Cold Feet: Addressing the Effect of Human Activity in Antarctica on Terrestrial Wildlife

Andrew J. Koper*

I. Introduction

"'Great [G]od! This is an awful place.'"[1] Those were some of Captain Robert Falcon Scott's last words after he arrived at the South Pole.[2] Not long after Scott entered those words into his journal, his team died off from the cold.[3] One of the men, Captain Lawrence Oates, wished to die in his sleep, but after awaking, stated his famous final words before walking shoeless into a blizzard: "I am just going outside and may be some time."[4] The rest of the team perished soon after Oates.[5] Even now, with advanced bases, hot showers, and Wi-Fi, a simple mistake in Antarctica can lead to death.[6] But while humans are not well suited to survive in Antarctica without life support supplies,[7] others have adapted to thrive in the frigid environment.

On the fringes of the frozen continent, penguins, seals, seabirds, and simple vegetation have gained a foothold.[8] Humans have entered their frozen realm as a competitor for space along the coast, the only portion of the continent that can foster life.[9] Humans and animals interact regularly through scientific activities and tourism. This paper examines

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[1] Gabrielle Walker, *The Great Thaw*, N.Y. Times (June 21, 2012), http://www.nytimes.com/2012/06/22/opinion/global-agenda-magazine-the-great-thaw.html?_r=0.

[2] *Id.*

[3] *Id.*

[4] Dhruti Shah, *Antarctic Mission: Who Was Captain Lawrence Oates?*, BBC News (Mar. 9, 2012), http://www.bbc.co.uk/news/uk-17269397.

[5] Walker, *supra* note 1.

[6] *Id.*

[7] *Id.*

[8] Jacques-Yves Cousteau & Bertrand Charrier, *Introduction: The Antarctic A Challenge to Global Environmental Policy*, in The Antarctic Environment and International Law 5, 5-6 (Joe Verhoeven, et al. eds., Philippe Sands trans., 1992).

[9] *See id.*

the extent of those interactions, as well as some of the negative impacts that human presence has had in Antarctica. Such impacts range from an oil spill of a science program's supply ship to a tourist knocking over a camera tripod onto a penguin chick, crippling it and causing it to be attacked and euthanized.

The current management regime for Antarctic living resources, and everything else in Antarctica south of 60° South Latitude,[10] is the Antarctic Treaty System (ATS). The ATS is the product of international cooperation in order to preserve the pristine Antarctic environment and its inhabitants.[11] Viewing human interactions with animals under the lens of the ATS, several problems arise. Sometimes there is a blatant disregard of the rules. Sometimes a lack of precautionary measures does not account for some human error or mechanical failure, and leads to harm of the animals and their habitats.[12] This article focuses on when the ATS fails, and when those failures result in harm to Antarctic terrestrial wildlife.

Living marine resources differ from terrestrial wildlife because they are highly mobile, either by their own strength or at the mercy of strong ocean currents.[13] As a result, management regimes for marine creatures must account for larger areas that fall beyond the jurisdiction of the Antarctic Treaty area.[14] Further, whales, which are at the top of the Antarctic food chain,[15] are governed by a distinct management regime.[16] Marine resources

[10] Antarctic Treaty art. VI, Dec. 1, 1959, 12 U.S.T. 794, 402 U.N.T.S (entered into force June 23, 1961) [hereinafter 1959 Treaty].

[11] *See id*. at Preamble.

[12] *See infra* Part III (listing many incidents where harm has resulted from a failure which led to noncompliance).

[13] J.A. Gulland, *The Management Regime for Living Resources*, *in* The Antarctic Legal Regime 219, 220 (Christopher C. Joyner & Sudhir K. Chopra eds., 1988).

[14] *Id*. The Antarctic Treaty System (ATS) applies to all areas south of 60° South Latitude and includes all ice shelves, but does not affect States' rights under international law regarding the high seas in that area. 1959 Treaty, *supra* note 10, art. VI. The drafters of the original Antarctic Treaty were eager to preserve freedom on the high seas, and so foreclosed upon the Treaty or any other agreement in the ATS being applicable to the Southern Ocean. Jennifer Angelini & Andrew Mansfield, *A Call for U.S. Ratification of the Protocol on Antarctic Environmental Protection*, 21 Ecology L.Q. 163, 186 (1994). Agreements completely separate from the ATS have been designed to regulate the use of living marine resources. *Id.*; *see also* United Nations Convention on the Law of the Sea, Dec. 10, 1982, 1833 U.N.T.S. 397.

[15] *See Whales, Antartica Food Chains and Food Webs*, Cool Antarctica, http://www.coolantarctica.com/Antarctica%20fact%20file/wildlife/whales/food%20web.htm (last visited Mar. 21, 2013).

[16] *See* International Convention for the Regulation of Whaling, Dec. 2, 1946, 62 Stat. 1716, T.I.A.S. No. 1849, 161 U.N.T.S. 72 [hereinafter ICRW]. The International Whaling Commission (IWC), established by the Convention, is charged with conserving whales and managing whaling. *See id.* arts. III-V. The Commission sets catch limits, untangles trapped whales, strikes whaling vessels, and creates protocols

present unique issues[17] and are beyond the scope of this comment. The rest of this article will deal strictly with terrestrial living resources, and marine living resources only as they latter relate to the former.[18]

While the current management regime provides strong protection to Antarctic terrestrial wildlife, there is room for improvement, as shown by the various violations that have occurred under the regime. Most of the problems that exist are the result of difficulties enforcing the ATS, or lack of precautionary measures. This note proposes a creative solution to enforce international law in Antarctica, and to contain human activities. It calls for a use of the philosophy of preclusive restoration to continue as the underlying principle of Antarctic law. It also discusses the use of observers, a fund, and pressure by media and Non-Governmental Organizations (NGOs) to ensure compliance with the ATS for the benefit of Antarctic wildlife. An adjustment to the current zoning regime that would contain visitors to certain areas will further benefit Antarctic habitats and the associated ecosystems, as well as those visiting the remote and dangerous land.

Section II describes Antarctica, its living and inanimate terrestrial environment, and a brief history of human presence. Section III examines the current issues that Antarctic terrestrial wildlife faces as a result of human contact. Section IV summarizes the current management regime, and evaluates it with regard to its ability to protect the terrestrial wildlife. Finally, section V looks at ways that the ATS could be improved, and proposes some creative ideas that could be used to enforce Antarctic law and contain the presence of visitors: the use of observers, a fund, NGO pressure, and a change to the current zoning regime.

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for whale watching. Int'l Whaling Commission, http://iwc.int/home (last visited Mar. 21, 2013). The International Convention for the Regulation of Whaling is the IWC's founding document. *See Key Documents*, Int'l Whaling Commission, http://iwc.int/convention (last visited Mar. 21, 2013); ICRW, *supra*, art. III(1). The IWC includes a Schedule, which sets catch limits for commercial and aboriginal whaling. *See, e.g.,* Amendments to the Schedule to the International Whaling Convention, Panama, July 6, 2012, *available at* http://iwc.int/cache/downloads/1lv6fvjz06f48wc44w4s4w8gs/Schedule-February-2013.pdf.

[17] One complicated issue is that the Southern Ocean surrounding Antarctica is viewed as a high seas region under international law, allowing for certain freedoms to all sailors, including freedom of navigation, overflight, fishing, laying pipelines and cables, constructing islands and artificial structures, and freedom of scientific research. Christopher C. Joyner, Antarctica and the Law of the Sea 185-86 (1992). Thus activities in the Southern Ocean, especially scientific research, are governed by an infusion of Antarctic, and other international law. *Id.* Likewise, the law of the high seas must be paired with Antarctic law for regulation of fishing. *Id.* at 221-22.

[18] To an extent, all Antarctic creatures, even the terrestrial ones, are marine creatures, due to their dependence on the sea. *See* Cousteau & Charrier, *supra* note 8, at 5. Krill is an example of a strictly marine resource that will be discussed, due to its importance in the Antarctic food chain, and its role in the diet of terrestrial species that are discussed in this paper. *See infra* Part II.B.

II. Antarctica: The Frozen Wasteland

a. The Inanimate Terrestrial Environment

"Antarctica is a white desert. It is the highest, windiest, coldest,[19] driest, most lifeless of the continents."[20] During the winter, there is perpetual darkness for months at a time,[21] and temperatures drop below negative forty degrees Celsius.[22] Conversely, when summer arrives, daylight reigns for months, and temperatures rise dramatically.[23] Only about two percent of Antarctica's surface is not covered in ice.[24] A massive ice sheet that represents ninety percent of all terrestrial ice and seventy percent of Earth's fresh water encrusts the remainder of the continent.[25] Antarctica accounts for roughly ten percent of the planet's *terra firma*, or dry land.[26] Further, the perennially frozen seventh continent is estranged from the rest of the world, surrounded by the vast, icy, windswept expanses of the Southern Ocean.[27]

Aside from being very cold, the Antarctic shares little in common with the northern Arctic.[28] An old expression states: "Antarctica is a continent surrounded by an ocean, while the Arctic is an ocean surrounded by continents."[29] Due to Antarctica's inaccessibility, scientific mysteries, and lack of resources inland from the coast,[30] some have likened Antarctica to the moon.[31] While Antarctica may seem

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[19] Walker, *supra* note 1 (noting that in 1983, the Russians "recorded the lowest air temperature ever experienced by humans on our planet: minus 89.2° Celsius—so cold that steel can shatter like glass, and diesel fuel can be cut with a chain saw."). *Id*.

[20] Christopher C. Joyner, Governing the Frozen Commons 1 (1998); *The World Factbook: Antarctica: Geography*, CIA, *available at* https://www.cia.gov/library/publications/the-world-factbook/geos/ay.html (last visited Mar. 21, 2013).

[21] *See generally* Alexander Kumar, *Lost in Time in the Antarctic Ice Age*, N.Y. Times (Sept. 6, 2012), http://scientistatwork.blogs.nytimes.com/2012/09/06/lost-in-time-in-the-antarctic-ice-age/.

[22] Craig D. Millar et al., *Adélie Penguins and Temperature Changes in Antarctica: A Long-Term View*, 7 Integrative Zoology 113, 113 (2012).

[23] *Id.* Temperatures rise to about -20 °C to -30 °C on the Antarctic plateau, and -3 °C to -10 °C on the coast. *Id.*

[24] *See* C. Hoitink, *Introduction*, *in* A(nta)rctic Law; Selected Documents, at I (C. Hoitink ed., 2011).

[25] Cousteau & Charrier, *supra* note 8, at 5.

[26] Hoitink, *supra* note 24.

[27] Joyner, *supra* note 20, at 2.

[28] David J. Bederman, *Theory on Ice: Antarctica in International Law and Relations*, 39 Va. J. Int'l L. 467, 468 (1999).

[29] *Id.*

[30] *See infra* Part III.C.

[31] *See, e.g.*, Kathleen T. Mulville, *How the Antarctic Science, Tourism, and Conservation Act of 1996 Fails Antarctica*, 23 Wm. & Mary Envtl. L. & Pol'y Rev. 649, 649 n.1 (1999).

distant and uninhabitable to humans, unlike the moon, some creatures find Antarctica to be a suitable home.

b. The Living Terrestrial Environment

The Southern Ocean provides the source of all life in Antarctica.[32] Few creatures have adapted to living on the land.[33] The biodiversity on terrestrial Antarctica is low.[34] There are no reptiles or fresh water fish, and all terrestrial mammals and birds on the continent are marine dependent.[35] In stark contrast, the sea around Antarctica is rich in living resources, which are in some places abundant.[36]

Because Antarctica is an immense, lifeless, icy desert whose few inhabitants all depend on marine resources, life is confined to the coastal fringes.[37] The need for space along Antarctica's coast is so pressured that most human structures and work annexes, such as runways and roads, usually occupy nesting grounds of penguins or other local birds.[38] Life is sparse; Antarctic food chains are relatively short,[39] and most

[32] Cousteau & Charrier, *supra* note 8, at 5.

[33] Cousteau & Charrier, *supra* note 8 at 5; Angelini & Mansfield, *supra* note 14, at 169 ("Most lifeforms cannot survive in the subfreezing temperatures, wind, winter darkness, and lack of precipitation that characterize Antarctica.").

[34] Tina Tin et al., *Climate Change and Ecosystems: Impact and Ecosystem-Based Adaptation Case Study from the Antarctic and Southern Ocean*, Antarctic and Southern Ocean Coalition, at 1, *available at* http://www.asoc.org/storage/documents/climate_change/IUCN_CEM_Antarctic_case_study052410-1.pdf. Many groups are missing or underrepresented at higher taxonomic levels, and those present "possess low levels of redundancy (i.e. other taxa performing similar functions.)" *Id.* The surrounding islands have a slightly higher biodiversity of invertebrates, but terrestrial vertebrates are absent on most islands with the exception of a species of bird, two species of duck, and two species of sheathbills, though each is limited to one or at most two islands. *Id.*

[35] Christopher C. Joyner, *The Antarctic Legal Regime: An Introduction*, *introduction to* The Antarctic Legal Regime 1, 2 (Christopher C. Joyner & Sudhir Chopra eds., 1988).

[36] Gulland, *supra* note 13, at 219. Aside from whales, krill fish, and the terrestrial creatures, such as penguins seals, and seabirds teeming along Antarctica's fringes, there are "less picturesque and decidedly weirder 20-legged starfish, giant sea spiders, ghostly transparent jellies and sponges the size of cars." Walker, *supra* note 1.

[37] Cousteau & Charrier, *supra* note 8 at 6.

[38] P. Jouventin, *The Antarctic Fauna: The Threats and Their Control*, *in* The Antarctic Environment and International Law 33, 34 (Joe Verhoeven, et al. eds., 1992).

[39] *See* Christopher C. Joyner, *Fragile Ecosystems: Preclusive Restoration in the Antarctic*, 34 Nat. Resources J. 879, 881-82 (1994). The Antarctic food chain has approximately three levels. *Id*. The lowest level consists of krill and zooplankton. *Id*. Second level creatures include "squid and fish that prey on lower … organisms, but are also preyed upon." *Id*. Third level organisms are whales, seals, penguins, and sea birds. *Id*. *See also Whales and Food Webs*, *supra* note 15.

species only rely on just one or two other species in the chain.[40] As such, the Antarctic ecosystem is incredibly vulnerable, and variations in the abundance of one species have immediate effects on other species.[41]

Krill, which are tiny shrimp-like crustaceans, are the fundamental link of the Antarctic food chain.[42] They swarm in major concentrations in the Southern Ocean, and their biomass is estimated to be some hundreds of millions of tons.[43] Krill are one of the most abundant species on the planet.[44] As the major food source for most Antarctic animals, the fate of the krill population has a significant and direct impact on most other species.[45] Were anything to happen to the krill, be they overfished or run to extinction by environmental degradation, the ramifications would impact the entire ecosystem.[46]

One of the Antarctic terrestrial life forms that feed on krill is the penguin.[47] Four species of "true" Antarctic penguins breed on or near continental Antarctica.[48] They slide into the sea on their bellies, and then return to land to rest and molt, but only after eating "enough krill to double their weight."[49] One major difference between the north

[40] Hoitink, *supra* note 24, at VI. "[F]rom primary production to the top predators (in this case killer whales), [there are a] small number of species involved, and the … dynamics of the whole system are governed by a single species—the krill." Gulland, *supra* note 13 at 220.

[41] Hoitink, *supra* note 24, at VI. For example, one study found that "[l]arge scale changes in krill biomass best explain[ed] why populations of Adélie and chinstrap penguins increased … following the harvesting of the whales and seals (the krill-surplus hypothesis) … and why more recently they have decreased as a result of climate change and the recovery of pinnipeds and baleen whale populations … ." *See* Wayne Z. Trivelpiece et al., *Variability in Krill Biomass Links Harvesting and Climate Warming to Penguin Population Changes in Antarctica*, 108 Proc. Nat'l Acad. Sci. U.S. 7625, 7625-26 (2011), *available at* http://www.pnas.org/content/108/18/7625.full?sid=f4c370fe-7f52-4cf2-92bb-8c8a294505fd.

[42] Hoitink, *supra* note 24, at VI.

[43] Joyner, *supra* note 20, at 10, 272 n. 24.

[44] Gulland, *supra* note 13, at 220.

[45] *Id.*

[46] Joyner, *supra* note 39, at 882.

[47] *See id*. Additionally several other species of bird occupy Antarctica, such as petrels, albatross, sheathbills, skuas, and cape pigeons. *Antarctic Skuas/Cape Pigeons/American Sheathbill/Antarctic Tern*, Cool Antarctica, http://www.coolantarctica.com/Antarctica%20fact%20file/wildlife/antarctic_skuas.htm (last visited Mar. 21, 2013). However, this article will primarily focus on penguins, as they are flightless, thus strictly bound to the Antarctic continent, and because they account for one of the dominant Antarctic species. *See, e.g.*, Millar, *supra* note 22, at 114 (The Adélie penguin is the dominant form of terrestrial wildlife on the seventh continent).

[48] *Antarctica Penguins Facts*, Cool Antarctica, http://www.coolantarctica.com/Antarctica%20fact%20file/wildlife/antarctic_penguins.htm (last visited Mar. 21, 2013). The four types of penguin are the: 1) Adélie penguin, 2) the Chinstrap penguin, 3) the "most southerly" Emperor penguin, and 4) the Gentoo penguin. *Id.*

[49] James Acret, *Antarctica*, 17 Cal. Construction L. Rep., art. 7 (2007).

and south poles is that the Arctic has no penguins, and Antarctica has no polar bears.[50] To the relief of the penguins, they have never had contact with polar bears.[51] With satellite technology, penguins are easy to track and monitor, as their distinctive black plumage stands in stark contrast to the ice beneath them, as do their fecal stains.[52] This makes their colonies clearly visible from above.[53]

Another terrestrial animal that reigns in Antarctica is the seal. Antarctica is home to six species of seal.[54] The primary source of a seal's diet is krill.[55] The leopard seal is unique because it is a top predator, supplementing its krill diet with fish, penguins, and even other seals.[56] Seal populations fell dramatically in the late eighteenth century as a result of being hunted to a point where most seal species in Antarctica were nearly extinct, so the activity became unprofitable.[57] The Convention for the Conservation of Antarctic Seals (Seal Treaty)[58] now governs

[50] *See* Int'l Wildlife Adventures, *Antarctic Tours in 2012: Don't Expect Any Polar Bears*, IWA Travel Blog (Feb. 3, 2011, 10:35 AM), http://www.wildlifeadventures.com/blog/antarctica-tours-dont-expect-any-polar-bears/. The most northerly penguin species, and the only one living (naturally) above the equator, is the Galápagos Penguin, living in the Galápagos Islands off the coast of Ecuador. *Galápagos Penguin: Overview*, World Wildlife Fund, http://worldwildlife.org/species/galapagos-penguin (last visited Mar. 21, 2013).

[51] Marianne Kaput, *Frequently Asked Questions*, Laboratory for Ecophysiological Cryobiology, http://www.units.muohio.edu/cryolab/education/Antarctic_FAQ.htm (last visited Mar. 24, 2013).

[52] *See* Peter T. Fretwell & Philip N. Trathan, *Penguins from Space: Faecal Stains Reveal the Location of Emperor Penguin Colonies*, 18 Global Ecology and Biogeography 543, 544 (2009), *available at* http://www.clas.ufl.edu/users/mbinford/GEOXXXX_Biogeography/Literature_reports_by_students/Report_3/Comte_Paper3.pdf.

[53] Reuters, *Even From Afar, a Distinctive Look*, N.Y. Times, Apr. 13, 2012, http://www.nytimes.com/2012/04/14/world/scientists-find-twice-as-many-emperor-penguins-in-antarctica.html?_r=0.

[54] *See* Convention for the Conservation of Antarctic Seals art. 1(2), June 1, 1972, 29 U.S.T. 441, 443 [hereinafter Seal Treaty] (entered into force Apr. 7, 1982) (listing all six species as within the scope of the treaty). Those species are: 1) the Southern Elephant Seal; 2) the Leopard Seal; 3) the Weddell Seal; 4) the Crabeater Seal; 5) the Ross Seal; and 6) the Southern Fur Seal. *Id.*

[55] The Crabeater seal has red fangs, which come from its krill diet. Acret, *supra* note 49.

[56] *Leopard Seal*, Travelwild Expeditions, http://www.travelwild.com/antarctica-wildlife/leopard-seals.aspx (last visited Mar. 21, 2013). Leopard seals have long, sharp teeth. *Id.* They will wait in the water beneath ice shelves near penguin rookeries, and then wait for the birds to enter the water. *Id.* They are also known to snatch seabirds resting on the water. *Id.*

[57] Gulland, *supra* note 13, at 221; Angelini & Mansfield, *supra* note 14, at 171-72.

