Perceptions of the Antarctic wilderness: views from emerging adults in Spain and the United States

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ABSTRACT. The preambles of the 1959 Antarctic Treaty and the 1991 Protocol on Environmental Protection to the Antarctic state that Antarctica is to be managed in the interest of all mankind. However, key phrases such as 'interest of all mankind' and 'wilderness and aesthetic values' are subject to interpretation. The objective of this study is to gain a better understanding of public perceptions of the Antarctic wilderness, proceeding from the assumption that public views should be incorporated into the consultative parties' decision making process. The study expands on previous research by exploring whether perceptions of the Antarctic environment varied between students at two comparably sized public universities in Spain and the United States. Four hundred undergraduate students were asked about their values, beliefs and attitudes with respect to environmental management practices in Antarctica. After controlling for course type, responses showed little variation based on nationality. A large proportion of students valued Antarctica as a science laboratory for the benefit of mankind, as one of the world's last great wildernesses, and an important component of the climate system. Students did not support an increase in the number of people going to Antarctica, and favoured limitations on infrastructure development.

Introduction

Over three quarters of the Earth's land surface has been directly influenced by human activities and the global extent of natural and wilderness areas is likely to continue to decline in the 21st century (Netherlands Environmental Assessment Agency 2010; Sanderson and others 2002). Large contiguous wilderness areas with little impact from human activities are now a global rarity. Wilderness is a natural resource that is valued by many people, appreciated for its ecological, economic, psychospiritual and other benefits; at the same time, societies vary in how they value and perceive wilderness as a resource (Callicott and Nelson 1998; Cordell and others 2005; Sæþórsdóttir and Saarinen 2016).

Antarctica has no indigenous population and is collectively managed by the governments of the 29 consultative parties to the Antarctic Treaty (ATCPs). The treaty Area encompasses the region south of 60°S. This is 14 million km^2 of ice-covered land and 20 million km^2 of ocean, making up one-sixth of the Earth's total surface (McGonigal and Woodsworth 2003). The ATCPs have frequently stated their intention to manage Antarctica 'in the interest of all mankind', beginning with the original 1959 Antarctic Treaty (see Preamble) and repeated in the Preamble of the 1991 Protocol on Environmental Protection to the Antarctic (Environmental Protocol) and in various recommendations and declarations (Bastmeijer and Tin, 2015; Tin and others, 2011). In addition, article 3(1) of the Environmental Protocol provides a provision for wilderness protection:

> The protection of the Antarctic environment and dependent and associated ecosystems and the intrinsic value of Antarctica, including its wilderness and aesthetic values and its value as an area for the conduct of scientific research, in particular research essential to understanding the global environment, shall be fundamental considerations in the planning and conduct of all activities in the Antarctic Treaty area.

Although Antarctica has been designated as a 'natural reserve devoted to peace and science', key phrases within the Environmental Protocol such as 'interest of all mankind' and 'wilderness and aesthetic values' have not been defined and are subject to interpretation. To this day, wilderness has remained a nebulous and subjective or philosophical value (Jabour 2013; Bastmeijer 2009). While designated as a natural reserve, the Treaty area has rarely been managed as a protected area (Bastmeijer and van Hengel 2009). Most human activities are limited and regulated only in Antarctic Specially Protected Areas (ASPAs). A total of 73 ASPAs cover 688 km^2, or less than 0.005% of Antarctica's terrestrial area (Shaw and others 2014; Terauds and others 2012). Areas outside ASPAs are considered to be open for most human activities; non-use is seldom accepted as a viable choice of action (Bastmeijer and Tin 2015), allowing the human footprint to expand, extending into areas that have hitherto rarely been visited (Tin and Summerson 2013; Hughes and

others 2011). Shaw and others (2014: 3) concluded that the 'apparent protection status [of the Treaty area] reflects management intent, not management outcome.'

In 2007, researchers in Europe and North America initiated a study to understand better the link between ATCPs' claim to manage Antarctica in the interest of humankind and humankind's views of Antarctica as a wilderness. The objective of the Consortium for Research on the Wilderness Values of Antarctica (AntWILD) is to gain a better understanding of public perceptions of the Antarctic wilderness, proceeding from the assumptions that: (i) ATCPs' claim to manage Antarctica in the interest of mankind obliges parties to take note of the interests and views of stakeholders outside the Antarctic Treaty System (ATS), and (ii) views of the general public with regards to Antarctica are taken into account in the decision making process of the ATCPs.

A more detailed account and explanation of ATCPs' claim to manage Antarctica in the interest of mankind and of the assumptions of the AntWILD study can be found in Tin and others (2011) and Bastmeijer and Tin (2015). AntWILD has since reported its findings on the perceptions of a Dutch community (Tin and others 2011), future scenarios for the Antarctic wilderness (Neufeld and others 2014) and the coexistence of wilderness and science (Bastmeijer and Tin 2015). The present study expands on an earlier analysis conducted by Peden and others (2015), and explores whether perceptions of the Antarctic environment varied between students at two comparably sized public universities in Spain and the United States. The following research questions were addressed: (1) *Do university students' values about the importance of Antarctic vary based on nationality? (2) Do university students' beliefs about current management practices in Antarctica vary based on nationality? (3) Does university students' support for management practices, including protection as a wilderness reserve, vary based on nationality? (4) Are there other factors that could explain any apparent differences in university students' values, beliefs and attitudes about the Antarctic environment?*

Background

Allen and others (2009) noted that there is increasing demand for the integration of public participation and the use of social science data in environmental decision-making. They argue that an understanding of stakeholders' values, beliefs, and attitudes is critical for establishing or refining policy, developing programme goals, mitigating conflict, and effectively implementing management strategies. Following Allen and others, we use the term 'values' to refer to what people consider important. In our context, this specifically refers to the importance of Antarctica and the importance of the human-nature relationship seen through the eyes of the respondents. We use the term 'beliefs' to refer to people's ideas about what is true. In this study, this refers specifically to the presence or absence of human activities that are taking place in Antarctica. We use the term 'attitudes' to refer to favourable or unfavourable reactions to specific situations. In our context, this refers to respondents' support or lack thereof for certain human activities in Antarctica.

University students from Spain and USA exhibit many similarities, yet provide contrasts in terms of their nations' involvement in Antarctica and wilderness preservation in general. In both countries, university students are in the same age group of 18–25, with the majority beginning their undergraduate studies around the age of 18–19. Undergraduate courses in both countries take, on average, four to five years. Studies have demonstrated that young people in both countries go through emerging adulthood; a developmental period extending from the teens into the twenties in which many engage in intense self-focus, contemplation about the realm of future possibilities, and identity exploration in the domains of love, work and world views (Arnett 2004; Buhl and Lanz 2007; Douglass 2007). Emerging adults' values, attitudes and beliefs will have far-reaching influence on society and conservation over the next four or more decades, as they shape the world through their choices of government, consumption habits, jobs and lifestyles. Although they have received little attention in the literature on wilderness, today's emerging adults appear to participate less in wilderness-based recreation when compared to previous generations (Potts 2007; Watson 2013; Zinn and Graefe 2007). Many emerging adults in the US are well integrated within the mass consumerism culture and are not concerned about associated environmental impacts or social injustice (Smith and others 2011).

