. 1982. Is rehabilitating orangutans worthwhile? Oryx **16**:263–271.

Bandy J. 1996. Managing the other of nature: sustainability, spectacle, and global regimes of capital in ecotourism. Public Culture **8**(3):539-566.

Bednar–Friedl B, Behrens DA, Getzner M. 2012. Optimal dynamic control of visitors and endangered species in a national park. Environmental & Resource Economics **52**(1):1–22.
Blanc R, Guillemain M, Mouronval J–B, Desmonts D, Fritz H. 2006. Effects of non–consumptive leisure disturbance to wildlife. Revue d'Écologie **61**:117–133.
Boyle SA, Samson FB. 1985. Effects of non–consumptive recreation on wildlife: a review. Wildlife Society Bulletin (1973–2006) **13**(2):110–116.
Bruford MW, Ancrenaz M, Chikhi L, Lackman-Ancrenaz I, Andau M, Ambu L, Goossens B. 2010. Projecting genetic diversity and population viability for the fragmented orangutan population in the Kinabatangan floodplain, Sabah, Malaysia. Endangered Species Research **12**:249–261.
Buckley R. 1985. Determining conservation priorities. Environmental Geochemistry and Health **7**(3):116-119.
Buckley R. 2011. Tourism and environment. Annual Review of Environment and Resources **36**:397–416.
Buckley RC, Morrison C, Castley JG. 2016. Net effects of ecotourism on threatened species survival. PLOS ONE **11**:1–12.
Butler R, Boyd S, editors. 2000. Tourism and National Parks: Issues and Implications. Wiley, Chichester, UK.
Caldecott JO, Miles L, editors. 2005. World Atlas of Great Apes and Their Conservation. University of California Press, Berkeley, California, USA.
Cater E. 1994. Introduction. Pages 3–17 in Cater E, Lowman G, editors. Ecotourism: a sustainable option? John Wiley & Sons, Chichester.
Cater E. 2006. Ecotourism as a western construct. Journal of Ecotourism **5(**1-2):23–39.
Catlin J, Jones R, Jones T. 2011. Revisiting Duffus and Dearden's wildlife tourism framework. Biological Conservation **144**(5):1537-1544.
Ceballos-Lascuráin H. 1987. The future of ecotourism. Mexico Journal **1**(987):1.
Clean Malaysia. 2016. Last two Orangutans are Released from Rasa Ria Resort in Sabah. Available from http://cleanmalaysia.com/2016/04/09/last-two-orangutans-are-released-from-rasa-ria-resort-in-sabah/ (accessed May 18, 2017).
Corpuz R. 2004. "Wild Borneo"–a perception: A Study of Visitor Perception and Experience of Nature Tourism in Sandakan, Sabah, Malaysian Borneo. Unpublished MSc thesis. International Centre for Responsible Tourism, University of Greenwich.
Dellatore DF, Waitt CD, Foitovà I. 2014. The impact of tourism on the behavior of rehabilitated orangutans (*Pongo abelii*) in Bukit Lawang, North Sumatra, Indonesia. Pages 98-119 in Russon AE, Wallis J, editors. Primate Tourism: A Tool for Conservation? 1st edition. Cambridge University Press, United Kingdom.
Duffus DA, Dearden P. 1990. Non-consumptive wildlife-oriented recreation: A conceptual framework. Biological Conservation **53**(3):213-231.
Ehrlich PR. 1968. The Population Bomb. Ballantine Books, New York.
Fennell D, Weaver D. 2005. The ecotourism concept and tourism-conservation symbiosis. Journal of Sustainable Tourism **13**(4):373-390.
Freese CH. 1998. Wild Species as Commodities: Managing Markets and Ecosystems for Sustainability. Island Press, Covelo, CA.
Frey R. 1978. Management of orangutans. Wildlife Management in Southeast Asia, BIOTROP Special Publication **8**:199-215.
Galdikas BMF. 1991. Protection of wild orangutans and habitat in Kalimantan vis a vis rehabilitation. Pages 87-94 in The Great Apes Conference: Proceedings on the Conservation of