[58] *See infra* Part IV.C.

seals and regulates their exploitation.[59] Recently, seal populations have recovered substantially, and are no longer endangered.[60]

Flora, or vegetation, is a form of terrestrial wildlife in Antarctica that is commonly overlooked. Antarctic flora struggle to maintain a toehold on Antarctic islands and the fringes of the continent.[61] Plant life in Antarctica is limited to snow algae, and various species of lichens and mosses.[62] There are only two higher plants represented on the entire continent,[63] and neither trees nor any other deep-rooted plants exist on the mainland.[64] Antarctic plants struggle to grow in the perennial freeze.[65] It takes moss beds centuries to grow just a few inches.[66] Antarctic plants are very fragile, but could play an important role in future terrestrial Antarctic food chains as a source of food, water, or insulation.[67] Thus, Antarctic flora represents a key component of the limited terrestrial wildlife in Antarctica, and preservation is important.[68]

Antarctica was not always hostile to plants or animals. Fossil evidence indicates that forests once stood where there is now only ice.[69] In 1986, hikers on the Antarctic Peninsula found the fossils of a new dinosaur species, the first ever found on the seventh continent.[70] Similar findings support the conclusion that Antarctica has not always been frozen or lifeless.[71] Whether Antarctica was a frozen wasteland, vibrant forest, or jungle, the one species that is not native is humans.[72]

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[59] Seal Treaty, *supra* note 54, pmbl. cl. 4; *see infra* Part IV.C.

[60] Austl. Antarctic Div., *Human Impacts in Antarctica*, Austl. Gov't, http://www.antarctica.gov.au/environment/human-impacts-in-antarctica (last modified Sept. 7, 2002).

[61] Gulland, *supra* note 13, at 219.

[62] Hoitink, *supra* note 24, at VI.

[63] Tin, *supra* note 34. There is a slightly greater diversity of higher plants on the sub-Antarctic islands, though this is still limited. *Id.*

[64] Joyner, *supra* note 20, at 1.

[65] Lee A. Kimball, *Southern Exposure: Deciding Antarctica's Future*, World Resources Inst. 1, 1 (1990), *available at* http://pdf.wri.org/southernexposure_bw.pdf.

[66] *See* David Helvarg, *Is Rise in Tourism Helping Antarctica or Hurting it?*, Nat'l Geographic (Aug. 22, 2003), http://news.nationalgeographic.com/news/2003/08/0822_030822_antarctictours.html.

[67] *Cf.* Stephen Sharnoff & Roger Rosentreter, *Lichen Use by Wildlife in North America*, Lichens of N. Am. (Feb. 2, 1998), http://www.lichen.com/fauna.html (describing the utility of lichens in North America).

[68] *See* Tin, *supra* note 34.

[69] *See* Walker, *supra* note 1 (articulating the find of fossilized leaves from a tree called Glossopteris Indica, "which had been extinct for more than 250 million years.").

[70] *Id.* The dinosaur, "Antarctopelta oliveroi, was [four] meters long from tip to tail with armored skin and a spike over its eye. It was also a plant eater, providing further proof that Antarctica had once been green." *Id.* Many other dinosaur fossil discoveries followed the first. *Id.* One carnivore was seven meters tall, and others were even larger. *Id.*

[71] *Id.*

[72] Hoitink, *supra* note 24.

c. A History of Human Presence

Antarctica is the only place in the world with no record of primitive humans or native groups.[73] Although there was speculation about the "Southern Land"[74] throughout history, Antarctica[75] was not actually discovered until the early 1800s.[76] For over two centuries, sealers, whalers, and fisherman sought not the basic productivity of the Southern Ocean, but the biological processes that made production available in large, convenient packages—huge seal colonies, large whales, and massive swarms of krill.[77] These excursions devastated

[73] *See 3.0 Antarctica: The Environment: Humanity*, Nat'l Sci. Found., http://www.nsf.gov/pubs/1997/antpanel/3enviro.htm (last visited Mar. 21, 2013); Martin D. Greenwall, *U.S. Air Operations in Antarctica*, *in* Symposium on Antarctic Logistics 121, 121 (Nat'l Research Council (U.S.) et al. eds., 1962); *see also* Daniel Grotta et al., *Antarctica: Whose Continent Is it Anyway?*, 240 Popular Sci. 62, 62-63 (1992) (stating that Antarctica was never colonized by humans, and that "there are only visitors, no inhabitants").

[74] Walker, *supra* note 1. Speculations of what existed in the "Southern Land" ranged from "fanciful legends of a tropical paradise ringed by ice" to "a giant hole leading to the center of the Earth." *Id.*

[75] The ancient Greeks and Aristotle, none of whom knew of Antarctica, postulated that it existed as a balance to the earth's northern inhabited regions. *Antarctica: History*, Lonely Planet, http://www.lonelyplanet.com/antarctica/history (last visited Mar. 21, 2013). That southern region was dubbed the 'Antarktos,' or opposite of the 'Arktos,' a constellation in the northern sky. *Id.* Coincidentally, the word "Arktos" is the Greek word for bear, referring to the Great Bear constellation in the northern sky. Int'l Wildlife Adventures, *supra* note 50. Thus, Antarctica was derived from the word "Antarktos," which means "opposite of the bear." Int'l Wildlife Adventures, *supra* note 50. The ancient Greeks did not know that Antarctica had no bears; they named Antarctica based off the constellation, not a presence or lack of bears. Yet the name was fortuitously suitable, as the northern "Arktos" did have bears, and the southern "Antarktos" did not. *See generally supra* Part II.B. This is where the name "Antarctica" is derived from.

[76] Who initially discovered Antarctica is still in dispute. William M. Welch, *The Antarctic Treaty System: Is it Adequate to Regulate or Eliminate the Environmental Exploitation of the Globe's Last Wilderness?*, Hous. J. Int'l L. 587, 611-12 (1992) (noting that the French, British, Russians and Americans each claim to have first sighted Antarctica). *Compare* Joyner, *supra* note 20, at 14-15 (asserting that the British discovered Antarctica through a series of expeditions), *with U.S. Antarctic Program Participant Guide 2010-2012*, at 1 (Nat'l Sci. Found./U.S. Antarctic Program, Arlington V.A.), *available at* http://www.usap.gov/USAPgov/travelAndDeployment/documents/ParticipantGuide-Chapter1.pdf (asserting that the U.S. may have been the first to discover Antarctica, but that historians are unsure). Despite the dispute, it is commonly recognized that the discovery of Antarctica was a result of seal hunting expeditions by the Americans, British, and Russians, who were reluctant to transcribe their findings for want of commercial secrecy. *See* Maria Pia Casarini, *Activities in Antarctica Before the Conclusion of the Antarctic Treaty*, *in* International Law for Antarctica 627, 632 (Francesco Francioni & Tullio Scovazzi eds., 1996).

[77] Gulland, *supra* note 13, at 219-220.

seal populations.[78] The hunting left empty beaches where legions of seals had once thrived for centuries, undisturbed by human greed.[79] But exploiting Antarctica's vast economic capabilities was not the only lure to Antarctica; others came to explore.[80]

National expeditions quickly followed the discovery of the large new land.[81] The first explorer to reach the South Pole was Roald Amundsen, a Norwegian, on December 14, 1911.[82] Captain Scott's fateful journey followed in 1912.[83] The ability to explore Antarctica's vast interior became easier, though by no means easy, following advancements in technology and transportation in the twentieth century.[84] This opened up new avenues for adventure, discovery and scientific research.[85]

Science is now the foremost activity conducted in Antarctica,[86] and remains the primary justification for human occupation in the unwelcoming wasteland.[87] The population of scientists ranges from 4400 in the summer to 1100 in the winter, with an additional 1000 personnel, including ship crews and scientists, doing onboard research in the Southern Ocean.[88] The scientific appeal comes from the purity of the Antarctic ecological system, and the fact that its geographical location and isolation creates a unique realm to study global processes.[89]

Scientists see Antarctica as a valuable natural scientific laboratory because of its near-pristine condition, and its remoteness from large human populations and pollution.[90] Because it is relatively undisturbed, Antarctica can serve as a benchmark against which other ecosystems around the globe may be compared; that is, Antarctic pollution levels

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[78] *See id.* at 221. In the 1820-21 season, forty-seven vessels sailed to the Southern Shetland Islands to hunt seals. *Id.* The next year, the forty-four vessels that sailed there came back nearly empty handed, and ten years later the hunters did not find a single seal. *Id.*

[79] Casarini, *supra* note 76, at 630.

[80] *See Antarctica: History*, *supra* note 75.

[81] Casarini, *supra* note 76, at 634-50 (providing background about each of the known periods of exploration).

[82] *Id*. at 647. Unlike the disputed discovery of Antarctica, this fact is uncontested. Welch, *supra* note 75, at 612. Antarctic sovereignty is often traced to discovery, so the Norwegians first reaching the South Pole helps explain their large interest in the seventh continent. *See* Welch, *supra* note 76, at 611.

[83] Casarini, *supra* note 76, at 647. *See generally supra* Part I.

[84] Casarini, *supra* note 76, at 656.

[85] *Id.*

[86] Joyner, *supra* note 20, at 181.

[87] Kimball, *supra* note 65, at 2, 32.

[88] *World Factbook: Antarctica: People and Society*, CIA *available at* https://www.cia.gov/library/publications/the-world-factbook/geos/ay.html (last visited Mar. 21, 2013).

[89] Cousteau & Charrier, *supra* note 8; Joyner, *supra* note 20, at 181.

[90] Joyner, *supra* note 20, at 181.

may serve as standards for a global minimum.[91] Scientists conduct many studies in Antarctica, including measurements of climate change, the ozone layer, and the rise of the sea level, as well as the recovery of meteorites.[92]

Tourism is another activity that is popular in Antarctica.[93] In 2011-2012, over 26,500 tourists visited Antarctica.[94] This number is relatively low compared with the average amount of tourists visiting Antarctica in the eight seasons prior: 34,686, with a peak in 2007-2008 of over 46,000.[95] These numbers represent only the passengers, which typically account for forty percent of the total people on board each vessel.[96]

Tourists in Antarctica engage in numerous activities. They visit historic sites and active scientific stations, and view the awesome Antarctic geography.[97] One of the most alluring prospects of Antarctic tourism is that visitors get to interact with Antarctic wildlife, such as penguins and seals.[98] Tourists are offered opportunities to land on the continent at least twice a day, at locations including penguin rookeries.[99] Other activities include camping overnight on the ice, kayaking, climbing and hiking.[100]

In 1991, the International Association of Antarctica Tour Operators (IAATO) was established "to advocate, promote and practice safe and environmentally responsible private-sector travel to the Antarctic."[101] Fifty vessels are listed as member vessels of the IAATO.[102]

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[91] *Id.*

[92] Mulville, *supra* note 31, at 654. Other scientific activities conducted in Antarctica include the studies of: meteorology, geomagnetism, airglow and aurora, the ionosphere, cosmic rays, glaciology, oceanography, seismology, zoology, botany, geology, astronomy, and gravimetric and tidal observations. Casarini, *supra* note 76, at 639, 681.

[93] *See generally* Asia N. Wright, *Southern Exposure: Managing Sustainable Cruise Ship Tourism in Antarctica*, 39 Cal. W. Int'l L.J. 43, 44-45 (2008).

[94] International Association of Antarctic Tour Operators, *2011-2012 Summary of Seaborne, Airborne, and Land-Based Antarctic Tourism* (Aug. 28, 2012), *available at* http://iaato.org/documents/10157/91866/tourism_summary_byexpedition.pdf.

[95] *Tourism Statistics*, International Association of Antarctic Tour Operators, http://iaato.org/tourism-statistics (last visited Mar. 21, 2013).

[96] *Id.*

[97] *Antarctic Highlights*, Lonely Planet, http://www.lonelyplanet.com/antarctica/tours/cruising/antarctic-highlights (last visited Mar. 21, 2013).

[98] *Id.*

[99] *Id.*; *Antarctic Tourism*, Aurora Expeditions, http://www.auroraexpeditions.com.au/antarctic-tours (last visited Mar. 21, 2013).

[100] *Antarctic Tourism*, *supra* note 99.

[101] Steve Wellmeier, *What is IAATO?*, IAATO, http://iaato.org/what-is-iaato (last visited Mar. 21, 2013).

[102] *IAATO Member Vessel Directory 2012-2013*, IAATO, http://apps.iaato.org/iaato/vessel/listVessels.jsp (last visited Mar. 21, 2013).

Moreover, private yacht excursions are allowed in Antarctica.[103] Many organizations offer and promote Antarctic tourism, due to the relatively high demand.[104] There is even an annual South Pole marathon: The Ice Marathon.[105] Recently, Sports Illustrated Magazine conducted a photo shoot in Antarctica.[106] With all of the human activity, there have been some adverse affects on the Antarctic wildlife.

III. Current Issues Confronting Terrestrial Antarctic Wildlife

Human activities have adversely affected terrestrial wildlife in Antarctica. This section discusses the primary human activities in Antarctica that have resulted in animal death.[107]

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[103] *See, e.g.*, *Antarctic Yachting Guidelines*, United Kingdom/Foreign & Commonwealth Office, *available at* http://www.highlatitudes.com/antarctic-yachting-guidelines.pdf; *Yachts*, IAATO, http://iaato.org/yachts (last visited Mar. 21, 2013).

[104] *Antarctica*, Polar Cruises, http://www.polarcruises.com/Antarctica (last visited Mar. 21, 2013); *Antarctica Cruises—Your Ticket to Polar Adventure*, Quark Expeditions, http://www.quarkexpeditions.com/antarctic-expeditions (last visited Mar. 21, 2013); *Antarctica: The Trip of a Lifetime*, Expedition Trips, http://www.expeditiontrips.com/antarctica-cruise.asp?source=travel-leisure&gclid=CNPop62durUCFc6DQgod90MABg (last visited Mar. 21, 2013); *Antarctic Highlights*, *supra* note 96; Antarctic Tourism, *supra* note 99.

[105] *See Antarctic Ice Marathon Races*, IceMarathon, http://www.icemarathon.com (last visited Mar. 21, 2013); Austin Murphy, *South Pole Marathon*, Sports Illustrated (Apr. 29, 2002), http://sportsillustrated.cnn.com/features/siadventure/14/south_pole/.

[106] *See* Steve Rushin, *Wonders of the World: Antarctica with Kate Upton*, Sports Illustrated, at 48; *Kate Upton's Nippy Bikini Shoot—in Antarctica*, The Sun (Dec. 20, 2012), http://www.thesun.co.uk/sol/homepage/news/4707062/kate-upton-bikini-shoot-antarctica.html. The issue even features penguins behind one of the models. *See* Rushin, *supra*, at 50-51, 52.

[107] There are many other situations that have ended in human death or environmental degradation that will not be discussed here, as they have not had an immediate impact on terrestrial animals. One such situation is the series of plane crashes that have occurred in Antarctica, including the 1979 New Zealand Flight 901 crash, and the recent Canadian plane crash. *See* Edwin Cartlidge, *No Survivors in Antarctic Plane Crash*, Sci. Insider (Jan. 27, 2013), http://news.sciencemag.org/scienceinsider/2013/01/no-survivors-in-antarctic-plane.html; Carl Murray & Julia Jabour, *Independent Expeditions and Antarctic Tourism Policy*, 40 Polar Rec. 309, 313 (2004), *available at* http://eprints.utas.edu.au/7624/1/Carl%5B1%5D.Murray,_Article_3.pdf. Another incident was the death of two south-pole skydivers in 1997. Murray & Jabour, *supra*, at 312. A more menacing instance of harmful human activity is the tale of 'Nukey Poo,' a failed nuclear reactor at the McMurdo Sound base that resulted in the U.S. Navy having to remove some 12,200 tons of radioactive dirt from the site, and quietly dispose of it. *See generally* Owen Wilkes & Robert Mann, *The Story of Nukey Poo*, 34 Bull. Atomic Scientists 32, 32-36, (1978). Another incident that has not harmed animals per se, but has the potential to, is the MS Explorer incident, where a cruise ship sank 1300 meters

a. Science

Though perhaps not intended, elements of civilization such as pollution and destruction are consequences of human presence at scientific bases. For decades at the American research base at McMurdo Sound,[108] garbage, including fuel drums and old vehicles, was set out on the ice and would eventually fall through to the ocean floor.[109] Raw sewage and discarded food have been bulldozed into the sea.[110] Consequentially, the bay became so polluted that it was, and remains, one of the most polluted bodies of water on the planet.[111] Human intestinal pathogens diluted in the water have directly threatened local seal populations.[112] While a new sewage treatment plant was installed in 2003, and waste is being recycled and sent back to the United States, the McMurdo Sound seabed remains severely contaminated.[113]

In 1989, an Argentine tourist and supply ship, the *Bahia Paraiso*, ran aground and sank near Palmer Station.[114] As a result, an estimated one million gallons of diesel and jet fuel sloshed into the sea.[115] Researchers

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to the ocean floor with approximately 210 cubic meters of oil, lubricants, and gas, all of which remain today. Thomas Sims, *Protecting Antarctica*, N.Y. Times, Feb. 27, 2011, http://www.nytimes.com/2011/02/28/business/energy-environment/28green.html?_r=1&. In the Humboldt oil spill, the Peruvian supply ship there had a very minor oil spill, in which no animals were harmed. Christopher C. Joyner, *The Effectiveness of CRAMRA*, *in* Governing the Antarctic 152, 163 (Olav Stokke & Davor Vidas eds., 1996). In the MS Nordkapp incident, a Norwegian cruise ship was stranded when it ran aground. *Norwegian Cruise Liner Stranded in Antarctica*, NBC News (Jan. 31, 2007), http://www.msnbc.msn.com/id/16901659#.UOfVnqXrhbw. No animals were harmed in that incident. Other incidents include emergency rescues of hikers, yachters, and other humans in distress. Murray & Jabour, *supra*, at 113-14.

[108] The American base at McMurdo Sound is the largest base in Antarctica, with a population of over 1,000 in the summer, and about 180 in the winter. *Fact Sheet: U.S. Antarctic Program*, Nat'l Sci. Found., Jan. 10, 2013, http://www.nsf.gov/news/news_summ.jsp?cntn_id=102869. While McMurdo Station is a crucial hub for many scientific activities, it also serves as the gateway to Antarctica for many field research teams. *Id.*

[109] Jason C. Anthony, Hoosh: Roast Penguin, Scurvy Day, and Other Stories of Antarctic Cuisine 156 (2012). Such litter was made up of fuel drums, heavy equipment, "honey buckets" (containers of human waste), and beer cans. *Id.* at 156-57.

[110] *Id.* at 157.

[111] *Id.* (stating that "[i]n some areas, beer cans outnumber the sea floor's sponges.").

[112] *Id.*

[113] *Id.*

[114] Zoe A. Eppley & Margaret A. Rubega, *Indirect Effects of an Oil Spill: Reproductive Failure in a Population of South Polar Skuas Following the 'Bahia Paraiso' Oil Spill in Antarctica*, 67 Marine Ecology Press Series 1, 1 (1990), *available at* http://www.int-res.com/articles/meps/67/m067p001.pdf.

[115] *Id.* at 2.

monitoring a skua nesting population at this location compared aspects of the breeding biology before and after the spill.[116] They found that one hundred percent of skua chicks died that breeding season as a result of abandonment due to the oil spill.[117] Adult skuas left to clean themselves, which disrupted the nesting cycle and allowed other skua pairs to attack the undefended chicks, as they do to unattended eggs and young of conspecifics, or members of the same species.[118] Ultimately the entire population lost its young.[119]

Many other diving birds in the area, such as Adélie penguins and Blue-eyed shags, were covered in oil and died of hypothermia, exhaustion or toxicity as a result.[120] Krill and other sea creatures also died because of this spill.[121] Scientists predict that such pollution will create dramatic long-term effects.[122] While long-term effects of oil spills in Antarctica are not well-understood, it is clear that crude oil degrades twenty to fifty times slower at 5°C (41°F) than it does at 25°C (77°F)."[123] It will take even longer to degrade in the icy waters of Antarctica.[124]

Airplanes are ideal for traversing the huge distances involved in moving to and within Antarctica, as well as avoiding the difficulties that ships face in the varying icy conditions.[125] The French began building an airstrip at their Dumont d'Urville base in 1983.[126] This construction took place on the rocky Adélie coastline in East Antarctica and ruined some of the continent's premium bird breeding areas.[127] Many Adélie penguins and cape pigeons were killed and penguin eggs crushed

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[116] *Id.*

[117] *Id.* at 2, tbl.1.