University students from Spain and USA come from different cultural backgrounds. The official language of Spain is Castilian Spanish and the most common language used in the USA is American English. The English word 'wilderness' is believed to have descended from the old English word 'wild-dēor-ness', meaning the place of the wild beasts (Nash 2001: 2), while there is no direct equivalent in Spanish. USA was the first country to establish legislation specifically designed to protect publicly owned land as wilderness. Spain does not have national provisions to designate wilderness areas, although as a member state of the European Union, it is encouraged to designate and protect wilderness areas (European Parliament 2009; Kormos 2008). The US National Wilderness Preservation System alone protects an area nearly the size of the whole of Spain. There are also big differences in the two countries' involvement with Antarctica. USA has one of the largest science and logistics programmes in Antarctica. It maintains three year-round research stations, including the largest station in Antarctica (COMNAP 2014), and is one of the original signatories to the Antarctic Treaty. While it had not claimed any territory in Antarctica by the signing of the Treaty in 1959, it reserved its right to claim territory at a later date. Spain became an ATCP in 1988 and maintains two summer-only research stations. USA is one of the

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ATCPs that is most active in submitting papers and influencing discussions at meetings while Spain is among one of the least active until recent years, reflecting the different levels of interest and priority that each country gives to Antarctica (Dudeney and Walton 2012).

Literature review

The vast majority of the world's population has not been to Antarctica and studies indicate that the continent holds little immediate relevance in their everyday lives. Based on a survey of 1000 young people aged between 15 and 25 years old in two Argentine cities, Del Acebo Ibáñez and Costa (2010) reported that many of their respondents held attitudes of indifference and scepticism towards Antarctica. Similarly, Salazar (2013) found that members of the public in Chile were not well informed on specific Antarctic issues. However, Shabudin and others (2016) found that many young people in Malaysia were interested to travel to Antarctica and supported Malaysia's involvement in Antarctic scientific research. In New Zealand, the majority of respondents to an online survey agreed that Antarctica was important to them. Yet, New Zealanders under 34 years old were likely to see less importance in Antarctica and in their government's involvement there (Colmar Brunton 2011).

Tin and others (2011) collected 269 survey responses from inhabitants in the Tilburg area of the Netherlands between March 2007 and June 2008. Respondents were between the ages of 15 and 91. They perceived wilderness as a place where 'nature goes its own path without human intervention.' Many respondents replied that 'as little [human activity] as possible' should take place in wilderness, and that use should be restricted to 'activities that add value and have only minimal impact.' They indicated that protecting the wilderness values of Antarctica, as mandated under the Environmental Protocol, means ensuring that Antarctica is preserved in its original condition.

The questionnaire used in the Netherlands was adapted into an ethnographic interview and used in California, USA in March 2008 (Neufeld and others 2014). Respondents were residents in the Santa Cruz area, aged between 18 and 69. Most respondents agreed that wilderness is a place that is not destroyed by humans and that should be preserved. They were in favour of protecting Antarctica but not vague 'values'. The phrase 'protecting the wilderness values of Antarctica', as mandated under the Protocol, was met with suspicion. Respondents called the phrase 'a scam', 'an empty slogan', 'illogical'. In general, many respondents thought of Antarctica in an abstract way; a place that exists but didn't affect their daily lives.

In 2013, 227 questionnaires were collected randomly from the student body of Tilburg University in the Netherlands (Bastmeijer and Tin 2015). Respondents valued Antarctica as: (i) an important component of the earth's climate system, (ii) one of the world's last great wildernesses, and (iii) a science laboratory for the benefit of mankind. These three values were chosen by 50%–500% more respondents than the values of Antarctica as a tourist destination or a reserve of mineral resources.

Peden and others (2015) presented preliminary results from the same dataset used in the current paper while participating in a special conference session aimed at engaging young people at the 10th World Wilderness Congress. Descriptive results suggested that university students in Spain and USA agreed that Antarctica should be managed as a wilderness reserve where development of infrastructure is limited, although students in USA appeared to be more supportive of resource management and tourism development activities than students in Spain. However, significance tests were not reported, and results were discussed within the context of different meanings of wilderness around the world, including protected areas in New Zealand and Kamchatka.

Environmental perceptions and behaviours of youth across cultures

Several studies have examined cross-cultural differences in the environmental attitudes and behaviours of youth. Based on the responses from over 6,000 university students from 34 nations, Liu and Sibley (2012) reported that students in developed countries demonstrated higher levels of willingness to make sacrifices to help protect the environment. Cordano and others (2010) reported that, compared to business students in USA, Chilean business students expressed a greater sense of obligation to protect the environment and stronger intentions to engage in pro-environmental behaviour. Based on a sample of over 2,000 university students in Spain, USA, Brazil and Mexico, Vicente-Molina and others (2013) reported that Spanish students were the most likely to recycle, while US students demonstrated greater consumptive behaviour and were the least likely to use public transport. Price sensitivity was a major barrier to pro-environmental behaviour for students in all four countries. Izagirre-Olaizola and others (2015) compared the recycling behaviour of Spanish and US students, and reported those with more altruistic motivations and who believed their actions could help to improve the environment were more likely to recycle than those who had more selfish motivations. Studies of younger people demonstrated that 16–17 year-olds in the Asia-Pacific region varied in their knowledge of individual environmental concepts but shared support for environmental protection (Yencken and others 2000). Based on the data of 400,000 fifteen year-olds from 56 countries, Boeve-de Pauw and Van Petegem (2010) found that females who have ready access to educational resources and who live in a country with a rich biodiversity and/or with polluted environments were more likely to show more pro-environmental attitudes.

In general, cross-cultural comparisons of environmental values and behaviours have reported that human-environment relationships differ between societies and also between individuals within a single society

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Table 1. Importance of Antarctica by nationality and course type

	Spain (%)[a]	USA (%)[a]	SP Tourism (%)[b]	US Tourism (%)[b]
Science laboratory for benefit of mankind	46.0	40.8	44.4	40.8
A tourism destination	11.1	15.1	17.8	15.1
One of world's last great wildernesses	56.6	62	51.1	62
Reserve for mineral resources that might support society in the future	24.3	41.3**	33.3	41.3
An important component of the Earth's climate system	65.1**	51.4	55.6	51.4
Antarctica does not have any value for mankind	1.6	3.4	2.2	3.4

[a]Chi-Square test for differences between Spain and the USA: * significant at $\alpha \leq .05$; ** significant at $\alpha \leq .01$.
[b]Chi-Square Test for differences between Spain Tourism and US Tourism courses: * significant at $\alpha \leq .05$; ** significant at $\alpha \leq .01$.

