



Stopping to appreciate the beauty of Desolation Wilderness near Lake Tahoe, CA. **Photo credit:** Eric Ward on Unsplash.

Urban Proximity and Visitor Numbers of Four Wilderness Areas in 2020 during the COVID Pandemic

by **TINA TIN**

In November 2019, the first unconfirmed cases of a new coronavirus appeared in Hubei province, China. Cases of the virus, which was later termed severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) or COVID-19, spread rapidly in and outside China. Governments attempted to control the spread by putting in place various types of travel restrictions (Ryan 2021; Carvalho et al. 2021). These include restrictions of travel distance (e.g., residents of Wuhan, China, were not allowed to leave their residential compounds without authorization during most of January 23–February 23, 2020; Qian and Hanser 2021) and duration (e.g., during March 17–May 11 and October 29–December 14, 2020, the population in France was allowed to go out for up to one hour per day and up to 1 kilometer (0.6 miles) from their home for outdoor recreation; Mironowicz et al. 2021), and border restrictions (e.g., all borders and entry ports of New Zealand were closed to nonresidents during most of the period between March 19, 2020, and February 27, 2022; Jeffries et al. 2020; Immigration New Zealand 2022). The



Tina Tin

“In essence, people did not go where externally imposed restraints made it physically impossible to go, but where external restraints allowed people to go, they went, and in larger numbers than usual.”



Figure 1–Paradise Harbour, one of the most frequently visited sites in Antarctica. With 20,252 visits, it was the eighth most visited site in 2019–20 (Secretariat of the Antarctic Treaty 2022). Photo by W. Bulach, CC BY-SA 4.0 <https://creativecommons.org/licenses/by-sa/4.0/>.

global peak of travel restrictions occurred on April 5, 2020, when 4.4 billion or 57% of the world's population were subject to a partial or full lockdown. These and other COVID-related measures have had widespread impacts on humans and the more-than-human world (Ryan 2021; Bates et al. 2021). Studies on outdoor recreation and human–nature relationships report that participation increased for some outdoor recreation activities (e.g., foraging, hiking, and watching wildlife) and decreased for others (e.g., camping and relaxing in the company of other people; Morse et al. 2020), while the distance that recreationists traveled to participate in outdoor recreation and the distance they traveled beyond roads during outdoor recreation decreased in both urban and rural areas in the United States (Rice et al. 2020). In Ireland, usage of recreational walking trails, especially those that are urban-proximate, was 26–47% higher in 2020 than in 2019 (Power et al. in press). A study of three forest areas in Poland reported that the number of visitors to a remote forest and the number of visitors to a suburban regional forest park were both larger in 2020 than in 2019, while for a regional forest park, the difference between visitor numbers in 2020 and 2019 was small (Ciesielski et al. in press). In Sweden, outdoor recreation participation increased rapidly and significantly during the pandemic and provided an opportunity for more people to experience themselves as a part of the Earth's systems and cycles (Beery et al. 2021). Interviews of outdoor recreationists in New Zealand in 2020 also reported that recreationists had renewed

and heightened appreciation for the outdoors (Espiner et al. in press).

Visitor numbers of urban-proximate wilderness areas can be large (Lindley et al. 2018) and can be exacerbated or alleviated by travel restriction measures, such as those that were in place in 2020. In this article, I present the visitor numbers of wilderness areas from four continents – North America, Europe, Australia, and Antarctica – in 2020 and reflect on lessons that can be learned from this global-scale experiment that is being referred to as an anthropause in the midst of the Anthropocene. I chose the study areas for their geographical scope, data availability, and differences in levels of urban proximity. Because of the limited availability of suitable data, I was unable to include only International Union for Conservation of Nature (IUCN) protected area management category 1b wilderness areas. However, for each study area, there is little or no human activity in most of the area and the absence of human intervention or activity is one of the principles that guides management activities.

Antarctica

Antarctica is the least urban-proximate of the study areas. Antarctica’s wilderness values are protected under the Protocol on Environmental Protection to the Antarctic Treaty, which is the international agreement that establishes the framework for comprehensive protection of the environment of the Antarctic Treaty Area. The Antarctic Treaty Area is defined as all land and water south of 60 degrees latitude south. It covers approximately 36 million km² (14 million square miles),

which includes the Antarctic continent (14 million km² or 5.4 million sq. miles) and the surrounding oceans (Kelkociuk and Wienecke 2017). A study of human activity in Antarctica during 1819–2018 reports that 99.6% of the continent’s area remains wilderness, and approximately 32% of the continent has never had any ground-based human activity (4.3 million km² or 1.6 million sq. miles; Leihy et al. 2020).

Most tourists arrive in Antarctica by air or sea via one of the five gateway cities in the southern parts of the closest inhabited continents – Cape Town in South Africa, Christchurch in New Zealand, Hobart in Australia, Punta Arenas in Chile, and Ushuaia, Argentina. Ushuaia, which is approximately 1,000 kilometers (620 miles) from Antarctica, is the closest. Most tourists travel to Antarctica on ship-based cruises to the Antarctic Peninsula. Most Antarctica’s tourists are inhabitants of the Northern Hemisphere. Many are nationals of the United States, China, or European countries. Approximately three-quarters of the tourist cruises depart from Ushuaia. Ninety percent of the cruises operate between November and March during the austral summer (IAATO 2021a). Activities that are usually associated with wilderness recreation, such as kayaking, camping, and ski touring, are also offered (Frame et al. 2021).