[118] *Id.* at 4.

[119] *Id.*

[120] *Id.* at 4-5.

[121] Woodruff A. Polk, *Welcome to the Hotel Antarctica: The EPA's Interim Rule on Environmental Impact Assessment of Tourism in Antarctica*, 12 Emory Int'l L. Rev. 1395, 1400-01 (1998).

[122] Cousteau & Charrier, *supra* note 8.

[123] U.S. Cong., Office of Tech. Assessment, OTA-O-428, Polar Prospects: A Minerals Treaty for Antarctica, 125, 139 (1989).

[124] *Id.*; *see* Rachel Williams, *Tourism Threat to Earth's Last Great Wilderness*, The Guardian (Apr. 29, 2007), *available at* http://www.guardian.co.uk/environment/2007/apr/30/travelsenvironmentalimpact.frontpagenews (noting that heavy fuel oil is persistent and difficult to clean up, and that a spill of a hundred of tons of heavy oil could coat thousands of penguins).

[125] Casarini, *supra* note 76, at 656.

[126] Angelini & Mansfield, *supra* note 14, at 178.

[127] *Penguins*, Indianapolis Zoo, http://www.indyzoo.com/SitePages/AboutTheZoo/Penguins.aspx (last visited Mar. 21, 2013).

during construction.[128] Some penguins were removed by truck from their nesting sites and unsuccessfully transplanted to new breeding grounds.[129] Competition for breeding space is difficult and the French activities at Pointe Géologie exacerbated that problem.[130] Ironically, the breeding area was ruined in vain: the airstrip was never used and was eventually destroyed by tidal wave and storm damage in 1994.[131] The airstrip is seen as "an ecological and financial nightmare."[132]

Another problem caused by scientists is the introduction of invasive species. In 2011, studies revealed that fresh fruit and vegetables sent to Antarctica were laden with non-native insects and plant seeds that posed a risk of entering the delicate ecosystem.[133] Non-native species could gain a foothold on the continent, which would negatively impact ecosystems by causing disease to the relatively primitive life that has never been exposed to foreign disease.[134] Cats, mice, and rats have also devastated bird populations on surrounding Antarctic islands.[135] Although they have not reached the mainland yet, scientists fear they could survive by hiding in the research stations.[136]

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[128] Angelini & Mansfield, *supra* note 14, at 178. Penguins were "killed when land areas were dynamited to level the islands and create archipelagic fill." Christopher C. Joyner, *Protection of the Antarctic Environment: Rethinking the Problems and Prospects*, 19 Cornell Int'l L.J. 259, 269 (1986).

[129] Joyner, *supra* note 128.

[130] *Penguins*, *supra* note 127. Dumont d'Urville base is the base at Pointe Géologie. Guillaume Dargaud, *Winter Over at Dumont d'Urville*, Dargaud, http://www.gdargaud.net/Antarctica/WinterDdU.html (last updated Feb. 24, 2013).

[131] Dargaud, *supra* note 130 (calling the airstrip "much debated" and a "financial nightmare."); *Penguins*, *supra* note 127.

[132] Dargaud, *supra* note 130. *See generally* T. Micol & P. Jouventin, *Long-Term Population Trends in Seven Antarctic Seabirds at Pointe Géologie (Terre Adélie)*, 24 Polar Biology 175 (2001), *available at* http://www.cebc.cnrs.fr/publipdf/2001/MPB24.pdf (examining the long-term impact of breeding population trends for seabirds at Pointe Géologie affected by the construction of the airstrip).

[133] Kevin A. Hughes et al., *Food for Thought: Risks of Non-Native Species Transfer to the Antarctic Region with Fresh Produce*, 144 Biological Conservation 1682, 1684-85 (2011), *available at* http://ecobio.univ-rennes1.fr/Fiches_perso/Banque/publi2_MLebouvier.pdf; Richard Gray, *Food Shipments Introduce Alien Species to Antarctica*, The Telegraph (Apr. 17, 2011), http://www.telegraph.co.uk/news/worldnews/antarctica/8455800/Food-shipments-introduce-alien-species-to-Antarctica.html. The researchers examined 11,250 pieces of fruit and vegetables sent to nine research stations in Antarctica and the surrounding islands. Hughes, *supra*, at 1683. They found soil on twelve percent of the food, mostly leafy vegetables, and fifty-six foreign invertebrates. Hughes, *supra.* Soil in the shipments contained slugs, spiders, weevils, caterpillars, and fungi known to cause plant diseases. Hughes, *supra* at 1685 tbl.2.

[134] Gray, *supra* note 133.

[135] *Id.*

[136] *Id.*

Studies have detected pathogens common to domestic poultry in penguin colonies.[137] Scientists suspect that the diseases came from carelessly discarded poultry or human waste.[138] Such diseases can spread easily once they enter the colony, due to the density of penguin breeding grounds and the large amounts of guano present.[139] As the human population in Antarctica grows, the risk of non-native species establishing themselves there also grows.[140] As the climate warms, this risk is further increased, as non-native species have a higher likelihood of survival.[141] However, the lingering risks associated with humans do not stop with the scientists.

b. Tourism

While the amount of scientists in Antarctica tops off at around 4,400,[142] the amount of tourists visiting Antarctica each year can exceed the number of scientists by more than ten times.[143] Scientists and environmentalists fear that the visitors could wreak havoc on the environment that is home to seals and penguins.[144]

Some rules and regulations govern tourist behavior in Antarctica or act as guidelines.[145] However, tourists are often ignorant or inattentive to these rules and guidelines. For example, on December 14, 2011, two tourists on a hike were caught dispersing barley seeds at Teflon Bay, in violation of the rules against invasive species.[146] A scientist who visited

[137] *See* Petra Griekspoor et al., *Campylobacter Jejuni in Penguins, Antarctica*, 15 Emerging Infectious Diseases 847 (2009), *available at* http://wwwnc.cdc.gov/eid/article/15/5/08-1160_article.htm; *Penguins*, *supra* note 127; Gary Miller et al., *A Virus Amongst*, 15 Austl. Antarctic Mag. 12 (2008), *available at* http://www.antarctica.gov.au/about-us/publications/australian-antarctic-magazine/2006-2010/issue-15-2008/science/a-virus-amongst-the-penguins.

[138] Griekspoor, *supra* note 137, at 848; Miller, *supra* note 137, at 12; *Penguins*, *supra* note 126. However, there is also speculation that the disease was transferred by migratory birds that picked up their disease during offshore feeding excursions which can be over a thousand miles away. Miller, *supra* note 135, at 12.

[139] Griekspoor, *supra* note 137, at 848.

[140] Gray, *supra* note 133.

[141] *Id.*

[142] *World Factbook: Antarctica: People and Society*, *supra* note 88.

[143] *See, e.g.*, IAATO, *2007-2008 Summary of Seaborne, Airborne, and Land-Based Antarctic Tourism* (Aug. 21, 2008), *available at* http://iaato.org/c/document_library/get_file?uuid=bcd40dfe-3145-4951-88e4-915b59448b03&groupId=10157. While the number of tourists in Antarctica did decrease each season after 2007-2008, the most recent 2012-2013 season saw a 29% increase from the year before to 34,375 tourists. IAATO, *Report of the International Association of Antarctica Tour Operators 2012-13*, at 3 (Antarctic Treaty Consultative Meeting, Information Paper 99, 2013).

[144] Sims, *supra* note 107.

[145] *See infra*, Part IV.

[146] IAATO, *Report of the International Association of Antarctica Tour*

Antarctica once observed passengers feeding and touching penguins; passengers throwing stones at penguins to get a better camera shot; crew members throwing lit cigarettes within ten meters of a penguin nest; shore guides with no previous Antarctic experience; groups of over one hundred ashore at a single time, passengers exceeding the recommended 25:1 tourist-to-guide ratio; and trash left behind, such as plastic bags, matches, cigarettes, as well as food waste discharged into an enclosed bay.[147] In addition to the tourists and tour operator crews, most of the small vessels and private yachts that travel to Antarctica are completely nonobservant of the rules.[148]

The "Ice Marathon" is an annual twenty-six-mile race through the Antarctic wilderness that is currently sold out through 2015.[149] One year, a PowerBar wrapper blew out of a runner's hand, leading to complaints filed with the U.S. Environmental Protection Agency and with Chile, which operates a nearby base.[150] Although this incident did not harm any animals, it is an example of the carelessness or blatant disregard for Antarctic law that could lead to harm to Antarctic animals or their environment.

Some of the largest cruise ships, such as the *Marco Polo*, a former troopship, spend twelve hours shuttling over four hundred passengers to and from breeding sites, increasing human exposure to animals.[151] One problem with this is that human interaction can lead to immediate harm to Antarctic wildlife. On February 11, 2012, a Gentoo penguin chick was injured when it approached passengers and a tripod was knocked over.[152] The baby penguin could not walk afterwards and was

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Operators 2011-12: Tourism Incidents 2011-12 (XXXV Antarctic Treaty Consultative Meeting, Hobart, Austl.), May 5, 2012, at 5, [hereinafter *2011-12 Tour Operators Report*] *available at* http://iaato.org/current-iaato-information-papers (last visited Mar. 25, 2013). The seeds were collected, additional seeds were confiscated, and the group was carefully monitored at future landings. *Id.*

[147] Debra J. Enzenbacher, *Antarctic Tourism and Environmental Concerns*, 25 Marine Pollution Bull. 258, 264 (1992); Angelini & Mansfield, *supra* note 14, at 180 n.122. Tourists and crews are not alone in engaging in this sort of behavior—scientists on their days off also come ashore, smoke cigarettes, and approach too close to the animals. Rod McGuirk, *Antarctica Concerns Grow as Tourism Numbers Rise*, Yahoo! (Mar. 18, 2013), http://news.yahoo.com/antarctica-concerns-grow-tourism-numbers-rise-053737703.html.

[148] Sims, *supra* note 107.

[149] *Id. See generally Antarctic Ice Marathon Races*, *supra* note 104; Laura Blue, *Running with the Penguins*, Time (Mar. 13, 2007), http://www.time.com/time/world/article/0,8599,1598511,00.html.

[150] Sims, *supra* note 107. After three years of defending his privilege to run in Antarctica, the race's organizer explains that the future of the race depends on each of the runners. *Id.* PowerBar wrappers are now banned. *Id.*

[151] Helvarg, *supra* note 66.

[152] *2011-12 Tour Operators Report*, *supra* note 146.

observed being attacked by conspecifics.[153] The tiny penguin had to be euthanized.[154] In another incident, an elephant seal, possibly disturbed by visitors, ended up going over a cliff.[155]

Antarctic wildlife has no fear of humans as they have evolved free of land predators and there have never been indigenous human populations who hunted them.[156] As a result, penguins will approach people out of curiosity, perhaps nibbling on a boot before waddling away with an air of satisfaction.[157] Despite a rule prohibiting tourists from approaching within fifteen feet of wildlife,[158] some tourists will lay down fifteen feet away and wait for the wildlife to approach them.[159] Sheathbill "mutts" are scavenger birds at the bottom of the Antarctic hierarchy, who wait outside kitchens for scraps.[160] There is a danger that Antarctic animals could become too familiar with humans, or worse, like the mutts, dependent on them. Should humans decide to hunt Antarctic animals, the animals would be easy prey, as they were in the 1800s.

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[153] *Id.*

[154] *Id.*

[155] Secretariat of the Antarctic Treaty, *Final Report of the Thirty-Fourth Antarctic Treaty Consultative Meeting* (XXXIV Antarctic Treaty Consultative Meeting, Buenos Aires, Arg.), July 1, 2011, at 122, *available at* http://www.ats.aq/documents/ATCM34/fr/ATCM34_fr002_e.pdf (last visited Mar. 25, 2013). The incident occurred in an area of high biodiversity, which was frequently visited until 2007, when stringent regulations were put in place. Secretariat of the Antarctic Treaty, *Proposed Amendment to Antarctic Treaty Site Guidelines for Hannah Point* (XXXIV Antarctic Treaty Consultative Meeting, Buenos Aires, Arg.), July 1, 2011, at 2, *available at* http://www.ats.aq/documents/ATCM34/fr/ATCM34_fr001_e.pdf. Despite the regulations, and precautionary measures such as an Expedition Leader with twenty years of experience working for a company that has been a member of the IAATO for almost twenty years, warnings to passengers about the sensitive nature of the area, and staff members positioned around the site to manage visitors, passengers formed a horseshoe around the seals. *Id.* When they were asked not to do so, passengers dispersed, but some time later, a seal walked away from its group, and slid down a six-seven meter cliff into the shallow water below. *Id.*

[156] Acret, *supra* note 49; David Krakowski & Isidro Bosch, *Birds and Seals of Antarctica*, Geneseo, http://www.geneseo.edu/~antarc/week7/ (last visited Mar. 21, 2013). In contrast, Arctic seals have a vast history of being hunted. Grete K. Hovelsrud, *Marine Mammal Harvests, and Other Interactions with Humans*, 18 Ecological Applications S135, S137-S140 (2008), *available at* http://www.jstor.org/stable/40062161?seq=6.

[157] Acret, *supra* note 49.

[158] *Help Protect the Environment*, IAATO, http://iaato.org/protecting-the-environment (last visited Mar. 22, 2013).

[159] Tom Dempsey, *Curious Gentoo Penguin Chicks*, PhotoSeek, http://photoseek.photoshelter.com/image/I00007NMUUjqJGj8 (last visited Mar. 22, 2013) ("'Don't approach penguins closer than 15 feet,' says an Antarctic tourism rule in 2005. But if you lie down on the ground more than 15 feet away, a curious Gentoo Penguin chick may approach you.").

[160] *Antarctic Penguins*, *supra* note 48.

This could endanger wildlife populations and lead to mass death or extinction. Moreover, if the animals become dependent on humans and humans leave Antarctica, animals would lose what they have learned to depend on. Alternatively, if the animals become too familiar with people, they could learn to fear us and become much more difficult to study.[161]

Tourism could also adversely affect Antarctic plants. Environmentalists are worried that tourists coming ashore could trample mosses and lichens.[162] A boot print in a rare patch of moss can remain visible for years; the moss takes twenty-five years to grow an inch, and struggles to regenerate in the perpetual freeze.[163] If a boot print remains for decades, cigarette butts, PowerBar wrappers, batteries and fuel drums will remain much longer.[164]

Invasive species accompany tourists, as they do scientists.[165] Aside from the intentional spreading of seeds,[166] a much more common problem occurs when tourists unintentionally bring plant seeds to Antarctica on their shoes and clothing.[167] Besides plants, tourists also bring mobile creatures with them. One completely terrestrial creature that humans have brought to Antarctica is the midge fly.[168] This small creature has established itself on the Antarctic Peninsula.[169] It is speeding up the rate that decomposition occurs, and is essentially a new process in the simple Antarctic ecosystem.[170] While one tiny fly might not seem to be very disruptive, Antarctic species are highly vulnerable to disturbances, and even a slight change, such as faster soil decay, could be a major shift for the delicate ecosystem.[171]

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[161] *See* Suzanne Phillippus, *MT Scientists Studying Weddell Seals in Antarctica*, 8KPax.com, http://kpax.com/news/mt-scientists-studying-weddell-seals-in-antarctica/#!prettyPhoto/0/ (last updated Feb. 26, 2013).

[162] Williams, *supra* note 125.

[163] Kimball, *supra* note 65.

[164] *See* Angelini & Mansfield, *supra* note 14, at 165.

[165] Tourists present a more probable source of invasive species. *See* Scientific Committee on Antarctic Research, *Preliminary Results from the International Polar Year Programme: Aliens in Antarctica*, May 3-14, 2010, at 3, XXXIII Antarctic Treaty Consultative Meeting, Punta del Este, Uru., *available at* http://www.ats.aq/documents/ATCM33/wp/ATCM33_wp004_e.doc.

[166] *See supra* Part III.B.

[167] Gray, *supra* note 133.

[168] *See* Claire Christian, *Antarctica Braces for Influx of Invasive Species*, Nat'l Geographic (Jan. 7, 2013), http://newswatch.nationalgeographic.com/2013/01/07/antarctica-braces-for-influx-of-invasive-species/; *There Goes the Ecosystem: Alien Animals Invade Antarctica*, Smithsonian (Jan. 9, 2013), http://blogs.smithsonianmag.com/smartnews/2013/01/there-goes-the-ecosystem-alien-animals-invade-antarctica/.

[169] Christian, *supra* note 168.

[170] *Id.*

[171] *Id.*; Smithsonian, *supra* note 168.

c. Harvesting Living and Mineral Resources

Other economic activities in Antarctica could also have a major impact on animals. While hunting is not a present threat, it is a major problem that could potentially reemerge.[172] In the past, commercial penguin egg collecting caused major damage to rookeries, where penguins breed.[173] Penguins and seals were slaughtered for their blubber and oil.[174] Krill fishing could have a potentially disastrous effect on the entire Antarctic ecosystem, although their capture is not economically viable.[175] The market for krill is small because of the high costs associated with working in Antarctica.[176] Hunting is a direct and immediate threat to the well being of Antarctic animals. Even the harvesting of krill has an immediate impact on Antarctic terrestrial creatures, as nearly all vertebrates in Antarctica depend on krill for survival.[177] Hunting is not a current threat, due to economic impracticality and legal issues, and will not be addressed further in this article.[178] However, it could someday return, and it is thus important to recognize hunting as a lingering threat to Antarctic terrestrial wildlife.

Mineral harvesting can harm animals through destruction of the environment,[179] but there is currently a complete ban on mineral resource activities in Antarctica.[180] Little is known about the mineral wealth of the

[172] Austl. Antarctic Div., *supra* note 60; *Penguins*, *supra* note 127.

[173] *Penguins*, *supra* note 127.

[174] Angelini & Mansfield, *supra* note 14, at 172-73; *Penguins*, *supra* note 127.

[175] The extreme perishability of krill means that they must be processed very quickly after capture. Gulland, *supra* note 13, at 223. But fishermen have come for another fish, the Patagonian Toothfish. Andy Isaacson, *In a Changing Antarctica, Some Penguins Thrive as Others Suffer*, N.Y. Times, May 9, 2011, http://www.nytimes.com/2011/05/10/science/10penguins.html?pagewanted=all&_r=1&. Penguins are benefiting from the destruction of the Patagonian Toothfish, as they compete with it for Antarctic silverfish. *Id.* However, killer whales, which eat the Toothfish, have been seen less since a fishery in the Ross Sea opened in 1996, suggesting that the fishery is affecting the ecosystem. *Id.*

[176] Gulland, *supra* note 13, at 220.

[177] Trivelpiece, *supra* note 41.

[178] *See, e.g.*, Angelini & Mansfield, *supra* note 14, at 189.

[179] *See* Convention on the Regulation of Antarctic Mineral Resource Activities pmbl. cl. 8, June 2, 1988, 27 I.L.M. 868 [hereinafter CRAMRA]; Hoitink, *supra* note 24, at X; Rüdiger Wolfrum, *The Exploitation of Antarctic Mineral Resources: Risks and Stakes*, *in* The Antarctic Env't & Int'l Law 27, 27 (Joe Verhoeven et al. eds., 1992).

[180] *See* Protocol on the Environmental Protection to the Antarctic Treaty art. 7, Oct. 4, 1991, 30 I.L.M. 1455, 1464 [hereinafter, Madrid Protocol]. The fifty-year ban on harvesting minerals began in 1991, and thus, for those not well versed in the ancient mysteries of arithmetic, twenty-eight years remain on the ban. *Id.*; *see infra* Part IV.A.

vast majority of Antarctica,[181] and to date, minerals have only been found in small, non-commercial quantities.[182] Further, the turbulent conditions of the Southern Ocean make commercial exploitation of Antarctic minerals economically non-viable, especially when mineral resources are more exploitable in more accessible areas of the globe.[183] As the world's resources diminish, mining in Antarctica could be inevitable, and it may become a controversial issue in the future.[184] However, due to the current ban, this article will not discuss mineral harvesting further.

d. Climate Change

Climate change does not affect animals as directly as other human activities, but its ramifications are magnitudes greater, as it affects entire populations of species across the globe. Adélie penguins, which experts refer to as the "bellwether of climate change," inhabit a narrow environmental range, and thus make an ideal indicator of environmental shifts.[185] They are completely dependent on sea ice,[186] and cannot move any farther south because of their need for light in the winter.[187] If global temperatures continue to rise, Adélie penguins will have nowhere to go.[188] Their only options are to adapt,[189] move to new territory, or face extinction.[190]

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[181] Christopher C. Joyner, *The Evolving Minerals Regime for Antarctica*, *in* The Antarctic Legal Regime 129, 131 (Christopher C. Joyner & Sudhir Chopra eds., 1988).