Table 2. Relationship between humans and the Antarctic wilderness by nationality and course type

	Spain (%)[a]	USA (%)[a]	SP Tourism (%)[b]	US Tourism (%)[b]
Humans are more important than the natural environment of Antarctica.	1.0	5.0	1.1	5.0
Humans and the natural environment of Antarctica are of equal importance.	11.6	26.8**	16.7	26.8
Antarctica is a place where people may experience their connection with nature.	51.3	49.2	51.1	49.2
Humans have no responsibility to protect elements of the Antarctic that are not useful to them.	1.6	1.1	2.2	1.1
Humans have a responsibility to protect Antarctica so that future generations will have the opportunity to benefit from it.	59.3	63.1	57.8	63.1
Humans must protect the Antarctic environment, including those components that have no direct benefits to society.	68.3**	33.5	53.3**	33.5

[a]Chi-Square test for differences between Spain and the USA: * significant at $\alpha \leq .05$; ** significant at $\alpha \leq .01$.
[b]Chi-Square test for differences between Spain Tourism and US Tourism courses: * significant at $\alpha \leq .05$; ** significant at $\alpha \leq .01$.

(Milfont 2012). Environmental attitudes are influenced by many factors at an individual level (for example values, educational level and environmental knowledge), as well as a societal or cultural level (for example religion, nation's wealth and environmental quality) (Gifford and Nilsson 2014), with wealth and educational development frequently correlating positively with pro-environmental behaviour (Pisano and Lubell 2015; Franzen and Meyer 2010).

Methods

In the 2012–2013 academic year, a questionnaire that included categorical, ordinal, and open-ended measures was distributed to a convenient sample of 400 undergraduate students enrolled in environmental science and tourism courses in Spain and in the United States. The study was not designed to generalise to larger populations, but to compare groups of undergraduate students enrolled in similar courses at two large public universities (> 20,000 students) in countries that are signatories to the Antarctic Treaty.

A short introduction at the beginning of the document provided brief background information on the Antarctic Treaty (for example date of ratification; number of signatories; that Antarctica is to be 'managed for the benefit of mankind') and explained the purpose of the study; 'to better understand global perspectives regarding the importance of Antarctica and how it should be managed now and in the future.' Care was taken to avoid language that might bias results. Respondents were asked to rate their level of environmental knowledge, and knowledge of Antarctica, as low, medium, or high on a three point ordinal scale. They were also asked to specify whether they had previously travelled to Antarctica, and their primary reasons for doing so. Values related to Antarctic wilderness were assessed through two categorical questions with multiple response options: (1) *What is, in your opinion, the importance of Antarctica?* (2) *Which of the following statements represent most closely your views on the relationship between human beings and the Antarctic environment?* Respondents were asked to check all that applied (Tables 1, 2).

Next, respondents were asked to indicate whether they believed that 14 resource management and tourism development practices were taking place in Antarctica, and whether they supported such actions (Tables 3, 5). They were also asked about their perceptions of annual

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Table 3. Accuracy of beliefs about resource management and tourism development practices by nationality and course type

	Spain (%)[a]	USA (%)[a]	SP Tourism (%)[b]	US Tourism (%)[b]
Small to medium-scale ship-based tourism (up to 300 tourists per ship; make short excursions ashore)	76.2	80.4	78.9	80.4
Large-scale ship-based tourism (between 300 and 3000 tourists per ship; no excursions ashore; luxury entertainment and dining)	28.6	43.6**	28.9	43.6*
Development of land-based tourism (hotel construction, tourist accommodation in research stations, snowmobile excursions, etc.)[c]	34.9	37.4	35.6	37.4
Educational trips for students	63.5	83.8**	74.4	83.8
Production of art projects (e.g. films, book, paintings, etc.).	81.0**	66.5	75.6	66.5
Construction of over-snow road networks	20.6	51.4**	27.8	51.4**
Construction of airstrips	45.5	62.0**	51.1	62.0
Construction of new stations for scientific research	93.1	91.6	92.2	91.6
Mining of oil and other mineral resources[c]	61.9	70.9	71.1	70.9
Commercial fishing	87.8	80.4	84.4	80.4
Hunting for whales	75.7	82.1	80.0	82.1
Exploitation of biological or genetic material for commercial purposes	63.5	76.0**	73.3	76.0
Exploitation of icebergs for fresh water supplies[c]	52.4	70.4**	62.2	70.4
Protection of Antarctica as a wilderness reserve where development of infrastructure is limited[c]	74.1	68.2	73.3	68.2

[a]Chi-Square test for differences between Spain and USA: * significant at $\alpha \leq .05$; ** significant at $\alpha \leq .01$.
[b]Chi-Square test for differences between Spain Tourism and US Tourism courses: * significant at $\alpha \leq .05$; ** significant at $\alpha \leq .01$.
[c]Management practices currently taking place in Antarctica at zero or very low levels.

Table 4. Accuracy of beliefs about visitation and infrastructure development by nationality and course type

	Spain (%)[a]	USA (%)[a]	SP Tourism (%)[b]	US Tourism (%)[b]
Number of people visiting Antarctica each year.	27.5	24.0	24.4	24.0
Percentage of Antarctica's land area visited by humans.	67.7	77.1*	78.9	77.1
Percentage of Antarctica's land area covered by long-term infrastructure (e.g. research stations) cover.	65.6	64.8	53.3	64.8

[a]Chi-Square test for differences between Spain and USA: * significant at $\alpha \leq .05$; ** significant at $\alpha \leq .01$.
[b]Chi-Square test for differences between Spain Tourism and US Tourism courses: * significant at $\alpha \leq .05$; ** significant at $\alpha \leq .01$.

visitation rates, the scope of visitation (that is the percentage of Antarctica's land area regularly visited by humans), and the extent of infrastructure development (Table 4). Responses were measured on three point ordinal scales and recoded as correct (using '1') or incorrect (using '0'). Additionally, respondents were asked whether these parameters should decrease, remain the same, or increase (Fig. 1).

Statistical analysis was completed in SPSS Version 21, and involved non-parametric techniques appropriate for the data (Chi-Square Tests and Mann-Whitney U Tests). The criterion for statistical significance was $\alpha \leq 0.05$. Explanatory variables included nationality and course type. The latter was used to control for variation associated with different course types. After testing for differences based on nationality, the environmental science course was excluded and classes were recoded as Spain Tourism or US Tourism. This helped us determine whether differences in values, beliefs, and attitudes were more attributable to nationality or course type. Responses to the open-ended questions were beyond the scope of the paper and were not reported.