The 2019–20 Antarctic tourism season concluded early because of the pandemic. By the end of the season, most international commercial flights had been canceled; the remaining Antarctic tourists waited for special repatriation flights on board their cruise ships docked at gateway ports (see e.g., Hart 2020;

Davies 2020). A total of 74,401 tourists visited Antarctica during the 2019–20 season, which was lower than the preseason forecast of 78,520 (IAATO 2021a). For the 2020–21 season, Antarctic tourism companies canceled their offers (Nielsen et al. 2022; Wenger 2020). According to official statistics, only 15 tourists traveled to Antarctica in 2020–21; they traveled by private yacht (IAATO 2021b). The number of visitors in 2020–21 is 0.03% of the average number of visitors from 2016 to 2020 (Figure 2a).

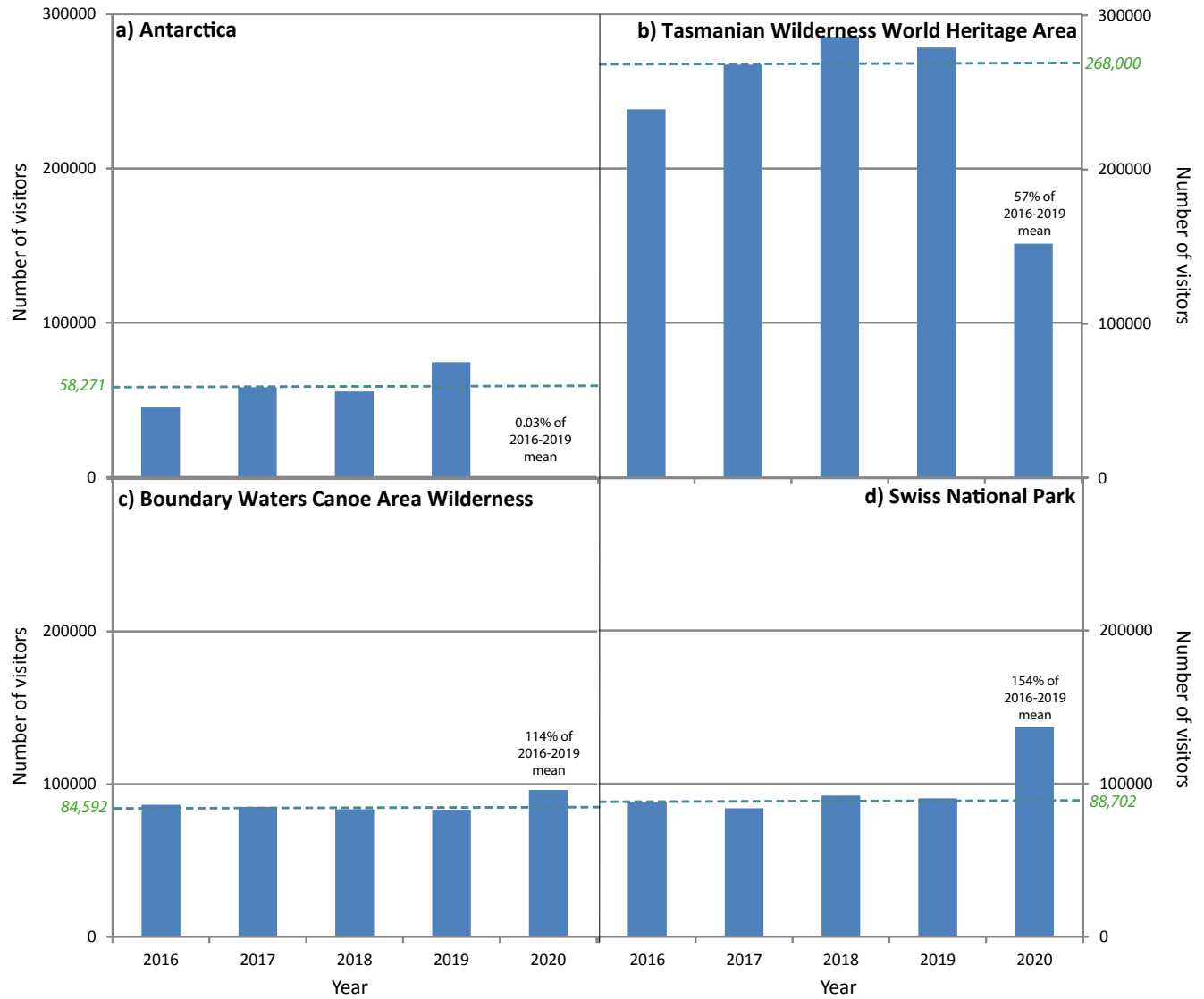


Figure 2 - Number of visitors to (a) Antarctica, (b) Tasmanian Wilderness World Heritage Area, (c) Boundary Waters Canoe Area Wilderness, and (d) Swiss National Park. Dashed line and number in italics indicate 2016–2019 mean. Data sources: IAATO, 2017, 2018, 2019, 2020, 2021b; Tasmania Parks and Wildlife Service, 2021; Superior National Forest 2021; Schweizerischer Nationalpark 2021.