the Great Apes in the New World Order of the Environment. Republic of Indonesia Ministries of Forestry and Tourism, Post, and Telecommunication, Jakarta.
Galdikas BMF. 1995. Behavior of wild adolescent female orangutans. Pages 163-182 in Nadler RD, Galdikas BMF, Sheeran LK, Rosen N, editors. The Neglected Ape. Plenum, New York.
Gaveau DL, Sloan S, Molidena E, Yaen H, Sheil D, Abram NK, Ancrenaz M, Nasi R, Quinones M, Wielaard N, Meijaard E. 2014. Four decades of forest persistence, clearance and logging on Borneo. PLOS ONE **9**(7):1-11.
Goodwin H. 1996. In pursuit of ecotourism. Biodiversity and Conservation **5**(3):277-291.
Goossens B, Chikhi L, Ancrenaz M, Lackman-Ancrenaz I, Andau P, Bruford MW. 2006. Genetic signature of anthropogenic population collapse in orang-utans. PLOS Biology **4**(2):285–291.
Gössling S. 1999. Ecotourism: a means to safeguard biodiversity and ecosystem functions? Ecological Economics **29**(2):303–320.
Harrisson B. 1962. The immediate problem of the orang-utan. Malayan Nature Journal **16**:4-5.
Harrisson B. 1965. OURS: The orang-utan recovery service—two years of activity 1963/5. Pages 296-298 in IUCN Public N.S. 10: Conservation in tropical South East Asia. International Union for Conservation of Nature and Natural Resources, Bangkok.
Hockings M, Stolton S, Leverington F, Dudley N, Courrau J. 2006. Evaluating effectiveness: a framework for assessing management effectiveness of protected areas, 2nd. Edition. Best Practice Protected Area Guidelines Series No. 14. IUCN Publications, Gland, Switzerland.
Honey M, Stewart M. 2002. Introduction. Pages 1-29 in Honey M, editor. Ecotourism and Certification: Setting Standards in Practice. Island Press, Covelo, California.
Isaacs JC. 2000. The Limited Potential of Ecotourism to Contribute to Wildlife Conservation. Wildlife Society Bulletin (1973-2006) **28**(1):61–69.
IUCN. 2016. *Pongo pygmaeus* ssp. *morio*: Ancrenaz M, Gumal M, Marshall AJ, Meijaard E, Wich SA, Husson S. The IUCN Red List of Threatened Species 2016: e.T63544A17990681. Available from http://www.iucnredlist.org/details/63544/0 (accessed March 14, 2017).
King N, Nair V. 2013. Gap analysis of future studies on wildlife tourism in Lower Kinabatangan, Sabah. Pages 310-322 in Mohamed B, Bahauddin A, editors. Proceedings of International Conference on Tourism Development: Building the Future of Tourism. Penang, Malaysia.
Kiss A. 2004. Is community-based ecotourism a good use of biodiversity conservation funds? Trends in Ecology & Evolution **19**(5):232–237.
Krüger O. 2005. The role of ecotourism in conservation: panacea or Pandora's box? Biodiversity & Conservation **14**(3):579–600.
Lackman-Ancrenaz I, Ancrenaz M, Saburi R. 2001. The Kinabatangan Orangutan Conservation Project (KOCP). Proceedings of a Conference on the Apes: Challenges for the 21st Century:262-265.
Lindberg K. 1998. Economic aspects of ecotourism. Pages 87-117 in Lindberg K, Epler Wood M, Engeldrum D, editors. Ecotourism: A Guide for Planners and Managers. Volume 2. Ecotourism Society, North Bennington, Vermont.
Loken B, Spehar S, Rayadin Y. 2013. Terrestriality in the bornean orangutan (*Pongo pygmaeus morio*) and implications for their ecology and conservation. American Journal of Primatology **75**(11):1129–1138.
Macfie EJ, Williamson EA. 2010. Best Practice Guidelines for Great Ape Tourism. IUCN/SSC Primate Specialist Group (PSG), Gland, Switzerland.
MacKinnon JR. 1977. Rehabilitation and orangutan conservation. New Scientist **74**(1057):697-699.