Results

Respondent profiles

A total of 368 surveys were returned in a usable format for an overall response rate of 96.5%. There were 189 respondents from Spain and 179 from USA. The sample from Spain included 99 students enrolled in

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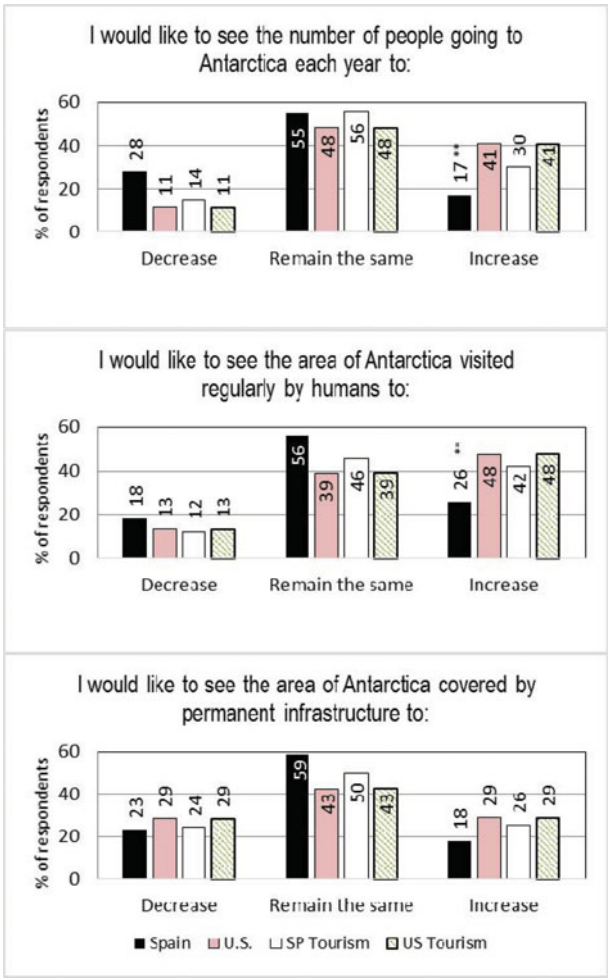

Fig. 1. Support for visitation and infrastructure development by nationality and course type.
**Chi-Square test for differences between Spain and USA significant at $\alpha \leq 0.01$.

an environmental science course and 90 in a tourism course. The sample from USA included 69 students in an international tourism course and 110 in an introductory level recreation and tourism management course. A majority of respondents from Spain were female (65.1%), while a majority of those from USA were male (53.1%). The average age was 21 in both countries. Environmental knowledge was moderate (Spain: $x = 2.07$; USA: $x = 1.70$, on a 1 to 3 scale with 1 being low and 3 being high) and knowledge of Antarctica was low (Spain: $x = 1.21$; USA: $x = 1.06$). None of the students had previously travelled to Antarctica.

Values: what is the importance of Antarctica?

When asked about the importance of Antarctica, students in USA were more likely to indicate that the area is 'a reserve of mineral resources that might support society in the future' ($X^2(1) = 12.09$, $p = .000$). Students in Spain were more likely to indicate that Antarctica is 'an important component of the Earth's climate system' ($X^2(1) = 7.09$, $p = .005$) (Table 1). There were no statistically significant differences when students in the Spanish tourism course were compared to tourism students in USA (Table 1). Less than 3% of respondents considered Antarctica to have no value for mankind. 'One of world's last great wildernesses', 'science laboratory for the benefit of mankind' and 'an important component of the Earth's climate system' were the items that received the highest level of support across samples (Table 1).

Values: relationships between humans and the Antarctic environment

Students in USA were more likely to indicate that humans and the natural environment of Antarctica were of equal importance ($X^2(1) = 13.75$, $p = .000$), while students in Spain were more likely to indicate that humans should protect the Antarctic environment, including those components that have no direct benefit for humans ($X^2(1) = 44.40$, $p = .000$) (Table 2). Students in the Spanish tourism course were more likely than US tourism students to state that humans have a moral obligation to protect the Antarctic environment, irrespective of direct benefits to society ($X^2(1) = 9.78$, $p = .002$) (Table 2). Less than 5% of respondents considered humans to be more important than the Antarctic environment. Half or more of the respondents considered Antarctica as a place where people may experience a connection with nature, and agreed that humans have a responsibility to protect Antarctica for future generations.

Beliefs

Students were asked whether they believed that 14 resource management and tourism development practices were taking place in Antarctica. Mining, water-resource development, land-based tourism including the construction of dedicated hotels and wilderness protection where development of infrastructure is limited are currently taking place in Antarctica at zero or very low levels, and were reverse coded. Chi-Square Tests revealed that the accuracy of beliefs varied significantly on seven items, with students in the United States scoring higher on six items (Table 3). After controlling for course type, the accuracy of beliefs differed significantly on only two items, the presence of large-scale ship-based tourism and the presence of road networks, with students in USA scoring higher on both (Table 3).

Students in USA held more accurate beliefs about the percentage of Antarctica's land area visited by humans ($X^2(1) = .585$, $p = .045$). There were no statistically significant differences after controlling for course type (Table 4).

Attitudes

Students in USA were more likely to support ten of the resource management and tourism development practices included in the study. Support for media projects, research activities, commercial fishing, and wilderness protection did not differ by nationality (Table 5). Only

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Table 5. Support for resource management and tourism development practices by nationality and course type

	Spain (%)[a]	USA (%)[a]	SP Tourism (%)[b]	US Tourism (%)[b]
Small to medium-scale ship-based tourism (up to 300 tourists per ship; make short excursions ashore)	71.9	83.8*	75.5	83.8
Large-scale ship-based tourism (between 300 and 3000 tourists per ship; no excursions ashore; luxury entertainment and dining)	17.5	55.3**	25.6	55.3**
Development of land-based tourism (hotel construction, tourist accommodation in research stations, snowmobile excursions, etc.)	24.3	45.8**	37.8	45.8
Educational trips for students	85.7	95.0**	85.6	95.0*
Production of art projects (e.g. films, book, paintings, etc).	79.9	76.5	75.6	76.5
Construction of over-snow road networks	14.3	39.1**	24.4	39.1*
Construction of airstrips	32.3	52.5**	41.1	52.5
Construction of new stations for scientific research	86.8	88.8	83.8	88.8
Mining of oil and other mineral resources	23.8	48.6**	38.9	48.6
Commercial fishing	45.5	53.1	47.8	53.1
Hunting for whales	4.2	12.3**	7.8	12.3
Exploitation of biological or genetic material for commercial purposes	6.3	19.0**	10.0	19.0
Exploitation of icebergs for fresh water supplies	27.0	41.9**	38.9	41.9
Protection of Antarctica as a wilderness reserve where development of infrastructure is limited	85.7	86.0	75.6	86.0*

[a]Chi-Square test for differences between Spain and USA: * significant at $\alpha \leq .05$; ** significant at $\alpha \leq .01$.
[b]Chi-Square test for differences between Spain Tourism and US Tourism courses: * significant at $\alpha \leq .05$; ** significant at $\alpha \leq .01$.

three of these differences remained after controlling for course type: support for large-scale ship-based tourism, educational trips for students, and construction of road networks, all of which were higher among students in US tourism courses. Support for protecting Antarctica as a wilderness reserve, which did not differ based on nationality alone, was higher among US tourism students (Table 5). Over three-quarters of respondents supported the protection of Antarctica as a wilderness reserve where development of infrastructure is limited. The majority of respondents (>65%) supported small to medium-scale ship-based tourism, educational trips, art projects and construction of new stations. Fewer than one-fifth of respondents supported hunting for whales or commercial exploitation of biological or genetic material.