Tasmanian Wilderness World Heritage Area, Australia

The second study area is the Tasmanian Wilderness World Heritage Area (TWWHA) in Australia. It covers 15,800 km² (6,100 sq. miles) or nearly 25% of the island state of Tasmania. Tasmania lies 240 kilometers (150 miles) to the south of the Australian mainland across Bass Strait, and has a population of 550,000. Melbourne is the closest city on the mainland and has a population of 5 million. The TWWHA is composed of several national parks and other reserved lands. Wilderness has been recognized as part of the Outstanding Universal Value of the TWWHA since its inscription on the World Heritage List in 1982. While the majority of the TWWHA is included in the Wilderness Zone, the whole area is considered to have some wilderness value (Dixon 2020; DPIPWE 2016). Parts of the TWWHA are accessible by road. One of the most accessible parts of the TWWHA is Dove Lake in Cradle Mountain–Lake St Clair National Park; it can be accessed by shuttle bus from Cradle Mountain Visitor Centre, which is connected to the rest of Tasmania by road (Figure 3). The number of visitors to Dove Lake in 2020 is 57% of the average number of visitors from 2016 to 2019 (Figure 1b). Further backcountry, the Overland Track is an 80-kilometer (50-mile) maintained hiking trail that runs through the park and has registered approximately 9,000 visitors each year since 2016. The number of visitors to the Overland Track in 2020 was estimated to be 7,000 or 77% of the average number of visitors from 2016 to 2019 (Tasmania Parks and Wildlife Service 2022).



Figure 3 - Dove Lake with Cradle Mountain in the background in Cradle Mountain–Lake St Clair National Park in the Tasmanian Wilderness World Heritage Area.

For most of the period between March 20, 2020 and February 21, 2022, only Australian citizens or residents were allowed to enter the country (Storen and Corrigan 2020; Department of Health 2022). Within Australia, all nonessential travelers arriving in Tasmania between March 19 and October 26, 2020, were required to self-quarantine for two weeks. A stay-at-home order was put in place in Tasmania on March 31, 2020. National parks and reserves in Tasmania were closed for recreational use between March 26 and May 11, 2020. Travel across Tasmania was allowed again after June 5, 2020 (Storen and Corrigan 2020). The number of interstate and international visitors to Tasmania in 2020 was down by 64% relative to 2019 levels (Tourism Tasmania 2021). An increased number of Tasmanians visited parks and reserves over the winter months of June, July, and August. The number of Tasmanians purchasing a one- or two-year parks pass increased by 160% in 2020 relative to 2019. Visitor numbers increased during the traditional busy summer months of December and January but were still well below numbers in previous summers (Tasmania Parks and Wildlife Service 2022).

Boundary Waters Canoe Area Wilderness, Minnesota, USA, North America

The Boundary Waters Canoe Area Wilderness (BWCAW) is more urban-proximate than Antarctica and the TWWHA. The BWCAW is in northeastern Minnesota in the United States. Approximately 10 million people live within a 500-kilometer (310-mile) radius of Ely, where one of the five ranger stations is located (NASA SEDAC Population Estimator 2022). The BWCAW extends nearly 240 kilometers (150 miles) along the international boundary with Canada. It covers over 4,400 km² (1,700 sq. miles). The BWCAW, Voyageurs National Park, and Canada's Quetico Provincial Park form a contiguous core of wilderness covering approximately 10,000 km² (4,000 sq. miles) in the center of the North American continent (Figure 4). The BWCAW has 67 entry point locations with access to over 2,000 kilometers (1,200 miles) of canoe routes, 12 hiking trails, and nearly 2,000 designated campsites (Tricker et al. 2017; Dvorak et al. 2012).

In 2020, 93% of the visitors to BWCAW visited during the summer season between May 1 and September 30 (Superior National Forest 2021). The number of overnight visitors in summer 2020 is 114% of the average number of overnight visitors in the summers between 2016 and 2019 (Figure 1c). The number of overnight hikers in summer 2020 is 200% of the average number of overnight visitors in the summers between 2016 and 2019 (Superior National Forest 2021).

For different periods between January 31, 2020, and December 31, 2021, travelers from 40 countries were forbidden to enter the United States (NAFSA 2021). In Minnesota, the governor declared a peacetime state of emergency on March 12, 2020. Schools were closed and residents were ordered to stay at home. There were no interstate travel restrictions. Residents were allowed to engage in outdoor activities, including walking, hiking, running, biking, driving for pleasure, hunting, or fishing in public parks and other public recreation lands (State of Minnesota 2020). Lockdown measures began to be lifted on June 1; barbershops and salons reopened, and outdoor dining services resumed in restaurants. Later in the year, social gatherings outside of



Figure 4 - Portages in the Boundary Waters Canoe Area Wilderness, MN. The Boundary Waters Canoe Area Wilderness has been one of the most visited US federal wilderness areas for the past several decades. Photo by Josh Hild on Unsplash.

one's household were suspended for four weeks starting from November 21 (Lopes et al. 2022).