[182] *World Factbook: Antarctica: Geography: Natural Resources*, CIA *available at* https://www.cia.gov/library/publications/the-world-factbook/geos/ay.html#top (last visited Mar. 22, 2013).

[183] Joyner, *supra* note 181.

[184] *Mining and Antarctica*, Antarctic and Southern Ocean Coalition, http://www.asoc.org/component/content/article/67 (last visited Mar. 23, 2013).

[185] Millar, *supra* note 22; Isaacson, *supra* note 175. *See generally* David G. Ainley, The Adélie Penguin: Bellwether of Climate Change (2002) (examining the Adélie penguin, and its relation to its ecosystem and the global climate).

[186] Jaume Forcada, *Contrasting Population Changes in Sympatric Penguin Species in Association with Climate Warming*, 12 Global Climate Change Biology 411, 412, 419-20 (2006), *available a*t http://faculty.jsd.claremont.edu/emorhardt/159/pdfs/2007/Forcada%20et%20al,%202006.pdf; Isaacson, *supra* note 173. During the winter, Adélie penguins survive on the sea ice, in order to avoid the perpetual darkness that consumes their breeding grounds, the rocky shores of mainland Antarctica. *Id.* Adélie penguins are the only Antarctic penguin species that breed on the ice-free areas of the continent. *Id.*

[187] Isaacson, *supra* note 175. Penguins need the light to hunt, navigate, and to comfort them in avoiding predators. *Id.*

[188] Millar, *supra* note 22, at 114.

[189] Studies have shown adaptive responses, and increased speciation. *Id.* at 118. Scientists look forward to tracking evolutionary changes in Adélie penguin populations. *See id*. at 118-19.

[190] *See id.* at 116-18.

Currently, Adélie penguin populations on the northernmost part of Antarctica, the Antarctic Peninsula, have collapsed because of climate change.[191] The Antarctic Peninsula is one of the most rapidly warming regions of Earth,[192] and the sea ice there is melting expeditiously.[193] The insurgency of warmer seawaters around the Antarctic Peninsula means that sea ice melts faster and is around for less of the year.[194] As a result,

[191] *See* Heather J. Lynch et al., *Population Trends and Reproductive Success at a Frequently Visited Penguin Colony on the Western Antarctic Peninsula*, 33 Polar Biology 493, 499-00 (2010), *available at* http://www.oceanites.org/science/science_papers/Popul_trend_PETE_PolarBiology2010.pdf; Isaacson, *supra* note 173. Over the past three decades, the Adélie penguin population on the Peninsula has dropped by nearly ninety percent. *Id. But see* Trivelpiece, *supra* note 41, at 7625 (stating that this loss may be a result of decreased krill biomass, as the non-ice dependent chinstrap penguin is also suffering from the ice sheet decrease). What the ice sheet melting is actually causing is less phytoplankton, which develops underneath the ice sheets, and this is leading to the decreased krill biomass, and thus fewer penguins, which depend on the krill to survive. *Issacson*, *supra* note 175. This theory that correlates penguin viability with krill biomass also explains why penguin populations surged following the harvesting of seals and whales, and why they have decreased as a response to the recovery of whale populations. Trivelpiece, *supra* note 41, at 7625-26. This is called the krill-surplus hypothesis. *Id.* Either way, the decrease in penguin populations in the Antarctic Peninsula is linked to climate change and ice loss. *Id.* at 7627 fig.2. Krill fishing is also regarded as contributing to penguin decline, as it is direct competition with the penguins for food. *See id.* The chinstrap penguin is in grave danger, as it is essentially confined to the Antarctic Peninsula. Forcada, *supra* note 186, at 412; Trivelpiece, *supra* note 41, at 7627. Aside from being competitors for food, fisheries also catch some Antarctic seabirds in their nets. *See* Christophe Barbraud et al., *Effects of Climate Change and Fisheries Bycatch on Southern Ocean Seabirds: A Review*, 454 Marine Ecology Progress Series 285, 294-95 (2012), *available at* http://darchive.mblwhoilibrary.org:8080/bitstream/handle/1912/5240/m454p285.pdf?sequence=1.

[192] The mean air temperature on the Western Antarctic Peninsula has risen almost eleven degrees Fahrenheit over the past fifty years. Trivelpiece, *supra* note 41, at 7625 (5-6°C increases in mean winter air temperature, and associated decreases in sea ice cover in the winter); Isaacson, *supra* note 175.

[193] Christophe Barbraud et al., *Comparison of Emperor Penguin Declines Between Pointe Géologie and Haswell Island Over the Past 50 Years*, 23 Antarctic Sci. 461, 465 (2011), *available at* http://www.cebc.cnrs.fr/publipdf/2011/BAS23_2011.pdf. Entire ice shelves have shattered in the Peninsula, the warmest and northernmost part of the continent. Walker, *supra* note 1. The removal of peripheral ice enables the movement of inland ice into the sea. Andrew C. Revkin, *Earth in Flux: An Antarctic Ice Shelf Crumbles*, N.Y. Times, Mar. 25, 2008, http://dotearth.blogs.nytimes.com/2008/03/25/earth-in-flux-the-antarctic-ice-shelf-crumbles/. If the floating ice shelves do not raise the sea level, the ice from the continent's interior ultimately will. *Id.* The ice sheets act as a giant conveyor belt: peripheral ice carries ice from the interior into the Southern Ocean. Devin Powell, *Big Antarctic Ice Sheet Appears Doomed*, 181 Sci. News 5, 7 (2012), *available at* http://www.sciencenews.org/view/generic/id/340580/description/Big_Antarctic_ice_sheet_appears_doomed.

[194] Christine Dell'Amore, *Polar Ice Sheets Shrinking Worldwide*, *Study Confirms*, Nat'l Geographic (Nov. 29, 2012), http://news.nationalgeographic.com/news/2012/11/121129-global-warming-climate-change-ice-sheets-science-environment/; Isaacson, *supra* note 173.

Adélie populations in the Antarctic Peninsula have plummeted by nearly ninety percent.[195] In the wake of this disappearance, Gentoo penguins, which can survive without sea ice, are moving in, and their numbers have surged by 14,000 percent.[196]

However, in other parts of Antarctica, Adélie penguins are thriving. Ross Sea colonies of Adélie penguins flourish where the sea ice cover is growing.[197] However, the growth of the Ross Sea ice sheet is predicted to reach a tipping point in roughly thirty to forty years, when global climate change will catch up to it and cause it to melt and recede.[198] As the sea ice retreats, penguins must move farther south; they will find themselves unable to escape the eternal night, and they will die out from loss of habitat, and their extreme phobia of darkness.[199]

Like Adélie penguins, the fate of Emperor Penguins is closely linked to the sea ice, which they are highly dependent upon.[200] One of the

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[195] Isaacson, *supra* note 175. Tourists visiting penguin breeding grounds are also seen as a non-negligible factor that can cause populations to decline, although sea ice degradation is a much more powerful factor and a much greater source of population size variation over a much wider spatial scale. A. Kato et al., *Changes in Adélie Penguin Breeding Populations in Lützow-Holm Bay, Antarctica, in Relation to Sea-Ice Conditions*, 25 Polar Biology 934, 934 (2002), *available at* http://docyaounde.free.fr/akatoHP/pdf/KatoPB25.pdf.

[196] Isaacson, *supra* note 175. Gentoo penguins are found farther North, as well as in continental Antarctica. Millar, *supra* note 21. For a case study of a specific breeding ground of Adélie and Gentoo penguins on the Antarctic Peninsula, see Lynch, *supra* note 191 (finding a twenty-seven percent increase in Gentoo population size, and a twenty-nine percent reduction in the size of an Adélie penguin population on the same island).

[197] Isaacson, *supra* note 175. *See generally* R.H. Taylor & P.R. Wilson, *Recent Increase and Southern Expansion of Adélie Penguin Populationsin the Ross Sea, Antarctica, Related to Climatic Warming*, 14 N.Z. J. Ecology 25 (1990), *available at* http://www.newzealandecology.org.nz/nzje/free_issues/NZJEcol14_25.pdf. However, when an iceberg the size of Jamaica fell into the water, the penguins had to move seventy kilometers to find open water to forage for food. Isaacson, *supra* note 175. Now the iceberg is broken up, and the penguins are thriving again. *Id.* (noting however, that speculation exists that the growth in penguin colonies in the Ross Sea is furthered by the removal of Patagonian Toothfish from that region by fishing). The East Antarctic ice sheet has grown by roughly fourteen billion tons a year. Dell'Amore, *supra* note 194. However, West Antarctica has lost sixty billion tons of ice per year, and the Antarctic Peninsula alone is losing twenty billion tons of ice per year. Isaacson, *supra* note 175; *see also* Dell'Amore, *supra* note 194 (noting that the increases in ice in East Antarctica dovetail with the expected increases in snowfall associated with climate change).

[198] Isaacson, *supra* note 175. While the bulk of the Antarctic ice sheet is either unchanged or getting thicker, polar ice overall is melting. Mark Halper, *Global Warming? Antarctic Ice Growing Thicker*, Smartplanet, Nov. 30, 2012, 3:33 AM, http://www.smartplanet.com/blog/bulletin/global-warming-antarctic-ice-growing-thicker/7056. In Antarctica, a key indicator of this is the thawing of the Peninsula. *Id.*

[199] Isaacson, *supra* note 175; *Penguins*, Antarctic and Southern Ocean Coalition, http://www.asoc.org/issues-and-advocacy/antarctic-wildlife-conservation/penguins (last visited Mar. 22, 2013).

[200] Barbraud, *supra* note 193, at 461; Isaacson, *supra* note 175.

Antarctic Peninsula's only Emperor Penguin colonies is now extinct.[201] In the more representative, and distant, colonies at Haswell Island and Pointe Géologie, both colonies are in decline, which is likely caused by a common, large-scale environmental factor.[202] Like the Adélie penguins, the Emperor Penguin colonies in the Ross Sea area are stable, but may be affected as a result of climate change in years to come.[203] On a positive note, satellite images of penguin fecal stains in 2009 have revealed new colony locations, which puts the total Emperor Penguin population at near 600,000, which is double previous estimates.[204] Despite these findings, scientists still worry that global warming will ultimately devastate Emperor Penguin populations.[205]

Invasive species are not just a problem accompanying tourism and scientific undertakings on the seventh continent. Through global warming, invasive species can invade Antarctica in much larger ways than by simply latching onto a visiting human's gear. In 2009, king crabs started appearing on the outer continental slope of the Antarctic Peninsula.[206] These crabs cannot survive at temperatures below thirty-four degrees Fahrenheit, with the result that sea creatures in the Southern Ocean have not developed defenses against their crushing pincers.[207] But now, an estimated 1.5 million king crabs that have

[201] Isaacson, *supra* note 175. *But see* Barbraud, *supra* note 193 (noting that this could also be explained by the colony's relatively small size, as small penguin colonies usually have sub-par breeding success.). The only other emperor penguin colony on the Antarctic Peninsula is located on Snow Hill Island, and could be in perilous danger, due to projected sea ice conditions. *Id.* at 466. For an in-depth analysis of the demise of this colony, see Philip N. Trathan et al., *First Recorded Loss of an Emperor Penguin Colony in the Recent Period of Antarctic Regional Warming: Implications for Other Colonies*, 6 PLOS | ONE 1 (2011), *available at* http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0014738 (concluding that changing sea ice conditions had a major impact on the demise of this colony, although this conclusion is based on limited data).

[202] Barbraud, *supra* note 193. Like the Adélie penguins, this loss could also be attributable to the krill biomass hypothesis. *Cf. supra* note 191 and accompanying text. But ice sheets in Eastern Antarctica, where Haswell Island and Pointe Géologie populations live, have been growing since the 1980s. Barbraud, *supra* note 193, at 465-66. A new hypothesis, which still needs to be tested, postulates that Emperor penguins actually need ice to be in an intermediate range, and that too little or too much ice can affect their ability to breed. Barbraud, *supra* note 193, at 466; *see* Micol, *supra* note 132, at 180-81 Fig.2-a (studying Emperor penguins at Pointe Geéologie, and noting that their population shows a significant decline).

[203] Stéphanie Jenouvrier, *Demographic Models and IPCC Climate Projections Predict the Decline of an Emperor Penguin Population*, 106 Proc. Nat'l Acad. Sci. U.S. 1844, 1846 (2009), *available at* http://www.jstor.org/stable/40421684?seq=3.

[204] Reuters, *supra* note 53; *see* Fretwell, *supra* note 52, at 545-49.

[205] Barbraud, *supra* note 193, at 466; Jenouvrier, *supra* note 203; Micol, *supra* note 132, at 180-81; Reuters, *supra* note 53.

[206] Christian, *supra* note 168.

[207] *Id.*

established themselves near the rapidly warming Antarctic Peninsula.[208] The range of these "ecosystem destroyers" will increase as the warmth of the water surrounding Antarctica increases.[209] While king crabs may not directly affect terrestrial Antarctic wildlife, their presence on the Antarctic Sea Floor is proof that humans have affected every facet of the Earth's environment.[210] Like king crabs, other species may naturally migrate to Antarctica as the climate changes. This could affect the delicate Antarctic ecosystems, and potentially have massive impacts on Antarctic terrestrial wildlife.[211]

A major complication that makes global warming extremely dangerous is its difficulty to reverse.[212] Policies aimed at slowing climate change will be slow to implement, due to the inertia of Earth's climatic system.[213] For Antarctic creatures, this creates a big problem, as they are slow to adapt due to their long generation cycles, and the rapid nature of environmental effects in their home.[214] Melt-off from Antarctica's ice sheets could have further adverse effects on terrestrial wildlife around the globe, and people as well.[215] The melt-off of massive amounts of ice from Antarctica will lead to a rise in sea levels.[216] Consequences of such a rise include major environmental damage,[217] and the displacement of large amounts of people and animals.[218]

IV. The Current Management Regime Under the Treaty

Because it was never inhabited, there was never a human population to create laws or legal principles to govern Antarctic activities, jurisdiction over territory, or resources.[219] A conceptual framework meant to govern the global commons, called the "common heritage of mankind," now governs Antarctica.[220]

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[208] *Id.*

[209] *Id.*

[210] *Id.*

[211] Changes to the ecosystem could cause major shifts to the delicate Antarctic ecosystem, and any change could disturb the native species. *See id.*

[212] Barbraud, *supra* note 191, at 298; Christian, *supra* note 168.

[213] Barbraud,, *supra* note 191, at 298.

[214] *Id.Seabirds: A Review, supra* note 189, at 298.

[215] Dell'Amore, *supra* note 194.

[216] *Id.*; *see* Charles Q. Choi, *Sea Levels Rising Fast on U.S. East Coast*, Nat'l Geographic (June 25, 2012), http://news.nationalgeographic.com/news/2012/06/120625-sea-level-rise-east-coast-us-science-nature-climate-change/.

[217] Such effects include catastrophic floods, such as the one caused by Hurricane Sandy, erosion, and contamination of crops and aquifers. Dell'Amore, *supra* note 194. Higher seas can boost storm surges, and leave even more destruction and flooding. *Id.*

[218] *Id.*

[219] Joyner, *supra* note 20, at 14.

[220] David Hunter, James Salzman & Durwood Zelke, International

a. General Provisions of the Antarctic Treaty System

In the early 1900s, seven countries: Argentina, Australia, Chile, France, New England, Norway, and Great Britain, made geographical claims to Antarctica.[221] The seven claimant states and the five other nations interested in scientific research in Antarctica—Belgium, Japan, South Africa, the United States, and Russia[222]—united during the International Geophysical Year of 1957-58[223] to form the Antarctic Treaty.[224]

The Antarctic Treaty prohibits military bases and weapons testing in Antarctica, except to the extent used for peaceful purposes.[225] The Treaty provides for freedom of scientific research, and encourages international cooperation in that research.[226] It also prohibits nuclear

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Environmental Law and Policy 452-53 (4th ed. 2011). Antarctica falls outside the bounds of any state, and is thus referred to as the "global commons." *Id.* (internal citations omitted). The general rule for global commons resources has been the right of capture, which less developed countries believes penalizes them for not being able to access the global commons. *Id.* at 453. So, for example, according to the right of capture, the first to capture a fish, or any resource, becomes the rightful owner of that fish or other resource. *Id.* The common heritage of humankind principle is not strictly defined, but typically has four characteristics: 1) being non-subject to appropriation, 2) international management, 3) all states share benefits of any resource exploitation, 4) reservation for peaceful purposes. *Id.* at 455-56. Aside from Antarctica, the common heritage of humankind principle has limited application, mostly to the moon and outer space, although it remains an important concept. *Id.* at 455.

[221] Hoitink, *supra* note 24, at I. The claims cover about eighty-five percent of Antarctica. *Id.*

[222] These states all claim entitlement to making decisions in any matters involving the regulation of Antarctica. Joe Verhoeven, *General Introduction*, *Introduction* to The Antarctic Environment and International Law 11, 12 (Joe Verhoeven et al. eds., 1992). Of the five states without territorial claims, two of them reserved a right to make territorial claims in the future. *Id.* Those two are the United States, and the Soviet Union. *Id.* Japan is one of the most active fishing states and is highly interested in minerals, especially oil. J.R. Rowland, *The Treaty Regime and the Politics of the Consultative Parties*, *in* The Antarctic Legal Regime 11, 23 (Christopher C. Joyner & Sudhir Chopra eds., 1988). However, Japan renounced its ability to make a claim in the 1951 Peace Treaty. *Id.*

[223] The International Geophysical Year was a time of international cooperation in scientific research, undertaken to resolve certain planetary phenomena, where a major focus was Antarctic research. Ellen S. Tenenbaum, *A World Park in Antarctica: The Common Heritage of Mankind*, 10 Va. Envtl. L.J. 109, 117 n.49 (1990). An alternative explanation of the reason for the Antarctic Treaty postulates that the Treaty was created during the Cold War when other claimant states realized that they could not exclude the Soviets, so they wanted a system where they could fit in and contain their presence. Rowland, *supra* note 222, at 16.

[224] Hoitink , *supra* note 24, at II; *see* 1959 Treaty, *supra* note 10, pmbl. cl. 1.

[225] 1959 Treaty, *supra* note 10, art. I.

[226] *See id* arts. II, III. Most of the cooperation is based on the free exchange and availability of research information. *Id.* art. III(1).

waste disposal or testing.[227] Observers, designated by the "Contracting Parties," promote the Treaty's objectives.[228] Article IX of the Treaty provides that the Contracting Parties meet regularly[229] to discuss peace, international scientific cooperation, and facilitation of research and observers.[230]

The meetings referred to in Article IX are called the Antarctic Treaty Consultative Meetings (ATCMs), and the participants are called the Antarctic Treaty Consultative Parties (ATCPs).[231] ATCPs may appoint representatives who attend the meetings, as long as the ATCP demonstrates its "interest in Antarctica by conducting substantial scientific research activity there…."[232] ATCPs may vote on issues relating to Antarctica, and their status as ATCPs allows them to unilaterally determine Antarctic affairs.[233] States who are members of the United Nations, or who are invited to join by all ATCPs, may accede to the Treaty.[234] When a State accedes to the Treaty[235] and demonstrates interest by conducting substantial scientific activity in Antarctica, it becomes an ATCP.[236]

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[227] *Id*. art. V.

[228] *Id.* art. VII(1). The observers have, at all times, complete freedom of access to all areas, installations, and equipment in Antarctica. *Id.* art. VII(1)-(3).

[229] Originally the meetings occurred every two years, but now they are now held annually. Klaus Dodds, *Governing Antarctica: Contemporary Challenges and the Enduring Legacy of the 1959 Antarctic Treaty*, 1 Global Pol'y 108, 110 (2010); *The Antarctic Treaty Consultative Meeting (ATCM)*, Secretariat Antarctic Treaty, http://www.ats.aq/e/ats_meetings_atcm.htm (last visited Mar. 24, 2013).

[230] 1959 Treaty, *supra* note 10, art. IX(1)(a)-(d).

[231] Hoitink, *supra* note 24, at II.