When asked whether visitation rates, the scope of visitation, and the extent of infrastructure development should decrease, stay the same, or increase, Mann-Whitney U Tests revealed that students in Spain were less supportive of increases in both the rate ($U(1) = 11{,}225.5$, $Z = -5.52$, $p = .000$) and scope of visitation ($U(1) = 12{,}536.5$, $Z = -3.804$, $p = .000$). There were no differences in perceptions of infrastructure development, and none of the tests were significant when tourism students in Spain were compared to tourism students in USA. The majority of respondents supported no change or decrease in the number of people going to Antarctica each year, as well as in the percentage of Antarctica's land area that is covered by permanent infrastructure (Fig. 1).

Discussion

Differences between Spain and the USA

This study sought to determine whether values, beliefs, and attitudes about human activities in the Antarctic environment varied between students at two comparably sized public universities in different parts of the world. Preliminary results indicated a number of statistically significant differences based on nationality**.** US students were more likely to value Antarctica as a reserve of mineral resources and to state that humans and the Antarctic environment are of equal importance. Students in Spain were more likely to value Antarctica as an important component of the Earth's climate system and to agree that humans have a moral obligation to protect components of the Antarctic ecosystem that have no direct benefit to society. The accuracy of US students' beliefs was significantly higher on six activities taking place in Antarctica, most of which concerned infrastructure development or resource use. They also showed greater support than Spanish students for ten tourism development and resource management practices, held more accurate beliefs about the current scope of visitation in Antarctica, and were more likely to support increases in both the number of people visiting each year and the extent of visitation. This suggests that US students' perspectives were more anthropocentric and development oriented.

These findings led to a final research question. *Are there other factors that could explain the apparent differences in university students' values, beliefs and*

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attitudes about the Antarctic environment? To explore this question we compared Spanish tourism students with US tourism students. If the observed differences between Spanish and US students were primarily attributable to nationality, the same differences should have appeared in a comparison of tourism students from the respective countries. Results indicated that there were fewer differences between Spanish and US tourism students than between all Spanish and US students. In other words, variation in the initial analyses resulted primarily from differences between environmental science students in Spain, and tourism students in the US. On the subject of the importance of Antarctica, there were no statistically significant differences between Spanish and US tourism students (Table 1). Spanish tourism students were still more likely than US tourism students to say that humans have a moral obligation to protect components of the Antarctic environment that have no direct benefit to society. There were no significant differences in the responses of Spanish and US tourism students to five other statements on the relationship between humans and the Antarctic environment (Table 2). The accuracy of US tourism students' beliefs was significantly higher than that of Spanish tourism students on only two of 14 tourism development and resource management practices (Table 3), and support of US and Spanish tourism students differed significantly on only four of these activities (Table 5). There were no statistically significant differences in accuracy of beliefs or support for visitation and infrastructure development between Spanish and US tourism students (Table 4 and Fig. 1). Therefore, we conclude that differences in university students' values, beliefs and attitudes regarding the Antarctic wilderness do not vary greatly based on nationality.

Accuracy of beliefs

The majority of respondents knew that small to medium-scale ship-based tourism, art projects, educational trips, construction of new research stations, and commercial fishing are all taking place in Antarctica. They also knew that there are currently no mining activities. Many respondents did not know that large cruise ships have been travelling to Antarctica. Most respondents believed that land-based tourism involving hotel construction and tourist accommodation in research stations is taking place. While there are currently no plans for the development of hotels, tourist accommodation in stations and specially dedicated facilities have existed in the recent past (ASOC 2011; IAATO 2009; Bastmeijer and others 2008). A majority of respondents also believed that Antarctica is currently being protected as a wilderness reserve in which development of infrastructure is limited. While the Environmental Protocol has given legal protection to Antarctica's wilderness values, there are no official limits to the development of infrastructure in Antarctica and the human footprint has continued to grow (Tin and Summerson 2013; Hughes and others 2011). The majority of respondents believed that hunting for whales is taking place in Antarctica, consistent with current practices as whales in the Southern Ocean are killed for controversial scientific research (Leaper and Childerhouse 2014).

A majority of respondents believed that only several thousand people go to Antarctica each year. In reality, over 60,000 staff, crew and paying passengers travelled to Antarctica with the tourism industry in the 2013–2014 season (IAATO 2014) and 104 National Antarctic Programme facilities have a peak simultaneous capacity for 4,500 people (COMNAP 2014). Respondents greatly underestimated the number of people going to Antarctica. When asked to choose whether they believed that long-term infrastructure covered $<10\%$, or 10–50% or $>50\%$ of Antarctica's land area, the majority of respondents chose the smallest value. This answer matches most closely with Summerson's (2013) estimate that less than one percent of Antarctica's land area is currently covered by long-term infrastructure.

Consistency with previous research

There have been relatively few studies on the perceptions of people who have not travelled to Antarctica, and not all of these studies have asked the same questions. Nonetheless, among existing studies in the literature, there is relatively little variation based on nationality on certain issues. For example, a majority of respondents in AntWILD studies valued Antarctica primarily for its role in the planetary climate system, its wilderness, and as a science laboratory for the benefit of mankind. Respondents came mostly from Europe and North America. They also supported the conduct of small to medium-scale ship-based tourism, educational trips, construction of new scientific stations and designating Antarctica as a wilderness reserve where development of infrastructure is limited (Bastmeijer and Tin 2015). In a random telephone survey of 600 members of the public in two Chilean cities, Salazar (2013) reported that large proportions of respondents supported Antarctica as 'a global commons to be preserved for humanity' and 'a continent for scientific research.' In New Zealand, respondents to an online survey indicated that Antarctica is one of the last pristine areas of the world that needs to be preserved, and also referred to its mitigating effect on global warming (Colmar Brunton 2011). In their study involving nearly 2000 secondary school and university students in Malaysia, Shabudin and others (2016) reported that more than 50% of respondents did not agree with mining in Antarctica, while 70% agreed with the statement 'Antarctica is for science and peace'. However, in their study involving 1000 young Argentines, Del Acebo Ibáñez and Costa (2010) reported that only a minority of their respondents embraced a poetic or utopian vision of Antarctica.

The present study focused on individuals from two different countries with similar ages, levels of education, and knowledge of Antarctica. The two countries, Spain and USA, also provide many contrasts in their involvement with Antarctica and in domestic wilderness protection. Despite their government's significant role in

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Antarctic affairs, US respondents were not more supportive of scientific research in Antarctica, nor did they value the Antarctic wilderness more than their Spanish counterparts. While cross-national studies of environmental attitudes indicate that cultural belief systems shape people's responses to the natural environment (Milfont and Schultz 2016), results from this study indicate that differences between Spanish and US students arose primarily from differences between Spanish environmental science students and US tourism students. Hence, as a corollary, students' values, beliefs and attitudes appear to have greater variations based on course type than on nationality.