Swiss National Park, Grisons, Switzerland, Europe

With approximately 113 million people living within a 500-kilometer (310-mile) radius of the park visitor center at Zernez (NASA SEDAC Population Estimator 2022), the Swiss National Park is the most urban-proximate of the four study areas. The Swiss National Park is in the eastern corner of Switzerland, on the border with Italy. It covers 170 km² (65 sq. miles) of the European Alps and is managed as an IUCN 1a Strict Nature Reserve. The park is accessible by road through one of its 13 official entry points. Accommodation is available inside the park, and camping is forbidden. Visitors can visit the park in the summer between May and October using the 21 hiking trails that extend over 100 kilometers (62 miles; Kupper 2014) (Figure 5).

Between March 16 and May 10, 2020, Switzerland was under a nationwide lockdown (Moser et al. 2021). Schools, restaurants, and public facilities were closed. Public and private gatherings of more than five people were forbidden (Conseil Fédéral Suisse 2020). Travelers from countries considered to be at high risk in terms of COVID were not allowed to enter Switzerland between March 13 and July 5, 2020 (Benhima and Billon 2021).

The number of park visitors in 2020 is 154% of the average number of park visitors between 2016 and 2019 (Figure 1d). Results of a survey study show that 8% of park visitors in 2020 came from outside Switzerland, while visitors from outside Switzerland made up 22% of the park visitors in 2006 and 2012. The number of international visitors in 2012 exceeds that in 2020 by 8,000, while the number of domestic visitors in 2020 exceeds that in 2012 by 60,000. In 2020,

As we move further into an era of rapid change and uncertainty, the axioms of visitor use management will need to evolve to ensure that our cherished wilderness can be preserved for generations to come.

most park visitors continued to be older adults between 41 and 60 years old, while there was a considerable increase in the number of younger adults (between 21 and 40 years old) visiting the park. Many of these younger visitors typically spend their holidays overseas. Approximately 20% of the survey respondents responded that, in the absence of the pandemic, they would not have spent their holidays in the park. There were many first-time visitors in 2020, and a large proportion of them were unfamiliar with park regulations. As a result, interactions between visitors and park volunteers, interns, and rangers, especially those related to park management measures,

were much higher than in previous years (Schweizerischer Nationalpark 2021).

Concluding Reflections

As travel restrictions eased, travel resumed. Global passenger air traffic in 2020 was 50% of that in 2019. By 2022, it has risen to 80% of passenger air traffic in 2019. Comparing domestic with international passenger air traffic, the International Civil Aviation Organization (ICAO 2022) reported that, in 2020, the decrease in domestic traffic was less than that in international traffic, and, after 2020, the recovery in domestic traffic was faster than that in international traffic. Extrapolating from these global trends, one could expect the number of visitors to urban-proximate wilderness to continue to increase with the arrival of

local and regional visitors, but the number of international visitors will remain low, and the number of visitors to remote wilderness areas is also likely to remain at lower levels.

For remote wilderness areas – Antarctica and TWWHA – COVID-related travel restrictions made it difficult or nearly impossible to visit; as a result, visitor numbers in 2020 were significantly lower than those of previous years. For the urban-proximate areas – BWCAW and the Swiss National Park – travel to and engagement in outdoor recreation in these areas remained possible under COVID-related restrictions; as a result, visitor numbers in 2020 were significantly higher than those of previous years. In essence, people did not go where externally imposed restraints made it

physically impossible to go, but where external restraints allowed people to go, they went, and in larger numbers than usual.

Yet, wilderness is often associated with an ethic of self-restraint and humility, especially in the United States where preservation of the untrammeled quality of wilderness is considered a cornerstone of wilderness stewardship (Landres et al. 2020). However, it has been suggested that self-restraint is the exception rather than the norm in the relationship between humanity and the rest of the planet (Johns 2020). Global expansion of human activities and the human footprint have encroached upon an additional 3.3 million km² (1.3 million sq. miles) of wild lands in Asia, Europe, Africa, North and South America,

and the Australian continent during the three decades between the 1990s and the 2010s (Watson et al. 2016). In Antarctica, human activity has been broadly distributed across the continent, and has progressively fragmented the once inviolate wilderness (Leihy et al. 2020). The number of Antarctic tourists has been growing substantially since the end of the 1980s. During the past four decades, decreases in visitor numbers occurred on two occasions; on both occasions, decreases occurred in response to externally imposed restraints (Figure 6). Numbers decreased between 2008 and 2011 because of the global economic crisis and decreased again in the 2020–21 season because of the pandemic (Netherlands and New Zealand 2019; IAATO



Figure 5 - Alp Trupchun is the most popular of the 21 marked hiking trails in the Swiss National Park. The automatic counter on the trail registered 28,638 visitors between end of May and end of October in 2020, which is 148% of the number of visitors registered for the same period in 2019 (Schweizerischer Nationalpark 2021).