Meffe GK, Carroll CR, Groom MJ. 2006. What is Conservation Biology? Pages 3–25 in Groom MJ, Meffe GK, Carroll CR, editors. Principles of Conservation Biology. 3rd edition. Sinauer Associates, Inc., Sunderland, Massachusetts.
Meijaard E, Albar G, Nardiyono, Rayadin Y, Ancrenaz M, Spehar S. 2010. Unexpected ecological resilience in Bornean orangutans and implications for pulp and paper plantation management. PLOS ONE **5**(9):1-7.
Meijaard E, Sheil D. 2008. Cuddly animals don't persuade poor people to back conservation. Nature **454**(7201):159.
Meijaard E, Wich S, Ancrenaz M, Marshall AJ. 2012. Not by science alone: why orangutan conservationists must think outside the box. Annals of the New York Academy of Sciences **1249**(1):29–44.
Mittermeier RA, Werner TB. 1990. Wealth of plants and animals unites "megadiversity" countries. Tropicus **4**(1):4-5.
Muehlenbein MP. 2017. Primates on display: potential disease consequences beyond bushmeat. American Journal of Physical Anthropology **162**(Supplement S63):32-43.
Muehlenbein MP, Ancrenaz M. 2009. Minimizing pathogen transmission at primate ecotourism destinations: the need for input from travel medicine. Journal of Travel Medicine **16**(4):229–232.
Muehlenbein MP, Ancrenaz M, Sakong R, Ambu L, Prall S, Fuller G, Raghanti MA. 2012. Ape conservation physiology: fecal glucocorticoid responses in wild *Pongo pygmaeus morio* following human visitation. PLOS ONE **7**(3):1–10.
Muehlenbein MP, Martinez LA, Lemke AA, Ambu L, Nathan S, Alsisto S, Andau P, Sakong R. 2008. Perceived vaccination status in ecotourists and risks of anthropozoonoses. EcoHealth **5**(3):371–378.
Muehlenbein MP, Martinez LA, Lemke AA, Ambu L, Nathan S, Alsisto S, Sakong R. 2010. Unhealthy travelers present challenges to sustainable primate ecotourism. Travel Medicine and Infectious Disease **8**(3):169–175.
Orams MB. 1995. Towards a more desirable form of ecotourism. Tourism Management, **16**(1):3-8.
Payne J, Andau P. 1989. Orang-Utan: Malaysia's Mascot. Berita Publishing Sdn. Bhd., Kuala Lumpur.
Rasa Ria Resort. 2016. Sabah Wildlife Department and Shangri-La's Rasa Ria Resort & Spa to Complete Successful Sepilok Orangutan Rehabilitation Centre Support Programme. Available from http://www.shangri-la.com/kotakinabalu/rasariaresort/press-room/press-releases/sabah-wildlife-department-and-shangri-las-rasa-ria-resort-spa-to-complete-succe/ (accessed May 18, 2017).
Reynolds PC, Braithwaite D. 2001. Towards a conceptual framework for wildlife tourism. Tourism Management **22**(1):31–42.
Rijksen HD. 1982. How to save the mysterious 'man of the forest'? Pages 317-341 in de Boer LEM, editor. The Orang Utan: Its Biology and Conservation. 1st edition. The Hague, Boston.
Rijksen HD, Meijaard E. 1999. Our Vanishing Relative: The Status of Wild Orang-utans at the Close of the Twentieth Century. Kluwer Academic Publishers, Boston.
Rijksen HD, Rijksen-Graatsma AG. 1975. Orangutan rescue work in North Sumatra. Oryx **13**:63-73.
Rosen N, Byers O, editors. 2002. Orangutan Conservation and Reintroduction Workshop: Final Report. IUCN/SSC Conservation Breeding Specialist Group, Apple Valley, Minnesota.
Russell CL, Ankenman MJ. 1996. Orangutans as photographic collectibles: ecotourism and the commodification of nature. Tourism Recreation Research **21**(1):71-78.