Previous research has documented similar findings, and some have forwarded the hypothesis that students choose disciplines that are consistent with their worldviews (Lang 2011; Hodgkinson and Innes 2001). Students enrolled in park management, outdoor recreation, and biology courses have shown more favourable environmental attitudes than students in economics and technology courses (Arnocky and Stroink 2013; Thapa 2001; Tikka and others 2000). Similarly, students in environmental studies courses displayed more biocentric attitudes than students in recreation management courses (Schultz and others 2011). While exposure to environmental courses has the potential to modify students' environmental attitudes (Rideout 2005; Hsu 2004), students' original views on domination of humans over the environment do not necessarily shift (Kuo and Jackson 2014). Vicente-Molina and others (2013) reported that Spanish and US students who took more courses on environmental issues were actually less likely to demonstrate pro-environmental behaviour, but reported no relationship between course type and environmental behaviour among students in Brazil and Mexico.

Implications

Emerging adulthood is a period of transition between adolescence and the stable adult roles of marriage, work and family responsibilities (Arnett 2011). Emerging adults have to make life decisions within contexts that have become more complex, diverse and globalised than those encountered by their parents (Parks 2011). While inherited cultural beliefs will remain important factors in their choices, the opportunities and information available in the globalised world of the 21st century could potentially allow emerging adults to adopt values that are different from their traditional local norms or even create new global norms. More cross-cultural studies of the environmental values of emerging adults will be needed to test such hypotheses. Meanwhile, results from this study suggest that emerging adults' perceptions of the Antarctic wilderness do not divide neatly along national borders.

Antarctica was valued by over 40% of respondents as a science laboratory for the benefit of mankind, one of the world's last great wildernesses and an important component of the Earth's climate system. If these preferences were to be placed into operation within the management of Antarctica, it would imply priority of research efforts that have clear benefits for mankind and management of human activities that would allow the cohabitation of scientific research and wilderness protection. Specifically, wilderness protection would entail limited development of infrastructure, and was supported by over 80% of respondents. The majority underestimated the number of people that are currently going to Antarctica each year and at the same time, they supported no change or decrease in these numbers. Similarly the majority correctly estimated the percentage of Antarctica's land area that is covered by permanent infrastructure and supported no change or decrease. If these preferences were to be operated, it would imply reducing the number of people going to Antarctica each year to levels far below current practice. It also implies the discontinuation of the expansion of the human footprint.

Limitations

The first limitation of the study lies in the limitations of the populations that were sampled. In order to understand what is in the interest of mankind, future studies need to include more people from different cultures, ages and locations. Future studies that focus on emerging adults may want to explore populations in different locations, for example capital versus small town, compare students with non-students, and explore the influence of value orientations and course of study on students' perceptions of Antarctica.

Other limitations concern data and methodology. The predominance of categorical data limits the range of data analysis tools that can be used, and hence, inferences that can be made. The study has not been designed to allow causal explanations to be derived. Interviews can elicit additional information that can help the interpretation of responses. In order to have a systematic view of mankind's perception of Antarctica and the way it should be managed, it is necessary to conduct large-scale, simultaneous studies across a large number of sample populations around the world. Until resources are available for such comprehensive analyses, the studies reported and reviewed in this article remain the few datasets that are currently available examining this topic.

The AntWILD project originated from the premise that the ATCPs have a responsibility to account for public views in their decisions. In reality, at present, few opportunities exist for the general public to be involved in Antarctic affairs. The Antarctic Environments Portal (www.environments.aq) enables Antarctic scientists to provide scientific advice by making peer-reviewed science available to the decision makers of the ATS. Some governments have included public consultations in their strategic Antarctic or Antarctic science planning processes, for example Australia (Press 2014) and New Zealand (New Zealand Government 2010). Some governments have provided legal provisions enabling the

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public to comment on Environmental Impact Assessments of proposed activities in Antarctica (Bastmeijer 2003). During the negotiations of the mining convention in the 1980s, protests in the home countries of ATCPs were organised by environmental non- governmental organisations (NGOs) (Roura 2007). For the most part, public involvement in Antarctic affairs is limited to indirect forms through the efforts of NGOs that attend Antarctic Treaty meetings with hopes of influencing decisions makers through their papers, analyses and criticism, and lobbying efforts (Barnes and Webb 1996; Tin 2013). In democratic countries, the public can also have an indirect influence on Antarctic affairs through the election of its national government and other votes and referendums. However, not all countries that are ATCPs are democratic regimes. Therefore, it remains unclear how governments of ATCPs measure and incorporate what is in the 'interest of mankind' into their decisions. Even in the case where more comprehensive information on the values, beliefs and attitudes of the global population becomes available, it remains to be seen how and if the ATS would take such information into account in their decisions with respect to the management of human activities in the Antarctic wilderness.

Conclusions

Spanish and US university students' values, beliefs and attitudes regarding the Antarctic wilderness do not appear to vary greatly based on nationality. Less than 5% of respondents considered humans to be more important than the Antarctic environment. Half or more of our respondents considered Antarctica as a place where people may experience a connection with nature, and agreed that humans have a responsibility to protect Antarctica for future generations. Nonetheless, differences do exist and they appear to be greater based on course type than on nationality.

Engelbertz and others (2013: 18) commented that 'values are at the core in human connections to Antarctica' and that 'every decision on how to manage human contact to and activity on the icy continent is necessarily linked to most basic questions of moral nature' and of human values. If that be the case, then managing Antarctica 'in the interest of mankind' would need to, somehow, allow mankind's values, beliefs and attitudes to be made known and be incorporated into 'every decision on how to manage human contact to and activity on the icy continent' (Engelbertz and others 2013: 18). This study contributes to the respective body of knowledge by bringing to light the perceptions of two groups of emerging adults. Few opportunities currently exist for the general public to be involved in Antarctic affairs, meaning that public views that are made visible do not necessarily result in them being taken into consideration. Nevertheless, this does not diminish the value of the data presented in this paper, as public views that are not visible stand very little chance of being recognised. Making public opinion visible is one of the first steps towards policy change.

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References

Allen, S.D., D.A. Wickwar, F.P. Clark and others. 2009. *Values, beliefs, and attitudes technical guide for Forest Service land and resource management, planning, and decision-making*. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station (General Technical Report PNW-GTR-788).

Arnett, J.J. 2004. *Emerging adulthood: the winding road from late teens through the twenties*. Oxford: Oxford University Press.

Arnett, J.J. 2011. Emerging adulthood(s): The cultural psychology of a new life stage. In: Jensen, L.A. (editor). *Bridging cultural and developmental psychology: new syntheses in theory, research, and policy*. New York: Oxford University Press: 255–275.

Arnocky, S. and M.L. Stroink. 2011. Variation in environmentalism among university students: majoring in outdoor recreation, parks and tourism predicts environmental concerns and behaviours. *The Journal of Environmental Education* 42(3): 137–151.

ASOC (Antarctic and Southern Ocean Coalition). 2011. Land-based tourism in Antarctica. Buenos Aires: Antarctic Treaty Secretariat (ATCM 34: Buenos Aires 20 June–1 July 2011 . Information paper 87).