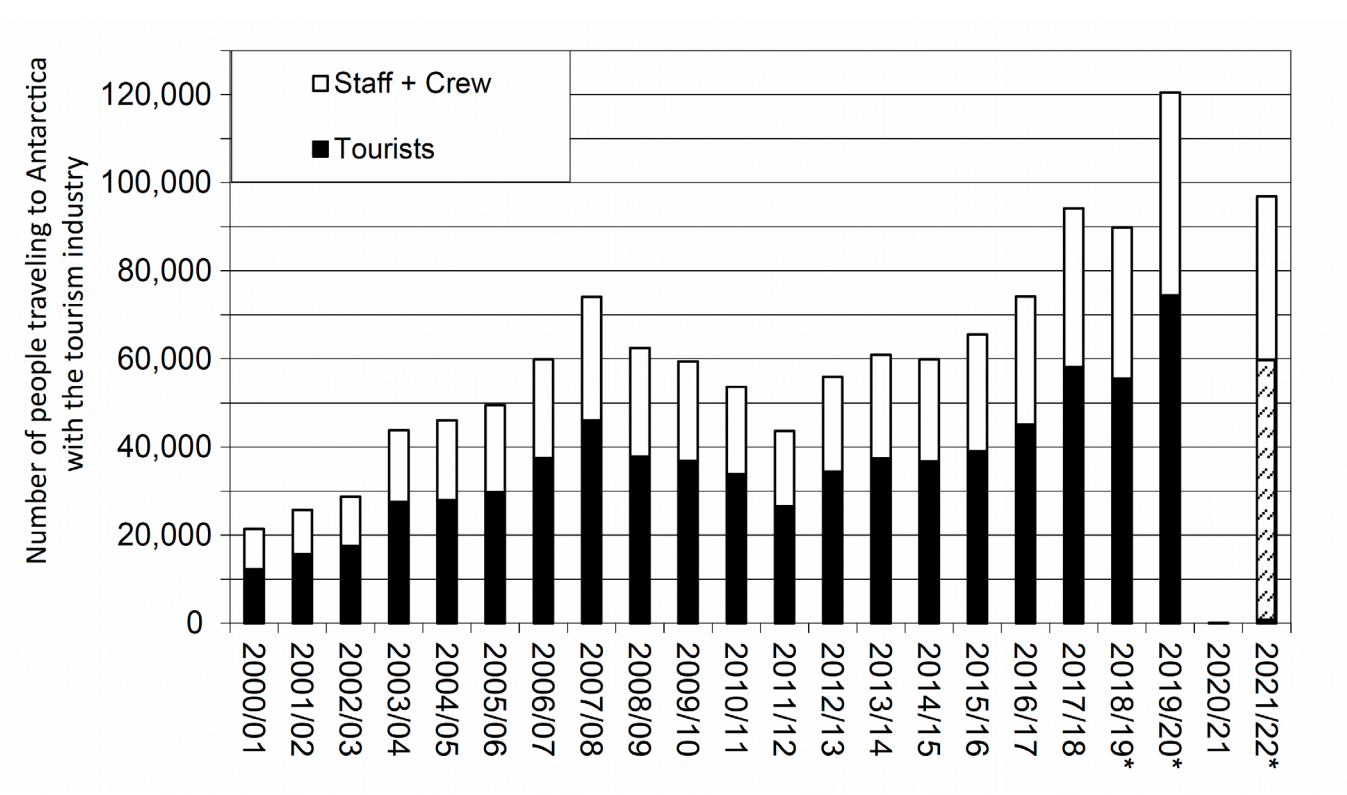


Figure 6 - Number of Antarctic tourists and accompanying staff and crew members. 2020–21 tourist numbers (hatched) are pre-season forecasts. * Numbers of accompanying staff and crew members are available from data sources up to and including the 2017–2018 season. Staff and crew numbers after the 2017–2018 season were calculated using tourist numbers for the season and the average ratio between tourists and accompanying staff and crew members derived from 2000–2018 data (1 tourist to 1.6 staff and crew). Data sources: IAATO, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021b.

2021b). After 2011, the number of people traveling to Antarctica with the tourism industry resumed its increase and exceeded 100,000 for the first time in the 2019–20 season (Figure 6). Similarly, preseason forecasts estimate that the number of visitors in the 2021–22 season would return to mean 2016–2020 levels should the majority of travel restrictions be removed (IAATO 2021b). Following Johns (2020), assuming absence of restraint as the norm, Antarctic tourist numbers can be interpreted as a reflection of a general absence of self-restraint, punctuated by occasional externally imposed restraints.

The norm of growth and absence of self-restraint continues to put pressure on wilderness, rendering the perilous task of wilderness stewardship even more challenging in the Anthropocene (see e.g., Allan et al. 2020; Kaye 2021; Tin 2014). As the number of humans on the planet and our collective consumption of energy and resources continue to increase, we push the global climate toward states that are dangerous for humans and the more-than-human world and exceed the safe operating space of the Earth systems that support the conditions for human societies to develop and thrive (Steffen et al. 2015). According to some forecasts, business-as-usual in the absence of self-restraint could lead to energy shortages and even global economic collapse (Moriarty and Honnery 2012; Wiseman and Alexander 2017). Limitations in economic or energy resources or other restraints imposed by geopolitics could significantly limit human mobility, which, as seen in 2020, render certain wilderness areas inaccessible, and de facto reduce the pressure on these areas. Paradoxically, absence of self-restraint may finally, through resource depletion, destabilization of human systems, and limitation of human mobility, strengthen wilderness protection.