[232] 1959 Treaty, *supra* note 10, art. IX(2). Substantial scientific activity could be establishing a scientific base, or dispatching a scientific expedition. *Id.*

[233] Hoitink, *supra* note 24, at II; *see The Antarctic Treaty Consultative Meeting (ATCM)*, *supra* note 229. Their powers under the Treaty are sizeable, and often go beyond the Treaty in discussing matters that the international agreement has not addressed. Hoitink, *supra* note 24, at II.

[234] 1959 Treaty, *supra* note 10, art. XII(1).

[235] *See id.* art. IX(2).

[236] Hoitink, *supra* note 24, at II. In addition to the original twelve, there are now sixteen other ATCPs, for a total of twenty-eight. *Parties*, Secretariat Antarctic Treaty, http://www.ats.aq/devAS/ats_parties.aspx?lang=e (last visited Mar. 22, 2013). The Netherlands is the only ATCP that has not built its own research station. Dodds, *supra* note 229. However, others have constructed bases, which lead to an overconcentration on the most easily accessible part of the continent, the Antarctic Peninsula. Dodds, *supra* note 229

Countries who have entered the Treaty into force, but have not demonstrated a substantial scientific interest in Antarctica, are non-consultative parties.[237] Non-consultative parties have no decision-making power, but may attend meetings and contribute to discussion.[238] Observers and invited experts may also attend meetings and contribute to discussion, though they may not make any decisions.[239] Measures, resolutions, and decisions are the law of Antarctica, developed and adopted at ATCMs, and must be ratified by all ATCPs, and approved by the respective governments to come into force.[240] Resolutions and decisions are not legally binding, but serve as suggestions.[241] Measures are legally binding once ratified by all ATCPs.[242]

The Antarctic Treaty has since developed into what is now the ATS.[243] In 1982 the Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR) entered into force, with a purpose of conserving Antarctic marine life—a goal that is congruent and parallel

[237] *See* Dodds, *supra* note 229; *The Antarctic Treaty Consultative Meeting (ATCM)*, *supra* note 229; *Parties*, *supra* note 236. Currently, there are twenty-two non-consultative parties. *Id.* The distinction between ATCPs and non-consultative parties has provoked criticism, and critics view the Antarctic Treaty and its progeny as an exclusive club for countries nearby or with enough wealth to establish a scientific presence. Hoitink, *supra* note 24, at IV.

[238] *The Antarctic Treaty Consultative Meeting (ATCM)*, *supra* note 229; *Parties*, *supra* note 236.

[239] *The Antarctic Treaty Consultative Meeting (ATCM)*, *supra* note 229. Observers include the Scientific Committee on Antarctic Research, the Commission for the Conservation of Antarctic Marine Living Resources and the Council of Managers of National Antarctic Programs. *Id.* Invited experts include the Antarctic and Southern Ocean Coalition and the IAATO. *The Antarctic Treaty Consultative Meeting (ATCM)*, *supra* note 229.

[240] Hoitink, *supra* note 24, at II; *The Antarctic Treaty Consultative Meeting (ATCM)*, *supra* note 229. Furthermore, all Measures, Decisions and Resolutions must conform to the principles of the 1959 Treaty and the Madrid Protocol, and also provide regulations and guidelines for management of Antarctica, and the ATCM work. *Id.* For the ATCM Rules of Procedure, see *Final Report of the Thirty-Fourth Antarctic Treaty Consultative Meeting*, *supra* note 155, annex 2 Decision 2, at 217.

[241] *The Antarctic Treaty Consultative Meeting (ATCM)*, *supra* note 229. Decisions address internal organizational matters of the ATCM, and resolutions strongly encourage certain behaviors. *Id*. They can be seen as advising appropriate courses of action, where applicable, but are not binding. Martin Lishexian Lee, *A Case for World Government of the Antarctic*, 9 Gonz. J. Int'l L. 73, 85 (2006).

[242] *The Antarctic Treaty Consultative Meeting (ATCM)*, *supra* note 229.

[243] Hoitink, *supra* note 24, at II; Verhoeven, *supra* note 222, at 14; Dodds, *supra* note 222, at 108. The ATS specifically refers to all instruments used in the international governance of Antarctica. Hoitink, *supra* note 24, at II-III. This remains the only international regime to successfully manage the affairs of an entire continent. *Id.* at 3.

to the focus of this paper.[244] The CCAMLR is dedicated to preserving sea life such as krill, birds, and seals by assessing their relationships with their environments and other species.[245] It seeks to balance the ecological interdependence between species and their dependent predators.[246]

In 1991, the Madrid Protocol on Environmental Protection (Madrid Protocol), and its annexes eliminated any issues regarding mineral rights by placing a fifty-year ban on "[a]ny activity relating to mineral resources, other than scientific research."[247]

The Madrid Protocol is the most important development in the ATS since the original treaty.[248] It designates Antarctica as a "natural reserve, devoted to peace and science."[249] It restricts activities that will have a severe impact on the environment.[250] The Madrid Protocol put a complete ban on all non-scientific resource harvesting.[251] Under the Madrid Protocol, all activities in Antarctica must be accompanied by Environmental Impact Assessments (EIAs), which evaluate the expected environmental impact of proposed activities.[252] Activities with more than a "minor or transitory" impact require a Comprehensive Environmental Evaluation (CEE) describing the proposed activity, its purpose, location, duration, and intensity, and a consideration of alternatives.[253] This is done so that states can determine whether the activity should proceed.[254]

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[244] *About CCAMLR*, CCAMLR, http://www.ccamlr.org/en/organisation/about-ccamlr (last modified Oct. 3, 2013); *see* Convention on the Conservation of Antarctic Marine Living Resources art. II, May 20, 1980, 33 U.S.T. 3476 (entered into force Apr. 7, 1982) [hereinafter CCAMLR]. Due to the dependence of all Antarctic land creatures on the sea, terrestrial Antarctic animals could be categorized as a subset of the topic of Antarctic marine life. *Id.*

[245] *About CCAMLR*, *supra* note 244, art. 1(3); Antarctic Legal Regime, *supra* note 35, at 5.

[246] Joyner, *supra* note 35, at 5.

[247] Madrid Protocol, *supra* note 180; *see* Hoitink, *supra* note 24, at IV; Dodds, *supra* note 229, at 111. The adoption of the Madrid Protocol eliminated the controversial Convention on the Regulation of Antarctic Mineral Resource Activities (CRAMRA), which would have eased the facilitation of mineral harvesting in Antarctica. Madrid Protocol, *supra* note 180; *see* CRAMRA, *supra* note 179, arts. 2-4 (stating the provisions that allow mineral harvesting activities under the regime). *See generally* Cousteau & Charrier, *supra* note 8 (opposing the adoption of the CRAMRA).

[248] Hoitink, *supra* note 24, at IV.

[249] Madrid Protocol, *supra* note 180, art. 2.

[250] *Id.* art. 3.

[251] *Id.* art. 7.

[252] *Id.* art. 8; *id.* annex I. Many environmental agreements in the international sphere include EIAs, e.g. the World Charter for Nature of October 1982. Hoitink, *supra* note 24, at V.

[253] Madrid Protocol, *supra* note 180, annex I art. 2(1).

[254] *Id*. annex I art. 2(1). For a comprehensive list of all Antarctic EIAs, see the EIA database at *EIA Database*, Secretariat Antarctic Treaty, http://www.ats.aq/devAS/ep_eia_list.aspx?lang=e (last visited Mar. 26, 2013).

The Madrid Protocol established the Committee for Environmental Protection (CEP), which advises on the efficacy of the Madrid Protocol, needs for improvement, application, and implementation of EIAs, and other procedures or needs relating to the Antarctic environment.[255] Article fourteen of the Madrid Protocol provides for inspections made by observers, pursuant to Article eight of the Antarctic Treaty.[256] The observers' inspections are usually accompanied by reports.[257] Inspection purposes range from discussing the inspectee's Antarctic program, to inspecting bases and historical sites, to monitoring tourist activities and inspecting cruise ships.[258] Inspections are typically "cooperative undertakings," and have been conducted by several states.[259]

The Madrid Protocol contains a "walk-out clause" that allows any ATCP to unilaterally withdraw from the Protocol after fifty years.[260]

Annex III of the Protocol regulates waste management in Antarctica by encouraging removal of waste to the state generating it, and cleaning up abandoned waste.[261] It further provides for the disposal of some liquid waste into the sea, and establishes a waste management plan.[262] Waste discharged into the sea is subject to regulations under Annex IV, which mostly applies to ships operating in the treaty area.[263]

Annex V designates certain areas as Antarctic Specially Protected Areas (ASPAs), or Antarctic Specially Managed Areas (ASMAs).[264] Activities in ASPAs may be "prohibited, restricted, or managed" according to management plans adopted at ATCMs.[265] Areas are designated as ASPAs when they have "outstanding environmental, scientific, historic, aesthetic or wilderness values, … or ongoing or

[255] *Id*. arts. 11-12.

[256] *Id.* art. 14.

[257] *List of Inspections*, Secretariat Antarctic Treaty, http://www.ats.aq/e/ats_governance_listinspections.htm (last visited Mar. 22, 2013).

[258] *See List of Inspections*, *supra* note 256; U.S. & Russ. Fed'n, *Report on Inspection* (XXXV Antarctic Treaty Consultative Meeting, Hobart, Austl.), May 14, 2012 (discussing the inspection of three Antarctic bases).

[259] *List of Inspections*, *supra* note 256.

[260] Lee, *supra* note 241, at 82; *see* Madrid Protocol, *supra* note 175, art. 25(5).

[261] Madrid Protocol, *supra* note 180, annex III art. 1, 4-5. Article 2 lists the types of waste to be removed from the Treaty area, such as batteries, radioactive materials, fuels, plastics, fuel drums and other solid, non-combustible waste. *Id.* at annex III art. 2.

[262] *Id.* at annex III arts. 5-8.

[263] *Id.* at annex IV art. 2.

[264] Annex V to the Protocol on Environmental Protection to the Antarctic Treaty art. 2, Oct. 17, 1991, S. Treaty Doc. No. 22, 102d Cong., 2d Sess. 97, 97 (1992) [hereinafter Annex V].

[265] *Id.*

planned scientific research."[266] A permit is required to enter ASPAs.[267] ASMAs are designated as such to help coordinate human activities, avoid conflict, and improve cooperation, or to minimize environmental impacts.[268] Entry into ASMAs does not require a permit.[269]

Any party, or the Scientific Committee on Antarctic Research (SCAR), may designate an area as an ASPA or ASMA by submitting a management plan at an ATCM.[270] Management plans describe an area, its value, the plan's aims, activities that will protect the area's values, a period of designation, identification of restricted zones within the area, maps and photographs of the area, supporting documentation, a clear description of conditions where a permit may be granted for entry, a code of conduct, and a method of exchanging information.[271] Each Treaty party appoints an authority to issue permits to enter ASPAs in accordance with the area's plan.[272] Anyone in an ASPA must carry the granted permit with him or her.[273]

Annex VI governs liability for environmental emergencies, and it applies to all tourist vessels and scientific programs.[274] It provides that parties shall take preventative measures to avert emergencies and to reduce environmental impact, incorporated in the design of facilities

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[266] *Id.* art. 3(1). Such areas may be later used to compare with areas affected by humans, represent examples of ecosystems, be a breeding grounds or habitat, be of scientific interest, or have geological, aesthetic, historic, or other value. *Id.* art. 3(2).

[267] *Id.* art. 3(4). There is an exception to the permit requirement for entry into ASMAs and ASPAs in the case of emergency. *Id.* art. 11.

[268] *Id.* art. 4(1).

[269] *Id.* art. 4(3). However, ASMAs may contain ASPAs within them, and those ASPAs shall still require a permit for entry. *Id.* art. 4(4).

[270] Annex V, *supra* note 264, art. 5(1). Areas previously designated as specially protected or areas of special scientific interest at past ATCMs become ASPAs. *Id.* art. 3(4). Most of the binding measures that have been adopted, and made effective at ATCMs have to do with management plans, or designating locations as ASPAs or ASMAs under Annex V. *See, e.g.*, Secretariat of the Antarctic Treaty, *Final Report of the Thirty-Fifth Antarctic Treaty Consultative Meeting*, (XXXV Antarctic Treaty Consultative Meeting, Hobart Austl.), June 11-20, 2012, at 173-200, *available at* http://www.ats.aq/documents/ATCM35/fr/ATCM35_fr001_e.pdf (last visited Mar. 26, 2013) (regulating ASPAs and ASMAs in all eleven measures); *see also Meetings*, Secretariat Antarctic Treaty, http://www.ats.aq/devAS/ats_meetings.aspx?lang=e (last visited Mar. 22, 2013) (providing a list of all meetings, and links for further information about each, the vast majority of which deal with ASPAs or ASMAs in all or almost all of their binding measures, especially those since 1992, which do so explicitly).

[271] Annex V, *supra* note 264, art. 5(3).

[272] *Id.* art 7(1).

[273] *Id.* art. 7(3).

[274] Annex VI to the Protocol on Environmental Protection to the Antarctic Treaty art. 1, *adopted* June 14, 2005, S. Treaty Doc. No. 2, 111th Cong., 1st Sess. 9, 9-10 (2009) [hereinafter Annex VI].

and the training of personal.[275] Furthermore, Article twelve of Annex VI provides for a fund, which the parties may use to reimburse reasonable costs to parties that respond to environmental emergencies that operators do not address.[276] Use of the money from the fund may be approved at ATCMs, which shall note special circumstances in distributing fund money.[277] Contributions to the fund are voluntary and are on behalf of any state or person.[278]

NGOs are becoming a strong influence in challenging the legitimacy of ATCPs.[279] The Antarctic and Southern Ocean Coalition (ASOC) works for environmental protection in Antarctica.[280] It is a grassroots movement formed by national and international environmental groups, including Greenpeace.[281] The ASOC plays a major role in enforcing the Madrid Protocol by regulating vessels operating in Antarctica, managing fisheries, and regulating tourism and biological prospecting.[282] ASOC campaigners work worldwide with countries that have a major presence in Antarctica, and raise public awareness through their blog, website, the media, and campaign advocacy.[283] Representatives of the ASOC are invited to participate in ATCMs as non-decision-making experts.[284]

Another NGO with a strong presence in Antarctica is the IAATO.[285] This NGO promotes and advocates for the practice of safe and responsible private-sector tourism in Antarctica.[286] The IAATO has created various regulations and procedures to insure safe and ecologically

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[275] *Id.* art. 3.

[276] *Id.* art. 12; *see id.* art. 5(2).

[277] *Id.* art. 12(2)-(3). Special circumstances include when an operator of the Party seeking reimbursement was responsible, and the responsible operator acted pursuant to Annex VI. *Id.* art. 12(3).

[278] *Id.* art. 12(4).

[279] Dodds, *supra* note 229, at 111.

[280] *About*, ASOC, http://www.asoc.org/about (last visited Mar. 22, 2013). The ASOC participates in ATCMs, advocates conservation goals, and raises public awareness of key issues. *Id.* They have successfully led efforts to enforce environmental standards against Antarctic mining, tourism and fishing. *Id.*

[281] Bederman, *supra* note 28, at 492-93. For a full list of ASOC's supporting organizations, see *ASOC Council and Supporting Organizations*, ASOC, http://www.asoc.org/about/asoc-council-and-supporting-organizations (last visited Mar. 22, 2013).

[282] *About*, *supra* note 280.

[283] *Id.*

[284] *The Antarctic Treaty Consultative Meeting (ATCM)*, *supra* note 229.

[285] *See* Dodds, *supra* note 229, at 111; Wellmeier, *supra* note 100. The IAATO is invited to ATCMs as an expert on Antarctic tourism. *The Antarctic Treaty Consultative Meeting (ATCM)*, *supra* note 229.

[286] Wellmeier, *supra* note 101. The IAATO developed as the result of a meeting of seven tour operators in 1991 who recognized the potential for environmental impact caused by tourism. *Id.*

friendly tourism.[287] Measures approved by the IAATO are rapidly introduced through an "extensive and effective E-mail network."[288] The IAATO attends all relevant ATCMs, and other important conferences each year.[289]

SCAR is another NGO whose representatives attend ATCMs and participate as non-decision-making observers.[290] SCAR is charged with initiating, developing, and coordinating international scientific efforts in Antarctica, and researching the role of Antarctica in the Earth's system.[291] Independently and objectively, SCAR informs the ATCPs of issues in Antarctica and the Southern Ocean, makes suggestions for future research, and accedes to ATCP requests to undertake certain research, which can influence decisions at the ATCMs.[292]

The Council of Managers of National Antarctic Programs (COMNAP) brings together its members, the National Antarctic Programs.[293] COMNAP is another NGO whose representatives attend and participate in ATCMs as non-decision-making members.[294] COMNAP is responsible for the delivery and support of scientific research in Antarctica on behalf of its respective members, the governments of the ATCPs.[295] In short, COMNAP develops and supports scientific

[287] *Id.* The IAATO has created regulations and restrictions on "numbers of people ashore; staff-to-passenger ratios; site-specific and activity guidelines; wildlife watching; pre- and post-visit activity reporting; passenger, crew and staff briefings; previous Antarctic experience for tour staff; contingency and emergency medical evacuation plans; and more." *Id.* For guidelines for tour operators, see *Guidance for Those Organizing Tourism*, IAATO, http://iaato.org/guidance-for-those-organising-tourism (last visited Mar. 22, 2013). For visitor guidelines, see *Visitor Guidelines*, IATTO, http://iaato.org/visitor-guidelines (last visited Mar. 22, 2013). The IAATO asserts that no other region of the world has such a unique, environmentally responsible tourism regime. Wellmeier, *supra* note 100.

[288] Wellmeier, *supra* note 100. The IAATO meets annually, and adopts policies and regulations by a two-thirds majority.*Id.*

[289] *Id.*; *The Antarctic Treaty Consultative Meeting (ATCM)*, *supra* note 229.

[290] *The Antarctic Treaty Consultative Meeting (ATCM)*, *supra* note 227. SCAR developed as an interdisciplinary committee of the International Council for Science. Antarctic Legal Regime, *supra* note 35; *Welcome to SCAR*, SCAR, http://www.scar.org (last visited Mar. 22, 2013). Since 1962, ATCPs have encouraged SCAR's advisory work. *See e.g.*, Antarctic Treaty Consultative Parties, *Final Report of the Second Antarctic Treaty Consultative Meeting* (II Antarctic Treaty Consultative Meeting, Buenos Aires, Arg.), at 3 (July 28, 1962), *available at* http://www.ats.aq/documents/ATCM2/fr/ATCM2_fr001_e.pdf.

[291] Antarctic Legal Regime, *supra* note 35; SCAR, *supra* note 290.

[292] Antarctic Legal Regime, *supra* note 35.

[293] *About COMNAP*, COMNAP, https://www.comnap.aq/SitePages/Home.aspx (last visited Mar. 22, 2013). The members of COMNAP are the National Antarctic Programs of each of the 28 ATCPs. *Id.*

[294] *The Antarctic Treaty Consultative Meeting (ATCM)*, *supra* note 230.

[295] *About COMNAP*, *supra* note 293.

research.[296] While the international community has worked to build this management regime, it is linked to clouded jurisdictional issues.

b. Jurisdictional Issues: "Frozen Claims"[297]

No discussion of Antarctica is complete without a discussion of jurisdiction. Antarctica belongs to no state.[298] Seven states have claimed a pie-slice-shaped sector of Antarctica.[299] Those states are Argentina, Australia, Chile, France, Norway, New Zealand, and the United Kingdom.[300] Some of the jurisdictional claims conflict with each other; for example, Britain, Argentina, and Chile all claim the Antarctic Peninsula.[301] Jurisdictional issues are further complicated, as the United States and Russia have reserved the right to make a claim.[302] The international community is indifferent to the various claims, which are effectively frozen by the Antarctic Treaty.[303] The Treaty neither recognizes nor does not recognize territorial claims in Antarctica, and it bars all future claims.[304] Due to this claim nullification, it is plausible that the national jurisdictional claims to Antarctica will ultimately melt away.[305]

[296] *Id.* COMNAP serves "as a forum to develop practices that improve effectiveness of activities in an environmentally responsible manner; [it] [f]acilitat[es] and promot[es] international partnerships; [it p]roved[es] opportunities and systems for information exchange; and [it p]roved[es] the Antarctic Treaty System with objective and practical, technical and non-political advice drawn from the National Antarctic Programs' pool of expertise." *Id.*

[297] Rowland, *supra* note 223, at 14.

[298] Hoitink *supra* note 24, at I.

[299] Verhoeven, *supra* note 223, at 12; *The Antarctic Treaty*, Discovering ANTARCTICA, http://discoveringantarctica.org.uk/9_claims.php (last visited Mar. 22, 2013).