Barnes, J.N. and C.W. Webb. 1996. Implementing the Protocol, state practice, and the role of Non-Governmental Organisations. In: Francioni, F. and T. Scovazzi (editors). *International Law for Antarctica*. (2nd Edn). The Hague: Kluwer Law International: 475–503.

Bastmeijer, K. 2009. Protecting polar wilderness: just a western philosophical idea or a useful concept for regulating human activities in the polar regions? In: Alfredsson, G., T. Koivurova (editors-in-chief), and D. Leary (special editor). *The yearbook of polar law*. 1. Leiden: Brill/Nijhoff: 73–99.

Bastmeijer, K. 2003. *The Antarctic environmental protocol and its domestic legal implementation*. Leiden: Kluwer Law International.

Bastmeijer, K., and S. van Hengel. 2009. The role of the protected area concept in protecting the world's largest natural reserve: Antarctica. *Utrecht Law Review* 5(1): 61–79.

Bastmeijer, K. and T. Tin. 2015. Antarctica – A wilderness continent for science: the 'public's dream' as a mission impossible? In: Alfredsson, G., T. Koivurova (editors-in-chief), and H.Ó. Ágústsson (special editor). *The yearbook of polar law*. 6. Leiden: Brill/Nijhoff: 559–597.

Bastmeijer, K., M. Lamers, and J. Harcha, 2008. Permanent land–based facilities for tourism in Antarctica: the need for regulation. *Review of European Community and International Environmental Law* 17(1): 84–99.

Boeve–de Pauw, J. and P. Van Petegem. 2010. A cross–national perspective on youth environmental attitudes. *The Environmentalist* 30(2): 133–144.

https://doi.org/10.1017/S0032247416000425 Published online by Cambridge University Press

Buhl, H.M. and M. Lanz. 2007. Emerging adulthood in Europe: common traits and variability across five European countries. *Journal of Adolescent Research* 22(5): 439–443.

Callicott, J.B. and M.P. Nelson. 1998. *The great new wilderness debate*. Athens, GA: The University of Georgia Press.

Colmar Brunton. 2011. *Public opinion of Antarctica*. Christchurch: Antarctica New Zealand. URL: www.parliament.nz/resource/mi–nz/50SCFDT_EVI_00DBSCH_FIN_10919_1_A227504/e94263e14ce8f546f8ffe2fd342912562df4979b (accessed 1 October 2015.

COMNAP (Council of Managers of National Antarctic Programs). 2014. Main Antarctic facilities operated by National Antarctic Programmes in the Antarctic Treaty Area (south of 60° latitude south). Updated 13 February 2014. Christchurch New Zealand: CONMAP Secretariat . URL: https://www.comnap.aq/Information/SiteAssets/SitePages/Home/Antarctic_Facilities_List_13Feb2014.xls (accessed 1 October 2015.

Cordano, M., S. Welcomer, R.F. Scherer and others. 2010. A cross–cultural assessment of three theories of pro–environmental behavior: a comparison between business students of Chile and the United States. *Environment and Behavior* 43(5): 634–657.

Cordell, H.K., J.C. Bergstrom, and J.M. Bowker. 2005. *The multiple values of wilderness*. State College, PA: Venture Publishing.

Del Acebo Ibáñez, E. and M. Costa. 2010. Antarctic environmental problems: attitudes and behaviours of young inhabitants of two Argentine cities (Buenos Aires and San Carlos de Bariloche). *Polar Record* 46(3): 257–263.

Douglass, C.B. 2007. From duty to desire: emerging adulthood in Europe and its consequences. *Child Development Perspectives* 1(2): 101–108.

Dudeney, J.R. and D.W.H. Walton. 2012. Leadership in politics and science within the Antarctic Treaty. *Polar Research* 31: 11075, doi: 10.3402/polar.v31i0.11075

Engelbertz, S., D. Liggett, and G. Steel. 2013. Value theory for an Antarctic case study. In: Liggett, D. and A.D. Hemmings (editors). *Exploring Antarctic values*. Christchurch: University of Canterbury(Gateway Antarctica special publication series1301): 10–21.

European Parliament. 2009. Resolution of 3 February 2009 on Wilderness in Europe (2008/2210(INI)) P6_TA(2009)0034. Strasbourg: European Parliament. URL: http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//TEXT+TA+P6-TA-2009-0034+0+DOC+XML+V0//EN (accessed 1 October 2015.

Franzen, A. and R. Meyer. 2010. Environmental attitudes in cross–national perspective: a multilevel analysis of the ISSP 1993 and 2000. *European Sociological Review* 26(2): 219–234.

Gifford, R., and A. Nilsson. 2014. Personal and social factors that influence pro–environmental concern and behaviour: a review. *International Journal of Psychology* 49(3): 141–157.

Hodgkinson, S.P. and J.M. Innes. 2001. The attitudinal influence of career orientation in 1st–year university students: environmental attitudes as a function of degree choice. *The Journal of Environmental Education* 32(3): 37–40.

Hughes, K.A., P. Fretwell, J Rae and others. 2011. Untouched Antarctica: mapping a finite and diminishing environmental resource. *Antarctic Science* 23(6): 537–548.

Hsu, S. J. 2004. The effects of an environmental education program on responsible environmental behaviour and associated environmental literacy variables in Taiwanese college students. *The Journal of Environmental Education* 35(2): 37–48.

IAATO (International Association of Antarctica Tour Operators). 2009. *Land–based tourism facilities*. Baltimore: ATCP (32nd ATCM 6–17 April 2009: Information paper 101).

IAATO (International Association of Antarctica Tour Operators). 2014. *2013–2014 Summary of seaborne, airborne, and land–based Antarctic tourism* (Version 10 May 2014). Newport, RI: IATTO. URL: http://iaato.org/tourism–statistics (accessed 1 October 2015).

Izagirre–Olaizola, J., A. Fernández–Sainz and M.A. Vicente–Molina. 2015. Internal determinants of recycling behaviour by university students: a cross–country comparative analysis. *International Journal of Consumer Studies* 39(1): 25–34.

Jabour, J. 2013. The utility of official Antarctic inspections: symbolism without sanction? In: Liggett, D. and A.D. Hemmings (editors). *Exploring Antarctic values*. Christchurch: University of Canterbury (Gateway Antarctica special publication series 1301): 90–106.

Kormos, C.F. (editor). 2008. *A handbook on international wilderness law and policy*. Golden, CO: Fulcrum Publishing.

Kuo, S.Y. and N.L. Jackson. 2014. Influence of an environmental studies course on attitudes of undergraduates at an engineering university. *The Journal of Environmental Education* 45(2): 91–10.

Lang, K. B. 2011. The relationship between academic major and environmentalism among college students: is it mediated by the effects of gender, political ideology and financial security? *The Journal of Environmental Education* 42(4): 203–215.

Liu, J.H. and C.G. Sibley. 2012. Hope for the future? Understanding self–sacrifice in the face of global warming among young citizens of the world in the face of global warming. *Analyses of Social Issues and Public Policy* 12(1): 190–203.