Complex systems, such as epidemics, abrupt climate changes, and geopolitics often demonstrate chaotic behavior, which has low predictability, high sensitivity to initial conditions, and a large number of equilibria (Jones and Strigul 2021; Kanat 2021). The COVID pandemic has opened a window into the complexity of the chaotic systems that we are part of. The chaos and complexity continue to invite us to leave behind normalcy and embrace the extraordinary and the hitherto unthinkable in human mobility, human–nature relationships, and wilderness protection. 

Acknowledgments

Thanks to John Peden and Bob Dvorak for the brainstorming sessions that led to this paper.

TINA TIN is an environmental consultant living in France; email: tinatintk@gmail.com.

References

Allan, J. R., H. P. Possingham, O. Venter, D. Biggs, J. E. M. Watson. 2020. The extraordinary value of wilderness areas in the Anthropocene. In *Encyclopedia of the World's Biomes*, ed. M. I. Goldstein, and D.A. DellaSala (pp. 158–168). Amsterdam: Elsevier.

Bates, A. E., R. B. Primack, B. S. Biggar, T. J. Bird, M.E. Clinton, R. J. Command et al. 2021. Global COVID-19 lockdown highlights humans as both threats and custodians of the environment. *Biological Conservation* 263: 109175. doi: 10.1016/j.biocon.2021.109175.

Beery, T., M. R. Olsson, and M. Vitestam. 2021. COVID-19 and outdoor recreation management: Increased participation, connection to nature, and a look to climate adaptation. *Journal of Outdoor Recreation and Tourism* 36: 100457.

Benhima, K., and A. Billon. 2021. Travel restrictions and tourism in Switzerland during the COVID-19 Pandemic. Université de Lausanne, HEC Lausanne, Institut CREA. CREA Swiss Institute of Applied Economics. CREA Working Paper No. 1.

Carvalho, T., F. Krammar, and A. Iwasaki. 2021. The first 12 months of COVID-19: A timeline of immunological insights. *Nature Reviews Immunology* 21: 245–256.

Ciesielski, M., M. Tkaczyk, T. Hycza, and K. Taczanowska. In press. Was it really different? COVID-19 pandemic period in long-term recreation monitoring – a case study from Polish forests. *Journal of Outdoor Recreation and Tourism*. <https://doi.org/10.1016/j.jort.2022.100495>.

Conseil Fédéral Suisse. 2020. Ordonnance 2 sur les mesures destinées à lutter contre le coronavirus (COVID-19). Modification du 20 mars 2020.

Davies, L. 2020. Repatriation a success, but Antarctic cruise was another major mistake. *The Sydney Morning Herald*, April 12. <https://www.smh.com.au/national/repatriation-a-success-but-antarctic-cruise-was-another-major-mistake-20200412-p54j6o.html>.

Department of Health, Australian Government. 2022. <https://www.health.gov.au/health-alerts/covid-19/international-travel/inbound>. Accessed March 24, 2022.

Dixon, G. 2020. Wilderness Tourism: A cautionary tale from the Tasmanian highlands. *International Journal of Wilderness* 26(3): 102–118.

DPIPWE, Department of Natural Resources and Environment Tasmania. 2016. *Tasmanian Wilderness World Heritage Area Management Plan 2016*.

Dvorak, R. G., A. E. Watson, N. Christensen, W. T. Borrie, and A. Schwaller. 2012. The Boundary Waters Canoe Area Wilderness: Examining changes in use, users, and management challenges. Res. Pap. RMRS-RP-g1. Fort Collins, CO: US Department of Agriculture, Forest Service, Rocky Mountain Research Station.

Espiner, N., G. Degarege, E. J. Stewart, and S. Espiner. In press. From backyards to the backcountry: Exploring outdoor recreation coping strategies and experiences during the 2020 COVID-19 pandemic in New Zealand. *Journal of Outdoor Recreation and Tourism*. <https://doi.org/10.1016/j.jort.2022.100497>.

Frame, B., D. Liggett, K. Lindström, R. M. Roura, and L.-M. van der Watt. 2021. Tourism and heritage in Antarctica: Exploring cultural, natural and subliminal experiences. *Polar Geography*. doi: 10.1080/1088937X.2021.1918787.

Hart, E. 2020. Quarantine with penguins: Life stuck onboard an Antarctica cruise ship. *Lonely Planet*, March 24. <https://www.lonelyplanet.com/articles/stuck-on-cruise-ship-coronavirus>.

IAATO, International Association of Antarctica Tour Operators. 2021a. IAATO Overview of Antarctic tourism: 2019–20 season. Information Paper 37 submitted to the Antarctic Treaty Intersessional Period 2019/2021.

IAATO. 2021b. IAATO Overview of Antarctic tourism: A historical review of growth, the 2020–21 season, and preliminary estimates for 2021–22. Information Paper 110 submitted to 43rd Antarctic Treaty Consultative Meeting, Paris.

IAATO. 2020. 2018–2019 Tourists by nationality (total).

IAATO. 2019. 2017–2018 Tourists by nationality (total).

IAATO. 2018. 2018–2019 Tourists by nationality (total).