[300] Hoitink, *supra* note 24; Verhoeven, *supra* note 223, at 12 & n.2.

[301] Verhoeven, *supra* note 223, at 12; *The Antarctic Treaty*, *supra* note 299; The Learning Network, *Dec. 1, 1959 | Antarctica is Set Aside as Scientific Preserve*, N.Y. Times (Dec. 1, 2011, 4:13 AM), http://learning.blogs.nytimes.com/2011/12/01/dec-1-1959-antarctica-is-set-aside-as-scientific-preserve/.

[302] Verhoeven, *supra* note 223, at 12 & n.4.

[303] Mulville, *supra* note 31, at 655; *see* 1959 Treaty, *supra* note 10, art. IV.

[304] 1959 Treaty, *supra* note 10, art. IV. Observers are subject to the jurisdiction of the party to which they are nationals. 1959 Treaty, *supra* note 10, art. VIII(1). Article IX(1)(e) of the 1959 Treaty makes jurisdictional issues a topic of ATCMs. 1959 Treaty, *supra* note 10, art. IX(1)(e).

[305] The Learning Network, *supra* note 301.

c. Provisions Explicitly Relating to Terrestrial Wildlife

Conservation of terrestrial flora and fauna has been a driving concern for humans in Antarctica since the beginning.[306] The Antarctic Treaty encourages the ATCPs to consider measures regarding the "preservation and conservation of living resources in Antarctica."[307] While the Treaty does not explicitly mention the preservation of living resources outside of Article IX, many provisions implicitly further that cause.[308] In 1964, the ATCPs created the Agreed Measures for the Conservation of Antarctic Fauna and Flora (1964 Treaty).[309] Annex II of the Madrid Protocol replaced the 1964 Treaty,[310] although very few changes were made, which attests to the value and contribution of the 1964 Treaty.[311]

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[306] *Conservation of Antarctic Fauna and Flora*, Secretariat of the Antarctic Treaty, http://www.ats.aq/e/ep_faflo.htm (last visited Mar. 22, 2013).

[307] 1959 Treaty, *supra* note 10, art. IX(1)(f).

[308] *See* Angelini & Mansfield, *supra* note 14, at 182-83. For example, the prohibitions on nuclear weapons testing, dumping radioactive waste, and military use, indirectly serve animals by protecting the Antarctic environment that is their home. *See id.*; *see also* 1959 Treaty, *supra* note 10, art. I (banning military activity); 1959 Treaty, *supra* note 10, art. V (banning nuclear activity). *But see* Angelini & Mansfield, *supra* note 14, at 183 (noting that, regarding the ban on military, an activity's peacefulness does not necessarily determine its effect on animals). Tourism is completely peaceful, but presents a large threat to Antarctic wildlife. *See* Angelini & Mansfield, *supra* note 14, at 183.

[309] *See* Agreed Measures for the Conservation of Antarctic Flora and Fauna, June 2-13, 1964, 17 U.S.T. 996 [hereinafter Flora and Fauna Treaty]. The Flora and Fauna Treaty was designed to protect the native mammals, birds and plants that live on the continent through preservation of endangered species and preventing the introduction of foreign species. Antarctic Legal Regime, *supra* note 35.

[310] Secretariat of the Antarctic Treaty, *Final Report of the Thirty-Second Antarctic Treaty Consultative Meeting Measure 16*, (XXXII Antarctic Treaty Consultative Meeting, Balt., U.S.), Apr. 6-17, 2009, at 201 (recommending that representative governments replace the Flora and Fauna Treaty with the amended version of Annex II to the Madrid Protocol).

[311] Joyner, *supra* note 39, at 897. The most significant change for the purposes of this discussion is that Annex II put a ban on dogs in Antarctica, something that the Flora and Fauna Treaty allowed. *Id*. at 897; *see* Flora and Fauna Treaty, *supra* note 309, annex C(a); *see also* Flora and Fauna Treaty, *supra* note 309, annex D(1) (describing precautionary measures to ensure that dogs in Antarctica are inoculated against certain diseases). Further, the Flora and Fauna Treaty did not include damage to native plants within the definition of "harmful interference" to the Antarctic environment, something that Annex II of the Protocol has done. *Compare* Flora and Fauna Treaty, *supra* note 309, art. VII(2) (describing the "acts and activities [that] shall be considered as harmful interference," but not including anything about Antarctic flora), *with* Madrid Protocol, *supra* note 178, annex II art. 1(h)(v) ("'harmful interference' means:… significantly damaging concentrations of native terrestrial plants by landing aircraft, driving vehicles, or walking on them, or by other means…").

The Seal Treaty arose out of a desire to protect Antarctic seals from commercial exploitation.[312] The Seal Treaty forbids the killing of certain seal species, and places strict limits on the killing of others.[313] It also creates a "closed season," during which hunting of all Antarctic seals is forbidden.[314] Permits to kill or capture seals may be issued only to provide "indispensible" food, or for scientific or educational purposes, such as providing them to museums.[315]

When paired with the Treaty, the Madrid Protocol makes Antarctica a world park,[316] which would preserve Antarctica as a nature reserve and remove all jurisdictional claims.[317] The Protocol makes the preservation of Antarctic ecosystems one of its "fundamental considerations."[318] Moreover, like the Antarctic Treaty, other sections of the Madrid Protocol implicitly protect terrestrial wildlife. For example, the Protocol seeks to protect water quality and prohibit mineral

[312] Seal Treaty, *supra* note 54, at 176 pmbl. cl. 4; ANTARCTIC LEGAL REGIME, *supra* note 35, at 4.

[313] Seal Treaty, *supra* note 54, annex (1), (2); *see* Sudhir Chopra & Craig Hansen, *Deep Ecology and the Antarctic Marine Living Resources: Lessons for Other Regimes*, 3 OCEAN & COASTAL L.J. 117, 125 (1997). The Treaty currently allows for the killing of 175,000 Crabeater seals, 12,000 Leopard Seals, and 5000 Weddell seals annually. Seal Treaty, *supra* note 54, annex (1).

[314] Seal Treaty, *supra* note 54, annex (3). The closed season is between March and August. Seal Treaty, *supra* note 53, annex (1), (3). Hunting of Ross seals, Southern Elephant seals, and Southern Fur seals is completely forbidden. *Id.* annex (2)(a). Moreover, Weddel seals are further protected by an additional closed season for them lasting from September until February. *Id.* annex (2)(b).

[315] *Id.* art. 4(1). The party who issues the permit must inform all other contracting parties and SCAR of the purpose and content of the permits, and subsequently, the number of seals captured or killed. *Id.* art. 4(2).

[316] HUNTER, SALZMAN & ZAELKE, *supra* note 221, at 445.

[317] Bernard P. Herber, *Mining or World Park? A Politico-Economic Analysis of Alternative Land Use Regimes in Antarctica*, 31 NAT. RESOURCES J. 839, 844 (1991). The World Park is the favored regime of Greenpeace and the ASOC. Elaine F. Foreman, *Protecting the Antarctic Environment: Will a Protocol be Enough?*, 7 AM. , U. J. INT'L L. & POL'Y 843, 865 (1992). Under this regime, science would still be allowed, but it would be secondary to maintaining the environment. Herber, *supra*, at 844-45.

[318] Madrid Protocol, *supra* note 180, art. 3(1). To that end, activities in the Antarctic are limited so that they do not effect the environment and the "dependent and associated ecosystems." *Id.* art. 3(2)(a). Further, Antarctic activities must be planned so that they do not detrimentally change the "distribution, abundance or productivity of species or populations of species of fauna or flora[,] further jeopardy to endangered or threatened species or populations of such species[,] or…degradation of, or substantial risk to, areas of biological, scientific, historic, aesthetic or wilderness significance." *Id.* art. 3(2)(b)(iv)-(vi). Further, Antarctic activities will be changed, suspended or terminated if they harm or threaten Antarctic environment or the associated ecosystems. *Id.* art. 3(4).

activities, which protects the environment that wildlife depends on.[319] Furthermore, the EIAs regulate all activities in Antarctica that will effect Antarctic ecosystems, and thus play a crucial role in regulating human activities effecting terrestrial Antarctic flora and fauna.[320] The designation of some areas as ASPAs further secures the well being of Antarctic habitats by limiting or controlling human activities in those protected areas.[321]

Annex II to the Madrid Protocol prevents the unpermitted taking or the harmful interference with flora or fauna in Antarctica.[322] Harmful interference consists of operating vehicles or using explosives in a manner that disturbs bird or seal concentrations, willfully disturbing breeding grounds, damaging native terrestrial plants, or doing anything else that modifies the habitat of any native species.[323] Further, Annex II prohibits the unpermitted introduction of non-native species.[324] Specifically, Annex II bans dogs from land and ice shelves as of April 1994.[325] Annex II designates the Ross Seal as a specially protected

[319] *See id.*, art. 3(2)(b)(ii); *Id.* art. 7; *see also* CRAMRA, *supra* note 179, pmbl. ("Recognizing that Antarctic mineral resource activities could adversely affect the Antarctic environment or dependent or associated ecosystems."). Moreover, maintaining the sanctity of the water surrounding the continent is crucial, as all terrestrial Antarctic life depends on the Southern Ocean. COUSTEAU & CHARRIER, *supra* note 8, at 5.

[320] *See generally* Madrid Protocol, *supra* note 180, art. 8; *Id,.* annex I.

[321] *See* Annex V, *supra* note 261, art. 3(1).

[322] Madrid Protocol, *supra* note 178, annex II art. 3(1). This has the effect of preventing tourists from bringing home flora or fauna as "souvenirs." Angela Williams, *Reconciling Tourism and the Environment: A Task for International Environmental Law?*, 9 VT. J. ENVTL. L. 23, 62 (2007). The permits specify and authorize certain scientific activities. Madrid Protocol, *supra* note 178, annex II art. 3(2). Permitted takings of species must be necessary, in numbers small enough as to be replaced the next breeding season, and must preserve existing ecological diversity, balance, and habitat. *Id* . annex II art. 3(3). Permitted takings must satisfy a "compelling scientific purpose," and be as humane and non-lethal as possible. *Id,.* annex II art. 3(5).

[323] Madrid Protocol, *supra* note 178, annex II art. 1(h); *id.* art. (3)(1).

[324] *Id*. annex II art. 4(1)-(2). Permits must provide detailed information, and only allow importation of species according to Appendix B to Annex II. *Id.* art. 4(3). Appendix B limits the importation of animals and plants to "domestic plants; and laboratory animals and plants including viruses, bacteria, yeasts and fungi." *Id.* annex II app. B. After a permit expires, flora and fauna must leave Antarctica, or be destroyed or rendered sterile, unless they do not pose a risk to native species. *Id.* art. 4(4). These prohibitions do not apply to food products. *Id.* art. 4(5).

[325] Madrid Protocol, *supra* note 180, annex II art. 4(2). However, lonely scientists consider the 1994 prohibition as a tragedy because of canine roles in transportation, and their use as distractions and entertainment, as well as companions on long journeys. Kumar, *supra* note 21.

species.[326] Nothing in Annex II applies in the case of emergencies.[327]

The IAATO has set up some measures to inform and provide guidance to Antarctic visitors and tour operators interacting with wildlife.[328] Such measures dictate human behavior, and denote indicators to determine whether an animal might be stressed by human presence.[329] There are also "Don't Pack a Pest" pamphlets that encourage responsible tourism to prevent introduction of non-native species in Antarctica, and encourage decontamination procedures during the visit.[330] The IAATO created a visitor slide show to promote the goals of maintaining a pristine environment; protecting all Antarctic wildlife; and respecting the protected areas, scientific research and safety.[331] The IAATO has developed visitor guidelines based on ATCM resolutions.[332] One guideline requires that tourists do not approach within fifteen feet of wildlife.[333] This management regime has met with a mix of praise and criticism.

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[326] *See Final Report of the Thirty-Second Antarctic Treaty Consultative Meeting Measure 16*, *supra* note 307, at 209 (amending appendix A to Annex II of the Madrid Protocol to include only the Ross seal); Madrid Protocol, *supra* note 180, annex II art. 3(4).

[327] Madrid Protocol, *supra* note 180, annex II art. 2(1). However, in the case of emergency, notice of the emergency shall immediately be circulated to all parties and the CEP. *Id.* art. 2(2).

[328] *Marine Wildlife Watching Guidelines* (2007), IAATO, *available at* http://iaato.org/c/document_library/get_file?uuid=6e12241c-eafe-41f9-93c2-8f59b1634642&groupId=10157 (stressing the fact that animals may choose to approach people or not but that their decisions must be respected, and people may never pursue the animals).

[329] *See id.*

[330] *See Don't Pack a Pest: Antarctica*, Leaflet, IAATO, *available at* http://iaato.org/c/document_library/get_file?uuid=7f52f927-8c86-46dd-9284-4a37be095e9c&groupId=10157 (last visited Mar. 30, 2013); *Don't Pack a Pest to Antarctica*, IAATO, http://iaato.org/dont-pack-a-pest (last visited Mar. 22, 2013).

[331] *Visitors' Slide Show*, IAATO, http://iaato.org/visitors-slide-show (last visited Mar. 22, 2013).

[332] *Guidelines for Visitors to the Antarctic*, IAATO, http://iaato.org/c/document_library/get_file?uuid=aed1054d-3e63-4a17-a6cd-a87beb15e287&groupId=10157; Visitor Guidelines Recommendation XVIII-1, IAATO, *available at* http://iaato.org/c/document_library/get_file?uuid=9d17f013-329a-40bb-91f5-04dca2333903&groupId=10157 (based on the recommendation made at the 1994 ATCM in Kyoto); *Visitor Guidelines*, *supra* note 284. In 1994, the ATCPS established guidelines for tourism in a Recommendation. Antarctic Treaty Consultative Meeting, Kyoto, Japan, Apr. 11-22, 1994, *Final Report of the Eighteenth Antarctic Treaty Consultative Meeting,* pt. 2, *available at* http://www.ats.aq/documents/ATCM18/fr/ATCM18_fr002_e.pdf (serving as the basis for the IAATO visitor guidelines). More guidelines for tourism have been adopted as a non-binding resolution. *Final Report of the Thirty-Fourth Antarctic Treaty Consultative Meeting*, *supra* note 155, Res. 3, at 313.

[333] *Help Protect the Environment*, *supra* note 158.

d. Evaluation of the Existing Regime

i. Positive aspects

Before the regime's inadequacies are analyzed, the Antarctic management regime deserves to be praised. The ATS has been recognized as a "remarkable development" that is a valuable model for similar situations in the future.[334] The fact that so many countries have contributed and that the regime has stood unopposed for over a half-century is testimony to its strength and endurance. The ATS has met with unprecedented international agreement and convocation, and it has even brought foes together, such as the United States and the former Soviet Union, or North Korea, to discuss the management of a common ground.[335] There have been no violations of the ban on nuclear weapons or waste dumping in Antarctica, or the ban on military presence. Jurisdictional claims remain frozen.

Compliance with Antarctic law is relatively high.[336] Scientists, eager to study Antarctic wildlife, respect the ASPAs, and if they do not have a permit, they will not enter.[337] The 1964 Treaty's adoption into the Madrid Protocol with very few substantive changes testifies to its effectiveness as a mechanism for protecting Antarctic wildlife.[338] The Seal Treaty has faced limited criticism, and is successful in protecting Antarctic Seals.[339] The use of non-binding recommendations from the ATCMs as the basis for visitor guidelines shows that the IAATO is willing to follow the law of the ATCPs—even non-binding law. There is much to praise about the current regime. However, it has yet to achieve perfection. If it were perfect, there would be nothing to discuss here.

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[334] Verhoeven, *supra* note 223, at 11.

[335] This success can be explained by the ATS's dedication to peace and the prohibition of "international discord," the freezing of jurisdictional claims, and the cooperation and exchange of scientific information. Rowland, *supra* note 223, at 14-15. Furthermore, there is likely some fear of chaos if the ATS was removed, and uncertainty about how to replace it. *Id.* at 15.

[336] Wendy Fletcher, *Enforcing Laws in a Remote Location—Antarctica*, Austl. Inst. Criminology: Envtl. Crime Proc. 7 (1993), *available at* http://www.aic.gov.au/media_library/publications/proceedings/26/fletcher.pdf.

[337] *See* Eppley & Rubega, *supra* note 113, at 2.

[338] Joyner, *supra* note 39, at 897.

[339] Chopra & Hansen, *supra* note 313, at 126-27; Mulville, *supra* note 31, at 657. However, an alternative explanation for the end to Antarctic seal hunting is because it is economically non-feasible. *See* Angelini & Mansfield, *supra* note 14, at 189. Further, the Seal Treaty does not have any enforcement mechanisms besides those in the 1959 Treaty, and so could be difficult to enforce if seal hunters began to exploit Antarctic seal populations again. Chopra & Hansen, *supra* note 313, at 127.

ii. Areas that require improvement

As discussed at length above, the current management regime does not completely prevent all harm to Antarctic terrestrial wildlife, such that animals sometimes feel the harmful consequences of human activity. Viewed solely from the perspective of terrestrial wildlife, issues stand out and must be addressed. The ATS can go further to address the current issues that result from science and tourism. Climate change, on the other hand, is a threat that faces the entire planet, and not just Antarctica. It is difficult and unsuitable for the ATS to address that issue. A separate international regime is the appropriate vehicle for addressing climate change.

Aside from total Antarctic abstinence, it is impossible for humans not to leave some footprint in Antarctica.[340] Human error can never be completely halted, even with the most demanding and inflexible regime.[341] The Bahia Paraiso incident and the accidental transmission of invasive species are examples of such accidents. The incident where the elephant seal went off the cliff is another example where precautionary measures—in this case an experienced Expedition Leader and crew, dispersed throughout the area, warning passengers, who had been counseled about the area's fragility, not to disturb wildlife—was not enough to prevent harm.[342]

Further, there are no strong enforcement mechanisms under the ATS that ensure compliance.[343] The Madrid Protocol has been criticized as ambiguous for using soft language, such as "to the maximum extent practicable," in Annex III, and for not defining terms, such as "minor or transitory impact."[344] Some have criticized the "walkout clause," and the limited guidelines as to who may issue permits.[345] Lack of enforcement mechanisms is a serious problem.[346] While voluntary

[340] And even then, climate remains a major issue facing Antarctica. *See supra* Part III.D.

[341] Welch, *supra* note 76, at 635. This contention has emerged as the "Cases of Emergency Provision." *See, e.g.*, Madrid Protocol, *supra* note 180, annex II art. 2 (creating an exception to the animal protection provisions of annex II in cases of emergency).

[342] *See supra* note 155 and accompanying text.

[343] Lee, *supra* note 242, at 77.

[344] *Id.*at 81-82; *see* Madrid Protocol, *supra* note 180, art. 8; *Id.* annex III art. 1(4) ("Wastes removed from the Antarctica Treaty Area shall, to the maximum extent practicable, be returned to the country from which the activities generating the waste were organized … .").

[345] Lee, *supra* note 242, at 82. The focus of this paper is not mineral harvesting, and not even the half-way mark of the fifty years before the walkout clause comes to fruition has approached as of writing this paper, so it will not be discussed further here.

[346] Welch, *supra* note 76, at 629.

compliance with ATCM recommendations is encouraged, they are not mandatory or enforceable.[347] Recommendations take years to ratify, and even when they are ratified, compliance is not unwavering.[348] Measures adopted at ATCMs are watered-down versions of the more strict and specific originals, and are left with their meanings ambiguous, and their enforceability discretionary.[349] Further, while measures stemming from the ATS are binding on all parties, they create no obligation for third party states without their consent.[350]

One instance where the ATCPs did nothing in response to a failure of the ATS was the construction of the airstrip at Pointe Géologie. The French waited until after construction commenced to conduct reports, which were largely criticized as inadequate.[351] The ATCPs did not vocalize opposition, which raised concerns about the credibility of the ATS.[352] The construction was a patent violation of the 1964 Treaty.[353] Further, this incident was a violation of France's domestic environmental policy.[354] While this incident happened before the Madrid Protocol mandated EIAs, it raises concerns about the enforceability of the ATS, and about whether the parties to the Treaty could, or would exert any real influence over similar actions.

Since the Madrid Protocol has mandated them, EIAs have received mixed reviews.[355] A recent study evaluated five cases of

[347] *Id.*

[348] *Id.* at 629-30.

[349] *Id.* at 630.