Russon AE, Susilo A. 1999. The effects of the 1997-98 droughts and fires on orangutans in Sungai Wain Protection Forest, E. Kalimantan, Indonesia. Pages 348-372 in Suhartoyo H, Toma T, editors. Impacts of Fire and Human Activities on Forest Ecosystems in the Tropics: Proceedings of the Third International Symposium on Asian Tropical Forest Management. Tropical Forest Research Center, Mulawarman University and Japan International Cooperation Agency, Samarinda, Indonesia.

Russon AE, Susilo A. 2014. Orangutan tourism and conservation. Pages 76-97 in Russon AE, Wallis J, editors. Primate Tourism: A Tool for Conservation? 1st edition. Cambridge University Press, United Kingdom.

Schoneveld-de Lange N, Meijaard E, Lohr A. 2016. South to south learning in great ape conservation. American Journal of Primatology **78**:669–678.

Sheil D, Meijaard E. 2010. Purity and prejudice: deluding ourselves about biodiversity conservation. Biotropica **42**(5):566–568.

Sherman PB, Dixon JA. 1991. The economics of nature tourism: determining if it pays. Pages 89-131 in Whelan T, editor. Nature Tourism: Managing for the Environment. Island Press, Covelo, CA.

Steele P. 1995. Ecotourism: an economic analysis. Journal of Sustainable Tourism, **3**(1): 29-44.

Swarna Nantha H, Tisdell C. 2008. The orangutan–oil palm conflict: economic constraints and opportunities for conservation. Biodiversity and Conservation **18**(2):487–502.

Terra Incognita Ecotours. 2017. Borneo: Red Ape Encounter. Available from http://www.ecotours.com/ecotour/borneo-red-ape-encounter (accessed May 17, 2017).

TIES. 2015. What is Ecotourism? Available from http://www.ecotourism.org/what-is-ecotourism (accessed May 10, 2017).

Tisdell C. 2005. Nature-based tourism and the valuation of its environmental resources: economic and other aspects. Pages 185–200 in Tisdell C, editor. Economics, Ecology, and the Environment. University of Queensland, School of Economics.

Tisdell C, Swarna Nantha HS. 2008. Conservation of the Proboscis Monkey and the Orangutan in Borneo: Comparative Issues and Economic Considerations. Pages 225-250 in Gupta VK, Anil K, editors. Perspectives in Animal Ecology & Reproduction Vol. 5. Daya Publishing House, New Delhi.

Tisdell C, Wilson C. 2012. Nature–based Tourism and Conservation: New Economic Insights and Case Studies. Edward Elgar, Cheltenham, UK.

Turner II BL, Meyer WB, Skole DL. 1994. Global land-use/land-cover change: towards an integrated study. Ambio **23**(1):91-95.

United Nations. 2015. World Population Prospects: The 2015 Revision, World Population 2015 Wallchart. United Nations, Department of Economic and Social Affairs, Population Division: ST/ESA/SER.A/378. Available from https://esa.un.org/unpd/wpp/publications/Files/World_Population_2015_Wallchart.pdf (accessed June 13, 2017).

Weaver DB. 2002. The evolving concept of ecotourism and its potential impacts. International Journal of Sustainable Development **5**(3):251-264.

Weaver DB. 2005. Comprehensive and minimalist dimensions of ecotourism. Annals of Tourism Research **32**(2):439–455.

WWF. 2016. Living Planet Report 2016. Risk and resilience in a new era. WWF International, Gland, Switzerland. Available from https://www.wnf.nl/custom/LPR_2016_fullreport/ (accessed June 13, 2017).