IAATO. 2017. Tourism summary by expedition.

IAATO. 2016. 2016–2017 Tourism summary by expedition.

IAATO. 2015. 2015–2016 Tourism summary by expedition.

IAATO. 2014. 2014–2015 Tourism summary by expedition.

IAATO. 2013. Tourism summary by expedition.

IAATO. 2012. Tourism summary 2012–2013.

IAATO. 2011. Tourism summary by expedition.

IAATO. 2010. Tourism summary by expedition.

IAATO. 2009. Tourism summary by expedition.

IAATO. 2008. Tourism summary by expedition.

IAATO. 2007. Tourism summary by expedition.

IAATO. 2006. Tourism summary by expedition.

IAATO. 2005. Tourism summary by expedition.

IAATO. 2004. Tourism summary by expedition.

IAATO. 2003. PAX 0203 by expedition.

IAATO. 2002. 0102 total pax.

IAATO. 2001. total pax.

ICAO, International Civil Aviation Organization. 2022. Effects of Novel Coronavirus (COVID-19) on civil aviation: Economic impact analysis. May 5.

Immigration New Zealand. 2022. Reopening the New Zealand border. <https://www.immigration.govt.nz/about-us/covid-19/border-closures-and-exceptions/border-entry-requirements>. Accessed March 24, 2022.

Jeffries, S., N. French, C. Gilkison, G. Graham, V. Hope, J. Marshall, C. McElroy, A. McNeill, P. Muellner, P. Paine, N. Prasad, J. Scott, J. Sherwood, L. Yang, and P. Priest. 2020. COVID-19 in New Zealand and the impact of the national response: A descriptive epidemiological study. *Lancet Public Health* 5(11): e612–23.

Johns, D. 2020. With friends like these wilderness and biodiversity do not need enemies. In *Conservation*, ed. H. Kopnina, and H. Washington. Springer, Cham. https://doi.org/10.1007/978-3-030-13905-6_5.

Jones, A., and N. Strigul. 2021. Is spread of COVID-19 a chaotic epidemic? *Chaos, Solitons, and Fractals* 142: 110376. <https://doi.org/10.1016/j.chaos.2020.110376>.

Kanat, S. 2021. International system, transformation of terrorism and chaos theory. In *Chaos, Complexity and Leadership 2020*, ed. Ş. Ş. Erçetin, Ş. N. Açıkalın, and E. Vajzović. Springer Proceedings in Complexity. Springer, Cham. https://doi.org/10.1007/978-3-030-74057-3_9.

Kaye, R. 2021. Preserving the wildness of wilderness in the Anthropocene. *International Journal of Wilderness* 27(2):12–18.

Kelkociuk, A., and B. Wienecke. 2017. *Australia State of the Environment 2016: Antarctic Environment*. Canberra: Australian Government of the Environment and Energy.

Kupper, P. 2014. *Creating Wilderness: A Transnational History of the Swiss National Park*. New York, Oxford: Berghahn Books.

Landres, P., B. A. Hahn, E. Biber, and D. T. Spencer. 2020. Protected area stewardship in the Anthropocene: Integrating science, law, and ethics to evaluate proposals for ecological restoration in wilderness. *Restoration Ecology* 28(2): 315–327.

Leihy, R. I., B. W. T. Coetzee, F. Morgan, B. Raymond, J. D. Shaw, A. Terauds, K. Bastmeijer, and S. L. Chown. 2020. Antarctica's wilderness fails to capture continent's biodiversity. *Nature* 583(7817): 567–571. <https://doi.org/10.1038/s41586-020-2506-3>.

Lindley, B. R., M. D. Blevins, and S. D. Williams. 2018. Cultural meanings and management challenges: High use in urban-proximate wilderness. *International Journal of Wilderness* 24(3): 16–27.

Lopes, G. S., S. M. Manemann, S. A. Weston, R. Jiang, N. B. Larson, E. D. Moser, V. L. Roger, P. Y. Takahashi, Y. Sandoval, M. R. Bell, A. M. Chamberlain, L. C. Brewer, M. Singh, J. L. St. Sauver, and S. J. Bielinski. 2022. Minnesota COVID-19 lockdowns: The effect on acute myocardial infarctions and revascularizations in the community. *Mayo Clinic Proceedings: Innovations, Quality and Outcomes* 6(1): 77–85.

Mironowicz, I., S. Netsch, and A. Geppert. 2021. Space and spatial practices in times of confinement. Evidence from three European countries: Austria, France and Poland. *Urban Design International* 26: 348–369.

Moriarty, P., and D. Honnery. 2012. What is the global potential for renewable energy? *Renewable and Sustainable Energy Reviews* 16: 244–252. doi: 10.1016/j.rser.2011.07.151, ISSN: 1364-0321.

Morse, J. W., T. M. Gladkikh, D. M. Hackenburg, and R. K. Gould. 2020. COVID-19 and human-nature relationships: Vermonters' activities in nature and associated nonmaterial values during the pandemic. *PLoS ONE* 15(12): e0243697. <https://doi.org/10.1371/journal.pone.0243697>.