[350] Lee, *supra* note 242, at 86. Moreover, most of the tour operators who do not comply with IAATO regulations are non-members. *See* Debra Enzenbacher, *Antarctic Tourism Policy-Making: Current Challenges and Future Prospects*, *in* Antarctica: Legal and Environmental Challenges for the Future 155, 159 (Gillian Triggs & Anna Riddell eds., 2007).

[351] Joyner, *supra* note 128. A revised statement failed to examine alternatives to construction. *Id.*

[352] *Id.* at 270. Australia and New Zealand discussed the matter with France privately but did not do so publically. *Id.* The other parties did nothing. *Id.* The ASOC feared that the public could not be confident in a regime where none of the other parties did anything about France's actions at Pointe Géologie. *Id.* (quoting ASOC, *Background Paper on the French Airfield at Pointe Geologie*, at 8 (mimeographed) (1985)).

[353] *Protection*, *supra* note 127; *see* Flora and Fauna Treaty, *supra* note 306, arts. VI & VII.

[354] Welch, *supra* note 75, at 630.

[355] Note that scientists generally dislike EIAs because they believe that they could miss research opportunities while waiting for approval. Richard Monastersky, *Science on Ice: Researchers Fear Antarctic Studies Face a Chilling Future*, The Free Libr. (Apr. 10, 1993), http://www.thefreelibrary.com/Science+on+ice%3a+researchers+fear+Antarctic+studies+face+a+chilling...-a013692852 ("Because weather restricts outdoor studies to a four-month window each year, scientists fear they will miss research opportunities while awaiting approval of their permit requests.").

decommissioning, and found that compliance with EIAs was high, and that human occupation was almost undetectable after all five camps were decommissioned.[356] However, another study suggests that EIA compliance was mostly procedural—submitting documents and having them signed off.[357] It asserts that certain legal jurisdictions have no ability to modify, restrict or impose any conditions on the operator, as long as the operator has a complete paper trail.[358] Furthermore, it indicates that the more stringent form of an EIA, the CEE, which should be prepared where a proposed activity is likely to have more than a "minor or transitory impact,"[359] is "essentially diplomatic."[360]

Even if there was a valid enforcement mechanism, it is difficult and extremely expensive to monitor every activity in Antarctica and the Southern Ocean, and it is impractical to do so.[361] Treaty observers have been criticized as lacking enforcement power, as ultimately the enforcement mechanism is international embarrassment at lacking environmental conscience.[362] However, inspections under Article VII of the Antarctic Treaty, and Article fourteen of the Madrid Protocol have been conducted since the early 1960s by several different observer nations.[363] Inspections of bases and tourist vessels help identify issues that need more attention from treaty parties, as well as provide critical information about compliance levels.[364] Further, they

[356] Tanya A. O'Neill et al., *The Effectiveness of Environmental Impact Assessments on Visitor Activity in the Ross Sea Region of Antarctica*, *in* New Issues Polar Tourism 87, 108 (Dieter K. Müller et al. eds., 2013). However, this article pointed out a need for more follow up studies such as this one. *Id.*

[357] Alan D. Hemmings & Lorne K. Kriwoken, *High Level Antarctic EIA Under the Madrid Protocol: State Practice and the Effectiveness of the Comprehensive Environmental Evaluation Process*, 10 Int'l Envtl. Agreements 187, 191 (2010).

[358] *Id.* During the 2012-2013 year, seventy-four EIAs were submitted, and 100% of those were either granted or are awaiting scientific advice. Antarctic Treaty Consultative Meeting, *Annual List of Initial Environmental Evaluations (IEE) and Comprehensive Environmental Evaluations (CEE) Prepared Between April 1st 2012 and March 31st 2013* Secretariat Paper No. 5 (Apr. 14, 2013).

[359] Madrid Protocol, *supra* note 180, annex I art. 3(1); Hemmings & Kriwoken, *supra* note 354, at 189.

[360] Hemmings & Kriwoken, *supra* note 357, at 193.

[361] Lee, *supra* note 242, at 88.

[362] *See id.* at 83-84.

[363] *List of Inspections*, *supra* note 257.

[364] ASOC, *Antarctic Ship-Borne Tourism and Inspections Under Article VII of the Antarctic Treaty and Article 14 of the Protocol on Environmental Protection*, Antarctic Treaty Meeting of Experts, at 3 (Dec. 9-11, 2009) [hereinafter ASOC for Meeting of Experts] *available at* http://www.asoc.org/storage/documents/ATME/ATME_paper_inspections113009.pdf; ASOC, *A Review of Inspections Under Article 7 of the Antarctic Treaty and Article 14 of its Protocol on Environmental Protection, 1959-2001*, at 15 Antarctic Treaty Consultative Meeting, IP-118-ASOC/UNEP/Rev.1 (June 9-20, 2003), *available at* http://www.asoc.org/storage/documents/Meetings/ATCM/XXVI/ip-118.inspections.pdf.

provide a valuable learning experience for the observers and those being observed.[365]

The potential for observation of any Antarctic activity is important; this transparency serves as a moderate compliance mechanism in and of itself. Out of concern that they may be inspected, all Antarctic programs will refrain from engaging in illegal activities. Furthermore, all tour ships will be expected to comply with the ATS, as observers may board and observe them at their convenience. Though they are without power to enforce the ATS themselves, bringing breaches to attention of the ATCPs is better than allowing breaches to go unnoticed, and should increase compliance to some degree.

Treaty observers are a valuable part of enforcing Antarctic law, even without formal enforcement powers. Observers can stop some problems, such as the intentional distribution of seeds by tourists; remedy problems before they are exacerbated, like wind sweeping foreign seeds across the continent; and prevent additional problems by informing the proper authorities of the breach who can take further action, such as searching tourists, removing seeds from the their possession, and monitoring them for the remainder of the trip. Observers are the front line for inspecting tour ships and bases for compliance. After an inspection report is made about littering, destruction of environment, or other breaches of the ATS, ATCPS or groups like the ASOC can move in to pressure violators into compliance.[366]

NGOs play an important role in enforcing Antarctic environmental policy. Greenpeace publicized environmental damage at McMurdo Sound base, Scott base, and the French Dumont d'Urville base.[367] In McMurdo Sound, Greenpeace successfully influenced residents of the U.S. and nearby New Zealand bases to begin shipping trash back home and taking more effective waste disposal procedures.[368] One method

[365] ASOC for Meeting of Experts, *supra* note 361, at 3. *But see* Netherlands, *Report of the Informal Contact Group on the Increasing Diversity of Tourism and other Non-Governmental Activities in Antarctica*, at 9, Antarctic Treaty Consultative Meeting, Working Paper No. 47 (May 5, 2013) (noting that in 2000 the Spanish domestic system denied a NGO authorization to take 300 penguin eggs because that could violate Annex II of the Madrid Protocol).

[366] *See infra*, Part V.B.3.

[367] Anthony, *supra* note 109, at 155.

[368] Malcolm W. Brown, *In Once-Pristine Antarctica, a Complicated Cleanup Begins*, N.Y. Times (Dec. 19, 1989), http://www.nytimes.com/1989/12/19/science/in-once-pristine-antarctica-a-complicated-cleanup-begins.html?pagewanted=all&src=pm. Greenpeace effectively played the role of the mother coming to make sure the children were cleaning the room, punishing them with a little smack on the hand. Anthony, *supra* note 109. All trash sent home by the United States Antarctic Program after the Greenpeace goading was sorted into recyclables and waste before being sent north. *Id.* at 157. In 2003, McMurdo installed a sewage treatment plant, so that only clean water would be released into McMurdo Bay. *Id.* at 157.

that Greenpeace used was collecting trash that blew away from the garbage dump, and placing it in the entrance to the McMurdo Sound administration building.[369] Greenpeace also used cameras to capture the pollution for the media.[370]

The ATS does very little to directly regulate tourism.[371] Self-regulation is the source of Antarctic tourist regulation.[372] The industry's willingness to be bound by a non-binding regime is doubtful.[373] As seen above, members of the tourist industry or its passengers have engaged in flagrant and gross violations of the ATS, especially regarding passenger contact with wildlife. While the ATS deals with all activities in Antarctica, and thus tourism implicitly,[374] it nowhere deals explicitly with tourism. With increased amounts of tourism, it is impossible to monitor all tourist and tour operator activities, especially contact with wildlife.

Impracticality is the primary anchor that most prevents Antarctic law from sailing to perfection. Whether it is the impracticality of monitoring all activities in Antarctica, of enforcing international laws against non-consenting parties, or of preventing all possible human error, there is always a hurdle to cross. Moreover, the looming threat of climate change threatens all possible efforts to curb the effect of human activity on terrestrial Antarctic wildlife. Wildlife may suffer an impending doom at the mercy of climate change, regardless of how pristine humans keep Antarctica through the course of their immediate contact. But even if perfection is never attainable, like the fruit of Tantalus,[375] there are ways to improve the current regime, which has endured for over fifty years, to push it a little bit closer towards that perfect state.

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[369] Brown, *supra* note 368.

[370] Anthony, *supra* note 109.

[371] *See* José-Roberto & Pérez-Salom, *Sustainable Tourism: Emerging Global and Regional Regulation*, 13 Geo. Int'l Envtl. L. Rev. 801, 825-26 (2001). While the ATCPs proposed a measure in 2009 to control landings from tourist vessels, it is not yet effective. Secretariat of the Antarctic Treaty, *Final Report of the Thirty-Second Antarctic Treaty Consultative Meeting Measure 15*, (XXXII Antarctic Treaty Consultative Meeting, Balt., U.S.), Apr. 6-17, 2009, 199 (having only Japan, France and Uruguay's approval to adopt the measure, and requiring twenty-six more of the ATCPs' approval).

[372] Roberto & Salom, *supra* note 371, at 826.

[373] *Id.* at 826. *But see* Wright, *supra* note 93, at 86 (arguing that self-interest drives tour operators to promote and abide by environmental standards).

[374] *See supra* Part IV.C (noting that many provisions do not explicitly protect animals, but have the effect of protecting them anyways).

[375] In Greek mythology, Tantalus occupied the deepest region of Tartarus, the underworld, and spent eternity standing in a lake under a fruit tree. James Hunter, *Tantalus*, Encyclopedia Mythica http://www.pantheon.org/articles/t/tantalus.html (last modified May 21, 2004). Whenever Tantalus reached for a piece of fruit from the tree, the branch would recede from him so that he was eternally hungry. *Id.*

V. Proposal to Improve the Existing Regime

Based on the inadequacies of the current regime, some methods of improvement stand out as effective solutions. The philosophy of preclusive restoration, which seeks to preempt environmental harm,[376] underlies existing Antarctic policy, and should be considered as a basis for all Antarctic policy. The enforcement mechanisms discussed below must be put in place to enforce Antarctic policy. A modified Antarctic zoning scheme can contain visitors and resulting harm to wildlife. This portion of the article will discuss the philosophy of preclusive restoration, some enforcement mechanisms to ensure compliance with the ATS, and a new zoning regime that will help to protect Antarctic wildlife by excluding visitors from their habitats.

a. The Philosophy of Preclusive Restoration

Preclusive restoration is an international effort to preempt damage to Antarctica's environment through a preventative legal regime.[377] Preclusive restoration seeks to revitalize Antarctica by preventing its degradation.[378] Instead of waiting for threats to emerge, systems based on preclusive restoration perceive and then act on the possibility of a threat. Such systems are preventative, rather than rehabilitative, in their design.[379] The philosophy of preclusive restoration underlies the ATS, although this is not explicitly stated.[380] As discussed in the previous section, preclusive restoration has been effectively implemented to protect terrestrial Antarctic flora and fauna,[381] although implementation has not been perfect.

While preclusive restoration is not a specific policy that could be implemented to help protect Antarctic terrestrial wildlife, it should serve as the basis for policies that can. Small steps can prevent large harms in the future. For example, the introduction of invasive species in food can be prevented by simple and practical methods, such as making sure

[376] Joyner, *supra* note 39, at 880.

[377] *Id.*

[378] *Id.* The principles of preclusive restoration could be summarized by the term: An ounce of prevention is worth a pound of cure. A similar principle, the precautionary principle, also applies principles of prevention to anticipate harm where scientific understanding of a threat is unclear. Hunter, Salzman & Zaelke, *supra* note 220, at 478.

[379] Joyner, *supra* note 39, at 901.

[380] *See* Madrid Protocol, *supra* note 180, at art. 3 (stating implicitly the principle of preclusive restoration). *See generally* Joyner, *supra* note 39 (giving a detailed evaluation of the ATS in terms of preclusive restoration).

[381] Joyner, *supra* note 39, at 882.

food products are properly cleansed before transport to Antarctica.[382] Introduction of invasive species through tourism can also be minimized by simple procedures, such as having tourists examine their clothing before travel and packing clean gear, and following decontamination procedures during the visit.[383] Such small steps can prevent big problems for Antarctic wildlife.

By implementing procedures to preempt harm to Antarctica, many of the issues confronting Antarctic wildlife can be prevented. This is an ideal principle for the governance of Antarctica, as it both saves wildlife from suffering the harms of environmental damage, and saves large amounts of money, time and effort that would be used to remedy those harms. Based on these benefits, this article calls for the continued and conscious use of preclusive restoration as the basis for all Antarctic laws and policies.

b. A Proposal: Creative Methods of Enforcement

Without a method of enforcing Antarctic policy, compliance with a regime of preclusive restoration cannot transpire because none will be compelled to obey.[384] The impossibility of preventing all human error and mechanical failure further complicates compliance, although the application of preclusive restoration should help to remedy this issue.[385] Overt acts of non-compliance are also difficult to prevent. However, with effective enforcement mechanisms, compliance with the methods of preclusive restoration that have been adopted into the ATS can be ensured. Compliance with the preclusive restoration based regime will prevent major harms to Antarctic terrestrial wildlife that would otherwise take far more effort, time, cost, and effectiveness to restore

[382] Hughes, *supra* note 134, at 1687 tbl.5 (listing detailed measures for preventing the introduction of invasive species associated with fresh foods); *See* Tin, *supra* note 33, at 4 (advocating for the implementation of appropriate biosecurity measures as a management concept to preserve terrestrial Antarctic ecosystems).

[383] *See Don't Pack a Pest: Antarctica*, *supra* note 330.

[384] An example of contemporary failure to comply with international law because of a lack of enforcement mechanisms occurred in the case of Jenin. Hans Koechler, *The United Nations' Failure to Enforce International Law in Palestine and the Need of Effective Mechanisms of International Criminal Law: The Case of Jenin*, Int'l Progress Org., at 2-3 (2003). There, the Israelis refused to conduct a fact-finding expedition regarding human rights violations in a Palestinian refugee camp, ignoring a United Nations Security Council resolution. *Id.* at 2. The resolution was rendered non-binding and unenforceable because Israel could not be compelled to obey, notably because any mandatory investigation would be vetoed by the United States, who acts with a bias towards Israel. *Id.* at 2-3. Thus, the United Nations must act under a double standard, and exempt Israel from all measures that might be deemed adverse to Israeli interests. *Id.*

[385] Welch, *supra* note 76, at 635.

through "reactive restoration," which is the cleaning and rehabilitating of an ecosystem after damage has been done.[386] This section proposes some enforcement mechanisms that can bolster compliance with the existing regime.

i. Observers: the front line in protecting terrestrial wildlife

As explained above, observers constitute one of the most effective enforcement mechanisms of the ATS. Observers complement the philosophy of preclusive restoration, as they can remedy violations before the violations avalanche into larger problems that harm wildlife.

One way that the current observer program could be enhanced to further the principles of preclusive restoration is to increase observer numbers. The current regime only allows observers to be designated by the ATCPs.[387] However, allowing non-consultative parties to the ATS the ability to designate observers could have two potential benefits. First, the authority could create a diplomatic effect to assure the non-consultative parties that the ATS is not an exclusive group. They will have the ability to conduct meaningful Antarctic activities that could serve as some balance to keep the ATCPs in check. Non-consultative parties could feel empowered to engage in inspections, and provide observers in an effort to make a meaningful contribution to the ATS.

Second, and more importantly, an increased amount of observers means more inspections and increased compliance. Parties will improve compliance with the ATS as the expectation that inspections and reports will be made more frequently increases. Also, more inspections can lead to more observations of violations for those who still do not comply. While the observers themselves do not have much enforcement power, the powers they do have can be used to inform higher authorities and to stop some violations—preventing violations from snowballing into something larger and more damaging to the terrestrial environment or wildlife.

Observers can also be used as an enforcement mechanism by assigning them to tour ships that have violated Antarctic law. Where a tour operator has been found to repeatedly or grossly violate Antarctic law, ATCPs could assign an observer to accompany that vessel, or other vessels of that operator.[388] This will help ensure compliance because the

[386] Joyner, *supra* note 39, at 901.

[387] Madrid Protocol, *supra* note 180, art. 14; 1959 Treaty, *supra* note 10, art. VII.

[388] The IAATO is in favor of observers accompanying member vessels, and is currently instigating a Dockside Observer program as part of their "enhanced observer scheme." *Report of the International Association of Antarctica Tour Operators 2012-13*, *supra* note 143.

observer will be able to observe and conduct detailed reports on all of that tour operator's activities. Those reports could lead to recognition of the operator's improved compliance, or its continued failure to comply. Failure to comply could lead to further sanctions by the appropriate ATCP, a withdrawal of licensing or privileges, or other sanctions. This will ensure compliance, as tour operators will not want to be monitored so strictly and so will do their best to comply with Antarctic law so as to avoid the heavy observations. Observers could thus serve as a powerful deterrent against activities that would harm the Antarctic environment or wildlife.

Arguments that observers themselves have no actual enforcement mechanisms, and thus are not a valuable resource and should not be accredited much weight, should not be accredited much weight themselves. As discussed above, observers do provide incentive to comply with international law, and can stem immediate problems before they grow. Even if the deterrence observers provide is menial, it is better than nothing. They have several uses, even if limited.

Additionally, allowing non-consultative parties to appoint observers will provide a strong diplomatic gesture, and allows them some meaningful place on the Antarctic stage. Arguments that such a gesture should not be allowed based on the text of the Treaty are purely doctrinal, and ignore the need to adapt to the real world and the concerns of parties interested in Antarctica. Moreover, ATCPs need not worry that such a gesture would grant a substantial interest in Antarctica to render the non-consultative party appointing the observer an ATCP. Without more, it does not. It is simply meant to increase compliance with the existing regime.

ii. Antarctic Wilderness Restoration Fund and the Antarctic Tour Operation Managers

Article Twelve of Annex VI to the Madrid Protocol creates a fund[389] that could be modified into an effective enforcement mechanism. The fund could become the Antarctic Wilderness Restoration Fund (AWRF). The Antarctic Tour Operation Managers (ATOM) will manage the AWRF. The ATOM and the AWRF will be beneficial by limiting tourism, punishing violations of Antarctic law, and distributing money to remedy harms to the Antarctic environment and wildlife habitats and breeding grounds.

[389] Annex VI, *supra* note 274, art. 12; *see supra* Part IV.A.

First, the ATOM will impose limits on tourism, consistent with scientific findings from SCAR and assessments made at ATCMs.[390] Then, the ATOM will allow tour operators to purchase visiting rights based on those limits.[391] This could be by lottery, auction, or a combination of the two.[392] This plan will serve several goals. First, it will limit the amount of tourists in a place where every footprint matters.[393] Second, the money collected from the auctions or lottery tickets will go into the AWRF, and thus provide income to an otherwise meager fund.[394] Third, the ATOM can lead to a regime that can further govern tourism.

A second method for the ATOM to generate income for the AWRF is to impose individual and collective sanctions on all Antarctic tour operators. Individual sanctions will be placed on tour operators who either themselves, or their passengers, violate Antarctic law. This is a way to ensure compliance, especially when coupled with the fear of inspections by observers. Tour operators will hold their ships, crews, and passengers to the highest standards, out of fear that they will be caught violating Antarctic law, and fined.

Additionally, a collective fine could be placed on the Antarctic tour industry as a whole. This fine will be based on the collective violations of all Antarctic tour operators. A negligible amount of violations will not require any sanction.[395] The collective fine will only be imposed where violations are various, such as constantly hiring tour conductors who have no prior Antarctic experience, or gross, such as dropping

[390] *See* Andy Stone, *How Ecotourism is Destroying Antarctica*, Envtl. graffiti, http://www.environmentalgraffiti.com/featured/ecotourism-antarctica/2535#ACfbuIrYMfhVltov.99 (last visited Mar. 22, 2013) (stressing the importance of limiting tourism for tourism to work, to protect Antarctica from invasive species, and to make monitoring activities less difficult).