Leaper, R., and S. Childerhouse. 2014. Present and future conservation management of Antarctic baleen whales. In: Tin, T., D. Liggett, P. Maher and M. Lamers. (editors). *Antarctic futures: human engagement with the Antarctic environment*. Dordrecht: Springer–Verlag: 97–112.

McGonigal, D. and L. Woodworth. 2003. *Antarctica: the complete story*. London: Frances Lincoln.

Milfont, T.L. 2012. Cultural differences in environmental engagement. In: Clayton, S. (editor), *The Oxford Handbook of Environmental and Conservation Psychology*. Oxford: OUP: 181–202.

Milfont, T.L. and P.W. Schultz. 2016. Culture and the natural environment. *Current Opinion in Psychology* 8: 194–199.

Nash, R.F. 2001. *Wilderness and the American mind.* 4th Edn. New Haven: Yale University Press.

Netherlands Environmental Assessment Agency. 2010. *Rethinking global biodiversity strategies: exploring structural changes in production and consumption reduce biodiversity loss*. The Hague / Bilthoven: Netherlands Environmental Assessment Agency (PBL).

Neufeld, E., J. O'Reilly, R. Summerson, and T. Tin. 2014. Valuing Antarctica: emerging views from international studies. In: Tin, T., D. Liggett, P. Maher and M. Lamers. (editors). *Antarctic futures: human engagement with the Antarctic environment*.. Dordrecht: Springer–Verlag: 233–252.

New Zealand Government. 2010. New Zealand Antarctic and Southern Ocean science: directions and priorities 2010–2020. Wellington: New Zealand Government. URL: http://antarcticanz.govt.nz/science/strategy (accessed 1 October 2015).

Parks, S.D. 2011. *Big questions, worthy dreams: mentoring emerging adults in their search for meaning, purpose, and faith*. 2nd Edn. San Francisco, CA: Jossey–Bass.

Peden, J., T. Tin, J. Benayas and others. 2015. Public values of the Antarctic wilderness: a comparison of university students

https://doi.org/10.1017/S0032247416000425 Published online by Cambridge University Press

in Spain and United States. In: Watson, A., S. Carver, Z. Krenova, and B. McBride (compilers). *Science and stewardship to protect and sustain wilderness values*. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station (10th World Wilderness Congress symposium 4–10, October 2013, Salamanca, Spain. Proceedings RMRS–P–74): 122–126.

Pisano, I. and M. Lubell. 2015. Environmental behaviour in cross–national perspective: a multilevel analysis of 30 countries. *Environment and Behavior* doi: 10.1177/0013916515600494.

Potts, R. 2007. Changing human relationships with wilderness and wildlands: implications for managers. *International Journal of Wilderness* 13(3): 4–6,11.

Press, A.J. 2014. 20 year Australian Antarctic strategic plan. URL: http://20yearplan.antarctica.gov.au/home. Accessed 1 October 2015.

Rideout, B.E. 2005. The effect of a brief environmental problems module on endorsement of the new ecological paradigm in college students. *The Journal of Environmental Education* 37(1): 3–11.

Roura, R.M. 2007. Greenpeace. In: Riffenburgh, B. (editor). *The encyclopedia of the Antarctic*. Vol 1. New York: Routledge: 472–474.

Sæþórsdóttir, A.D. and J. Saarinen. 2016. Challenges due to changing ideas of natural resources: tourism and power plant development in the Icelandic wilderness. *Polar Record* 52(1): 82–91.

Salazar, J.F. 2013. Perceptions and opinions of Antarctic values in Chile. In: Liggett, D. and A.D. Hemmings (editors). *Exploring Antarctic values*. Christchurch: University of Canterbury (Gateway Antarctica special publication series 1301): 48–69.

Sanderson, E.W., M. Jaiteh, M.A. Levy and others. 2002. The human footprint and the last of the wild. *BioScience* 52(10): 891–904.

Schultz, J., S. Simpson and E. Abdulaziz. 2011. The environmental action and philosophy matrix: an exploratory study of the environmental attitudes of recreation management and environmental studies students. *Journal of Environmental Education* 42(2): 98–108.

Shabudin, A.F.A., R.A. Rahim, N.M. Nor and other. 2016. Antarctic values and Malaysia's involvement in Antarctica: perceptions among young citizens of Malaysia. *Polar Record* 52(3): 305–315.

Shaw, J.D., A. Terauds, M.J. Riddle and others. 2014. Antarctica's protected areas are inadequate, unrepresentative, and at risk. *PLoS Biology* 12(6), e1001888. doi:10.1371/journal.pbio.1001888.

Smith, C., K. Christofferson, H. Davison, and other. 2011. *Lost in transition: the dark side of emerging adulthood*. New York: OUP.

Summerson, R.M.V. 2013. *The protection of wilderness and aesthetic values in Antarctica*. Unpublished Ph.D. dissertation. Melbourne: The University of Melbourne, Faculty of Architecture, Building and Planning.

Terauds, A., S.L. Chown, F Morgan and others. 2012. Conservation biogeography of the Antarctic. *Diversity and Distributions* 18(7): 726–741.

Thapa, B. 2001. Environmental concern: a comparative analysis between students in recreation and park management and other departments. *Environmental Education Research* 7(1): 39–53.

Tikka, P., M. Kuitunen, and S. Tynys. 2000. Effects of educational background on students' attitudes, activity levels, and knowledge concerning the environment. *Journal of Environmental Education* 31: 12–19.

Tin, T. 2013. Environmental advocacy in the Antarctic Treaty System – a personal view from the 2000s. *The Polar Journal* 3(2): 415–430.

Tin, T., and R. Summerson. 2013. Growing human footprint, diminishing wilderness in Antarctica. *International Journal of Wilderness* 19(3): 10–13, 36.

Tin, T., K. Bastmeijer, J. O'Reilly, and other. 2011. Public perception of the Antarctic wilderness: surveys from an educated, environmentally knowledgeable European community. In: Watson, A., J. Murrieta–Saldivar, and B. McBride, comps. *Science and stewardship to protect and sustain wilderness values*: Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station (9th World Wilderness Congress symposium 6–13 November 2009. Merida: Mexico. Proceedings RMRS–P–64): 109–117.

Vicente–Molina, M. A., A. Fernández–Sáinz, A. and J. Izagirre –Olaizola. 2013. Environmental knowledge and other variables affecting pro–environmental behaviour: comparison of university students from emerging and advanced countries. *Journal of Cleaner Production* 61: 130–138.

Watson, A.E. 2013. The role of wilderness protection and societal engagement as indicators of well–being: an examination of change at the Boundary Waters Canoe Area Wilderness. *Social Indicators Research* 110(2): 597–611.

Yencken, D., J. Fien and H. Sykes. 2000. *Environment, education and society in the Asia–Pacific: local traditions and global discourses*. London: Routledge.

Zinn, H.C. and A.R. Graefe. 2007. Emerging adults and the future of wild nature. *International Journal of Wilderness* 13(3): 16–22.