Moser, A., V. von Wyl, and M. Höglinger. 2021. Health and social behaviour through pandemic phases in Switzerland: Regional time-trends of the COVID-19 Social Monitor panel study. *PLoS ONE* 16(8): e0256253. <https://doi.org/10.1371/journal.pone.0256253>.

NAFSA, Association of International Educators. 2021. Archive: Geographic COVID-19 Proclamations affecting entry from certain countries, December 31. <https://www.nafsa.org/regulatory-information/archive-geographic-covid-19-proclamations-affecting-entry-certain-countries>. Accessed March 24, 2022.

NASA SEDAC. Population Estimator. 2022. <https://sedac.ciesin.columbia.edu/mapping/popest/pes-v3/>. Accessed March 24, 2022.

Netherlands and New Zealand. 2019. Proactive management of Antarctic tourism: Time for a fresh approach. Information paper 26 tabled submitted to 42nd Antarctic Treaty Consultative Meeting, Prague.

Nielsen, H., D. Cajiiao, G. Roldan, J. Benayas, A. Herbert, Y.-F. Leung, P. Tejedo, and V. Dinica. 2022. Is COVID-19 helping, or hindering, effective management of Antarctic Tourism? *Polar Perspectives* 10, The Wilson Center.

Power, D., B. Lambe, and N. Murphy. In press. Trends in recreational walking trail usage in Ireland during the COVID-19 pandemic: Implications for practice. *Journal of Outdoor Recreation and Tourism*. <https://doi.org/10.1016/j.jort.2021.100477>.

Qian, Y., and A. Hanser. 2021. How did Wuhan residents cope with a 76-day lockdown? *Chinese Sociological Review* 53(1): 55–86.

Rice, W. L., T. J. Mateer, N. Reigner, P. Newman, B. Lawhon, and B. D. Taff. 2020. Changes in recreational behaviors of outdoor enthusiasts during the COVID-19 pandemic: Analysis across urban and rural communities. *Journal of Urban Ecology* 6(1): juaa020. <https://doi.org/10.1093/jue/juaa020>.

Ryan J. M., ed. 2021. *COVID-19 Volume 1: Global Pandemic, Societal Responses, Ideological Solutions*. Abingdon, UK: Routledge.

Schweizerischer Nationalpark. 2021. Geschäftsbericht 2020. <https://www.nationalpark.ch/de/about/mediencorner/geschaeftsberichte/>.

Secretariat of the Antarctic Treaty. 2022. Antarctic Treaty. Electronic Information Exchange System. Most visited sites. Annual: 2019/2019–2019/2020. Reopening the New Zealand border. <https://www.ats.org>. Accessed May 17, 2022.

State of Minnesota. 2020. Emergency Executive Order 20-20. Directing Minnesotans to Stay at Home.

Steffen, W., K. Richardson, J. Rockström, S. E. Cornell, I. Fetzer, E. M. Bennett, R. Biggs, S. R. Carpenter, W. de Vries, C. A. de Wit, C. Folke, D. Gerten, J. Heinke, G. M. Mace, L. M. Persson, V. Ramanathan, B. Reyers, and S. Sörlin. 2015. Planetary boundaries: Guiding human development on a changing planet. *Science* 347: 1259855.

Storen, R., and N. Corrigan. 2020. COVID-19: A chronology of state and territory government announcements (up until 30 June 2020). Research Paper Series, 2020–21, Department of Parliamentary Services, Parliament of Australia.

Superior National Forest. 2021. Boundary Waters Canoe Area Wilderness Superior National Forest permit and visitor use report 2016–2020. US Department of Agriculture Forest Service.

Tasmania Parks and Wildlife Service. 2022. Visitor numbers to selected parks and reserves, Tasmania ("Reference Sites") – Calendar Year. <https://parks.tas.gov.au/about-us/parks-visitation-and-tourism>. Accessed March 24, 2022.

Tin, T. 2014. Looking into the future of the Antarctic wilderness. *International Journal of Wilderness* 20(3): 39–42.

Tourism Tasmania. 2021. Tourism snapshot. Year ending December 2020.

Tricker, J., A. Schwaller, T. Hanson, E. Mejicano, and P. Landres. 2017. Mapping Wilderness Character in the Boundary Waters Canoe Area Wilderness. Gen. Tech. Rep. RMRS-357. Fort Collins, CO: US Department of Agriculture, For-

est Service, Rocky Mountain Research Station.

Watson, J. E. M., D. F. Shanahan, M. Di Marco, J. Allan, W. F. Laurance, E. W. Sanderson, B. Mackey, and O. Venter. 2016. Catastrophic declines in wilderness areas undermine global environment targets. *Current Biology* 26(21): 2929–2934.

Wenger, M. 2020. What's going on for the 2020/21 Antarctic season? October 20. <https://polarjournal.ch/en/2020/10/20/whats-going-on-for-the-2020-21-antarctic-season/>.

Wiseman, J., and S. Alexander. 2017. The degrowth imperative: Reducing energy and resource consumption as an essential component in achieving carbon budget targets. In *Transitioning to a Post-Carbon Society*, ed. E. Garcia, M. Martinez-Iglesias, and P. Kirby. International Political Economy Series. London: Palgrave Macmillan. https://doi.org/10.1057/978-1-349-95176-5_4.