[391] Dutch researchers initially came up with the idea to limit, and then auction off Antarctic visiting rights. *Id.*

[392] Brandon Keim, *Should Antarctica Visiting Rights Be Sold to the Highest Bidder?*, Wired (Sept. 30, 2008), http://www.wired.com/wiredscience/2008/09/should-antarcti/ (noting that a lottery based on costs associated with tourism on specific tourist days will give everyone a fair chance to visit, and that Antarctica belongs to the world, not just the super rich). Having only an auction would give an advantage to the incredibly rich. Stone, *supra* note 386.

[393] McGuirk, *supra* note 147.

[394] *See*, Michael Johnson*, Liability for Environmental Damage in Antarctica: The Adoption of Annex VI to the Antarctic Environment Protocol*, 19 Geo. Int'l Envtl. L. Rev. 33, 40 (2006) (noting that there is little economic activity in Antarctica that could support the fund, as it stands under Annex VI).

[395] The exact amount that constitutes the line between negligible and non-negligible will be determined by ATCPs.

a camera tripod on a baby penguin.[396] The fine amount will be based on the collective violations of the tourism industry, and the damage, or potential for damage that they caused. The collective fine should be divided between all tour operators according to the type and amount of activities each operator conducted, and how often each operator visited Antarctica. Larger and more frequently visiting operators will be responsible for a larger portion of the whole fine. The actual violators will be held responsible for their portion of the collective fine, however large that is, as well as individual sanctions.

The collective fine could be the most powerful method of tourist self-regulation. All tour operators would zealously seek to ensure their colleagues' compliance with the Antarctic law, out of fear that they will be responsible for some of the collective cost; especially the larger tour operators who will have the most resources to devote to insuring compliance, and the most to lose to the AWRF if a collective fine is imposed.

Some argue that tour operators will self-regulate out of a sole desire to preserve the Antarctic environment for future visitors.[397] Others argue that sustainable tourism is an oxymoron.[398] They believe that tourists only care about a fancy vacation, a floating palace with pools, golf, a casino, drinks, and spending time getting close to animals.[399] Allegedly, tourists don't care about invasive species or littering.[400] The above discussion about violations of Antarctic law by tourists[401] suggests that unmonitored self-regulation might not be the best way to manage the Antarctic tourism industry. However, when monetary sanctions are put in place, such as those described here, self-regulation may actually be the best way to regulate the tourist industry. This regime effectively transforms the cruise operators' monetary desires into a powerful incentive to comply with Antarctic law. Additionally, tourism quotas effectively prune the human Antarctic impact and drive down the supply of opportunity to visit Antarctica, increasing demand and allowing the tour operators to generate more money from their limited visiting privileges.

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[396] Although this accident was not intentional, it serves as an example of something that could have been prevented, had the appropriate precautionary measures been taken. E.g., if the tripod had not been placed so close to the animals, or had been more carefully secured and operated, the incident could have been avoided. In the proposed regime, punishments would be most harsh in this sort of incidence, where no precautionary measures were taken.

[397] *See* Wright, *supra* note 93, at 75-76.

[398] Tom Zeller, *Growth of Eco-Tourism Raises Concerns*, N.Y. Times (Apr. 12, 2009), http://www.nytimes.com/2009/04/13/business/global/13iht-green13.html?pagewanted=all.

[399] Williams, *supra* note 125.

[400] *Id.*

[401] *See supra* Part III.B.

This proposed regime could benefit from the aid of the IAATO. The IAATO has the infrastructure, standing, and reputation, to be very helpful in regulating Antarctic tourism. In fact, the IAATO could serve as the centerpiece for the regime, and replace the proposed ATOM. Given the IAATO's commitment to safe and responsible private sector Antarctic tourism, they should advocate for the adoption of this regime. Their role as an organizer of Antarctic tour operators makes them an ideal centerpiece of this regime, should they choose to take on that obligation, and become a much more powerful player on the Antarctic board, like SCAR or the CEP. Furthermore, the IAATO's member vessels would benefit from the proposed regime through more organization and collaboration with international organizations and governments.

This proposed regime depends on the consent of the ATCPs. Their concerns that tour operators would be impartial to such a regime need not be a reason to reject this regime. The ATCPs can withhold tour operator visitation privileges to scientific bases. Furthermore, the ATCPs can deny tour operators permits for entry into ASPAs or other protected areas. Thus, the ATCPs are in a powerful position as the gateway to the continent. By closing that gateway, Antarctic tour operators would be placed in a precarious position in such a dangerous and hostile land. Cooperation between the ATCPs and tour operators is a much more desirable outcome for both parties. Furthermore, operators' self-interest in regulating their own industry means that the tour operators should have confidence that, sanctions or not, they will comply with the Antarctic law in order to preserve Antarctic terrestrial wildlife for future visitors.

Like tour operators, other organizations that profit from Antarctic activity should pay some amount into the AWRF. Such organizations would include the ice-marathon organizers and Sports Illustrated. A small contribution to the fund could be a prerequisite to engaging in commercial Antarctic activities, and would be a sign of goodwill. Companies could advertise such acts as testimony of their eco-friendliness, and they could be known for their contributions and the benefits of their presence in Antarctica, as opposed to the problems associated with their presence there, such as littering a PowerBar wrapper. Enforcement of this regime for these companies will be similar to enforcement for tour operators: via withholding of access to bases, and denial of permits by the appropriate ATCPs.

With all of the money that the AWRF has generated, the goals of Article twelve of Annex VI to the Madrid Protocol can be greatly furthered, as voluntary donations will be supplemented by income from the tourist industry and other economic actors. The AWRF can reimburse parties for their environmental cleanup, consistent with Article twelve. Or, they could be used to restore parts of Antarctica that

nobody has taken the initiative to clean, such as the filthy McMurdo seabed. Finally, funds can be used to hire additional observers, who will work to preclude incidents that will harm the Antarctic environment and its occupants.

iii. Chilling pressure

A strong enforcement mechanism can come from NGOs, grassroots movements, and the media, as a result of these groups protesting, and pressuring for compliance. Major corporations, such as Sports Illustrated, may not need anything that the ATCPs could give them or take away, but negative media attention and protests could impact sales and investments.[402] As demonstrated by Greenpeace's vestibule trashing incident, pressure from NGOs can play a valuable part in policy enforcement. Further, drawing attention to actors who do not comply allows all other actors to take account of that actor's behavior, which can later affect bargaining, negotiations, or other arrangements.

The ASOC and its associated groups will play a valuable role in launching media campaigns and forming popular movements to ensure that policy is enforced. Ultimately it is up to the people, through groups like these, to put pressure on other groups and governments who do not comply with the rules. Anyone who wants to get involved with protecting the Antarctic environment can join the ASOC.[403] There is no obligation for NGOs to engage in these activities, but they do anyways. They effectively chill harmful and non-compliant Antarctic activity. Because of their pressures, they play a valuable role in enforcing Antarctic law and in protecting the southern continent's terrestrial wildlife.

c. Reversing the Current Antarctic Zoning Regime

i. The nature of the proposed new regime

One of the largest problems in enforcement of Antarctic law is monitoring every human interaction with terrestrial wildlife. Even with an increased amount of observers and inspections, there will not be nearly enough eyes to watch ten percent of the Earth's land surface area,

[402] There is no indication that Sports Illustrated caused any harm to the Antarctic environment or the wildlife there. They are solely an example of a major corporation with enough money to visit Antarctica privately, and resources to do what they want there.

[403] Anybody can become involved. *See ASOC Home Page*, ASOC, http://www.asoc.org (last visited Mar. 22, 2013) (presenting a sign-up sheet on the front page of the website where anybody can input their name, E-mail address, and country of origin to become involved).

and the surrounding ocean. However, this problem could be solved by a zoning regime where the vast majority of human activity is concentrated into certain areas. Then observers could be more effectively spread into areas of high human concentration. For this reason, the ATCPs should reverse the current zoning regime.[404]

The current regime is provided for in Annex V of the Madrid Protocol, and designates areas as ASPAs and ASMAs.[405] While this regime is effective in protecting certain areas, it could be improved in an effort to further contain human activities to selected areas. Instead of the entire continent being open for access, except for certain designated protected areas, the ATCPs should designate the entire continent as protected, and deny access to it, except that it will only allow access in certain designated areas. ASPAs will be the highest protected areas, and will generally remain the same in the new regime as they are under the current regime. They will require a permit, granted only for the most compelling purposes, to enter, and will be governed and protected with the utmost international scrutiny.

The major regime shift comes from the introduction of a new type of area designation, Antarctic Protected Areas (APAs).[406] All land in Antarctica that is not designated otherwise will be an APA by default. APAs will require a permit for entry; however, permit granting will be more liberal than it is in ASPAs.[407] Unnecessary human activities or tourism will be mostly banned from APAs. The areas will be mostly used for scientific purposes or transportation. Emergency access will still be allowed for all areas in the regime, although parties remain liable for damage costs associated with emergencies.

Finally, areas may be designated as Antarctic Non-Protected Areas (ANPAs), another type of zone novel to the new regime.[408]

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[404] *See* Tin, *supra* note 34, at 4 (advocating for "[m]ore holistic and strategic designations of a network of protected areas that can protect representative ecosystems and values of Antarctica.").

[405] *See supra* Part IV.A.

[406] Expanding the protected areas in Antarctica is not a novel concept. Some thirty environmental organizations advocate for creating a perimeter of protected areas around Antarctica. *A chance to Save the Southern Ocean*, N.Y. Times (Oct. 28, 2012), http://www.nytimes.com/2012/10/29/opinion/a-chance-to-save-the-southern-ocean.html?_r=0.

[407] The current procedure allows for parties to issue permits pursuant to relevant management plans. Annex V, *supra* note 264, art. 7. Where a party seeks a permit for entry into an ASPA not governed by a management plan, a permit may only be issued for "a compelling scientific purpose which cannot be served elsewhere and which will not jeopardize the natural ecological system in that Area." *Id.* art. 7(2).

[408] Designation as an ANPA does not mean that an area would not be protected—it will still be governed by all relevant Antarctic law. It will just not be held to the heightened standard reserved for ASPAs and APAs, as it will not require a permit to enter. It will be more akin to the current ASMA.

ANPAs must be affirmatively designated, or will exist where there is substantial human activity at the time the new regime is put into place, as recognized by the ATCPs at the appropriate ATCM. ANPAs will be the only place in the new regime where a permit is not required for entry. ANPAs will be the areas where observers are most common. This allows for a much smaller portion of Antarctica to be monitored for compliance with the ATS, and makes inspection much more practical.

ASMAs can still play an important role in the new regime, as all areas will still require management plans to provide for their upkeep, management, and coordination of activities there. The difference under the new regime is that the only ASMAs that will not require a permit to enter will be the ANPAs. All other ASMAs will be affirmatively designated as ASPAs, or will be defaulted as APAs. Entry into either will require a permit. Concerns about restricting the freedom of movement are not as critical in Antarctica as they are in other regions of the globe, due to the continent's unique nature, isolation, and lack of any human contact before the 1800s.

Humans in APAs and ASPAs can be held accountable for any mishaps there, as a record will exist of whom was granted a permit to enter those areas. Human presence will be contained, mostly, to ANPAs, and so enforcement of Antarctic law will be made much more feasible. Tourism especially will be restricted to ANPAs, and tourist presence elsewhere will not be allowed without a permit. If a permit is granted to a tour operator, the ATCPs will have sufficient time, and knowledge of the permitted activity, to assign an observer to accompany the tour into the APA or ASPA.

Another benefit of the new regime is that the majority of the eco-footprint by humans will be contained to ANPAs. This means that reactive restoration may be focused on and targeted to problems that are contained to those ANPAs. Moreover, this regime is consistent with the philosophy of preclusive restoration, as it contains problems to certain areas, and requires conditions to enter other areas governed by specific management regimes, thus anticipating and preempting unregulated or uncontained behavior. Violations will thus be easier to monitor and remedy under the new regime. Increased precautionary measures can be undertaken in ANPAs, where a recognized majority of human activity occurs, and can be monitored.

ANPAs could be harmful, as they are ultimately magnifying the human footprint in those areas where more people will be. But the fact that the footprint is contained is beneficial, as it allows for monitoring of violations that could lead to great damage. This monitoring will lead to compliance with the rules, and ultimately less violations. Although there is increased traffic in ANPAs, the human footprint will be smaller than it would be otherwise, due to the increased attention to preclusive restoration based policies. Further, any remedial efforts can

be focused narrowly on ANPAs, instead of broadly across Antarctica, thus intensifying those efforts.

Another concern might be that with all of the observers concentrated on ANPAs, tour ships could secretly visit APAs and ASPAs and evade being monitored. Under that scenario, observation becomes just as difficult as it is under the current regime. However, there are two reasons why tour operators can be relied on not to violate the new regime. First, they could face the sanctions described above, such as financial penalties to the AWRF, pressure from other tour operators and NGOs, observer placement on future tours, or denial of permits or licensing by their home state. Transgressing tour operators should not have absolute confidence that they will not be caught violating the zoning regime, as persons permitted in protected areas, or observers there for other purposes, could signal attention to the violation.

Secondly, tour operators or private adventurers sneaking around under the noses of the ATCPs should tread wearily because non-compliance could mean that nobody is around to help them when they are in trouble. Yachting guidelines state that in emergencies, no rescue is guaranteed, and any help that can be relied on could take several days to arrive.[409] Rescue resources are very limited around the Antarctic Peninsula, and in past emergencies, other vessels operating in the area, not emergency response teams, have usually been the first to respond.[410] The IAATO provides for mutual contingency planning, where member vessels provide support to each other and private yachts.[411]

But according to the new regime, the vast majority of tour operators and other vessels, complying with Antarctic law, will only be operating in the ANPAs. Thus, if a tour ship is sneaking around somewhere it is not supposed to and an emergency happens, the nearest rescue vessel could not arrive for some time, and *will* learn of the violation. However, where tour operators comply with the new regime, other vessels will be more readily available to help, or the appropriate authorities will be aware of the tour operator's permitted presence in an APA or ASPA, and can thus plan for emergency, or be prepared to help if the weather turns sour or other problems arise. Supplies are not available in Antarctica, commercially or from other operators.[412] Private tour operators or yachters would thus be wise to comply with Antarctic law, lest they upset an Antarctic program whose supplies or help they may later necessitate.

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[409] *Antarctic Yachting Guidelines*, supra note 103, at 3.

[410] *Id.* at 4.

[411] *Id.*

[412] *Id.* at 3. This includes even essential supplies, such as fuel and water. *Id.* Further, sailing is too dangerous in the Southern Ocean due to the chaotic wind always being either too strong, too weak, or in the wrong direction. *Id.*

ii. A hurdle for the new regime: synthesizing desires of tourists and wildlife

The largest difficulty in imposing the new regime would be deciding how to classify certain breeding grounds and animal sanctuaries in order to accommodate tourists' desires to have animal interaction. One way to do this would be to have platforms at the edge of the habitat, and have the platforms part of the ANPAs, but have the habitat as an ASPA. This would have the effect of making the habitats into zoos, with no interaction, but an ability to observe the creatures. Few such facilities should be allowed in the new regime, at least at first, in light of the dangers of tourist and animal interaction noted above. This would allow time to study the new regime, and improve its implementation in future endeavors.

Another possibility would be to allow some animal habitats to be wholly placed within ANPAs, and give tourists the ability to interact with no more stringent regulations than the ATS or management plans impose already. These areas, as ANPAs, would be targets of increased observation, so compliance could be more readily ensured of tourists. This option should be considered and implemented slowly and infrequently, to allow time to assess the change, and reflect on its application. But, allowing ANPAs to cover certain breeding grounds does have one unique benefit: it allows the animals to decide what is best for them.

One study showed that Adélie Penguin populations in the West Antarctic Peninsula had greater breeding productivity where humans visited frequently, compared to sites visited less.[413] Conversely, Gentoo penguins had more success in less visited sites than in more frequently visited sites.[414] The study suggested that the lower breeding success at the Gentoo site could be, not a result of humans affecting breeding success, but a result of lower recruitment to that site, or less penguins returning where the colony is disturbed by people.[415] Another study found that penguins prospecting for a breeding site were discouraged from settling at colonies with more human interference, and found Adélie penguins distributing themselves away from a local research station and its personnel's disturbances.[416]

[413] Lynch, *supra* note 191, at 497. However, the study is unsure whether this was the result of a penguin's preference, or the humans scaring away penguin predators, such as skuas. *Id.* at 501.

[414] *Id.* at 497.

[415] *Id.* at 500.

[416] *Id.* at 500. Another study, conducted at the heavily tourist visited Port Lockroy rookery, suggests that tourism does not affect Gentoo population change, with no difference in hatching success, chick mass or survival up to twenty days of

Perhaps it is best to let the penguins decide for themselves whether to allow tourists in their habitats. The studies indicate that there could be some preference for humans by penguins. However, the study had some uncertainties,[417] and so any decision to include breeding grounds in an ANPA should be made carefully, and cautiously introduced. The plan should be implemented slowly, and to only a couple of colonies, at least initially, as it would be unfair otherwise to test the theory on many breeding colonies if it would just ultimately displace them.

If serious harm or recruitment problems result from this plan, breeding colonies should be left out of ANPAs. However, if certain species of penguins or seals decided that they didn't mind human visitors, their habitats could be included in the ANPAs. At that point, additional precautions would have to be taken so that the animals do not become reliant on the human visitors for food and protection. Furthermore, if animals did decide to relocate their breeding grounds to avoid humans, the ANPAs, and humans, should respect that choice, and not follow them. A regime focused on the well being of wildlife should reflect the will of the animals, and this regime could do so.

d. Danger to Any Antarctic Regime: Preemption by Heat

Climate change is causing a large problem for Antarctic terrestrial wildlife, as discussed above. The ATS cannot adequately remedy that issue, and humans of the world have to remedy that problem under a different management regime. Hopefully climate change can be stopped, if not for the benefit of the Antarctic animals, than out of the self-interest of humanity, to preserve themselves, and prevent the destruction of all low-laying environments.

Antarctica is a dynamic place, and there is evidence of it having previously been a forest or jungle, abundant with life.[418] Antarctica is not a weak, fragile place. It is kind enough to warn humans of the problems to come if they don't take action.[419] No management regime can save the current wildlife that call it home, nor other wildlife around the globe, once Antarctica decides to melt. Hopefully human kind can prevent that melting, which will be the only way to preserve the Antarctic wildlife, and their own habitats, in the long run.

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age between the Port Lockroy rookery and a rarely visited control group. N.D. Cobley & J.R. Shears, *Breeding Performance of Gentoo Penguins (Pygoscelis Papua) at a Colony Exposed to High Levels of Human Disturbance*, 21 Polar Biology 355, 355 (1999).

[417] *See* Lynch, *supra* note 191, at 500-01.

[418] Walker, *supra* note 1.

[419] Walker, *supra* note 1.

VI. Conclusion

By evaluating the ATS in terms of its ability to protect the living environment, some unique issues have arisen. This comment has described the issues that confront wildlife as a result of human contact. While the ATS has gone a long way to protecting the Antarctic environment, it could go farther. Preclusive restoration must remain the dominant theme underlying Antarctic policy. Furthermore, functional enforcement mechanisms must be utilized to ensure compliance with the current management regime. Observers can help to alert higher authority to breaches of the ATS, and can act as a front-line remedy to stop small problems before they avalanche into larger ones. The AWRF could be a powerful incentive for compliance, as well as a method to raise funds to remedy environmental damage, and hire more observers. Pressure from NGOs can also protect Antarctica and ensure compliance.

To contain human activity and preserve the majority of the continent, this comment seeks to reverse the current zoning regime by creating two new designated areas: APAs, which will be somewhat like the current ASPAs, and ANPAs, which will be the basic unit where most human activity will be contained. Antarctica is neither weak nor fragile, but is a dynamic beast, kind enough to warn humanity that it will thrive in the cold, or in warmer weather as it has before.[420] Antarctica will be fine either way, although its inhabitants may not survive that transformation. Unfortunately, the same cannot be said for the rest of Earth—geomorphic or living. The ATS can do much to help animals in their direct and indirect interactions with mankind, but it can do nothing to remedy climate change. It is up to Earth's people as a whole to create a solution, apart from the ATS, to stop Antarctica's melting. Man must act cautiously to avoid the irreparable and irreversible.[421] Antarctica is a sleeping dog that we might not want to wake up.

[420] Kimball, *supra* note 65 (stating that Antarctica may be the Earth's early warning system).

[421] Cousteau & Charrier, *supra* note 8.