SCAR 2020

Antarctic Science – Global Connections

SCAR OPEN SCIENCE CONFERENCE 2020

SESSION 40

VALUES IN ANTARCTICA: IDENTIFICATION AND VULNERABILITY TO ANTHROPOGENIC IMPACTS

Rupert Summerson, Kevin Hughes
Shaun Brooks

ABSTRACTS SUBMITTED TO THE (CANCELLED) SCAR 2020 OSC IN HOBART

1277

Antarctic geological heritage: identification, vulnerability and threats

Luis Carcavilla Urqui[1], Enrique Díaz-Martínez[1], Jerónimo López-Martínez[2]
[1]Spanish Geological Survey (IGME), Madrid, Spain, [2]University Autonoma of Madrid, Madrid, Spain

Antarctica is a key piece to reconstruct the Earth's geological history. The Antarctic territory contains information that in some cases is unique, a model particularly representative of certain geological aspects, or is among the best examples in the world. Therefore, some Antarctic geological (including geomorphological) features can be considered as part of the geological heritage of international relevance at a global scale. To identify such elements is currently an object of attention by the Antarctic scientific community, and advances in that direction are taking place through the SCAR Action Group on Geological Heritage and Geoconservation. A necessary first and basic step to be taken before considering any possible subsequent conservation actions is the identification of the elements that form part of geological heritage, which needs to be based on the scientific consideration of their intrinsic value and following the appropriate systematic methodology. Once destroyed, geological elements cannot be recovered or restored. Hence, geological heritage must be managed considering also an assessment of its fragility, vulnerability to threats, and risk of degradation. While some geological elements are spectacular and evident, others may have great scientific value even though they may go unnoticed by a non-expert, so their destruction may occur due to ignorance of their value. This work presents a series of concepts and procedures to detect the susceptibility to degradation, vulnerability and quantification of anthropic threats, which should guide potential protection measures for those elements of the Antarctic geological heritage that require it.

1146

Defining the environmental footprints of McMurdo and Palmer Stations, Antarctica

Andrew Klein[1], Stephen Sweet[1], Terry Palmer[2], Terry Wade[1], Paul Montagna[2], Jose Jose Sericano[1]
[1]Texas A&M University-College Station, College Station, United States, [2]Texas A&M University-Corpus Christi, Corpus Christi, United States

The term “footprint” is commonly used in Antarctic environmental research. Only recently, however, has the term received a systematic examination aimed at developing a common understanding of its meaning. Additionally, the first continent-wide estimate of buildings and ground disturbance has recently been made. This recent work provides an ideal framework for synthesizing over 15 years of environmental monitoring observations made at McMurdo Station and for a shorter period at Palmer Station. These two station represent a wide range of station sizes found on the continent – from a mid-size peninsular station to the largest human occupancy on the continent. Geographic Information Systems (GIS) analysis provides quantitative estimates of the spatial extent of multiple overlapping footprints (geochemical, building, ground disturbance) at these two stations that adhere to the newly established “footprint” definitions. After delineation of individual “footprints” (e.g., total petroleum hydrocarbons or buildings) a systematic analysis of their overlap is undertaken. Typically, areas heavily impacted by human activities at both stations are found to occur within multiple “footprints.” Standard GIS overlay operations may provide a straightforward means of producing a hierarchical assessment of impact for a station and its environs. As accurate estimates of two footprints (buildings and ground disturbance) exist for both stations from their construction until present, temporal trends in the early growth, and their subsequent relative stability, of these two “footprints” will be described.

1148

Mapping the marine spatial footprint of U.S. science and operations on the Antarctic Peninsula

Andrew Klein[1]
[1]*Texas A & M University-College Station, College Station, United States*

Recently, attempts have been made to define the term “footprint” as it applies to the human impact on the Antarctic terrestrial environment. While some research has investigated the spatial footprint of ship-based Antarctic tourism, little work has examined the spatial footprint of marine science. The ASRV Laurence M. Gould (LMG) has been the primary support vessel for United States Antarctic Program (USAP) operations on the Peninsula since 1998. Thus, its location maps the spatial footprint of US science and operations. Navigation files recording the LMG’s position were used to construct an overall picture of its time in Antarctic waters. Positions from 209 cruise tracks representing approximately 77% of the ship’s total cruises and a higher percentage of its cruises within the Antarctic Treaty waters were binned into 5x5 km areas in western Antarctica. More detailed observations from a smaller number of cruises (approx. 200) that included a timestamp for each geographic location mapped the LMG’s spatial footprint seasonally and over the period of record. Clear patterns emerge, such as the annual Palmer Long-Term Ecological Research Program summer sampling cruise. Other areas of concentrated activity related to specific activities such as scientific fishing are also evident. This demonstrates that basic geographic information such as the position of a research vessel can provide useful information documenting the footprint of specific scientific activities on the Antarctic Continent.

1210

Study on the status quo and proposal of Implementing Spatial Planning in Fildes Region, Antarctica

XUEFENG LI[1]
[1]*National Ocean Technology Center, Tianjin, China*

The Antarctic is one of the most primitive and vulnerable ecosystem in the world. In view of the intensification of global climate change and the increase of polar human activities, the Antarctic and its ecosystem are facing unprecedented changes. The continuing concern of the international community to mitigate and adapt to these changes has prompted an ongoing call for an ecosystem-based approach to manage human activities in the Antarctic. In many sea areas around the world, marine spatial planning has become an effective way to transform this concept into management practice, which could be a new tool for the comprehensive management of polar oceans. The Fildes peninsula is characterized by high density of scientific research stations, abundant human activities and rich biodiversity. It is an ideal research area for spatial planning studies. By arranging the important bio-ecological distribution and human activity space information in the Fildes Peninsula regions, the zoning system for spatial planning was constructed. Three first-level functional zones were set up: important biological protection zones, human activity functional zones and Antarctic characteristic protection zones. There are ten second-level functional zones: integrated demonstration zone of biogeographic protection, typical species protection zone, fishery operation zone, scientific investigation zone, Antarctic tourist zone, flight/shipping channel zone, maritime search and rescue zone, historical relics zone, aesthetic value zone, and wilderness value zone. Research on spatial planning in the Fildes Peninsula regions can effectively protect marine biodiversity and ecosystem functional integrity, reduce and resolve spatial conflicts between current and future human activities and nature.

656

The Environmental Protocol and Climate Change: A Problem of “Fit”?

Alejandra Mancilla[1]
[1]*University Of Oslo, Oslo, Norway*

The concept of “regime fit” is used in environmental governance to measure whether a given institutional arrangement is adequate for dealing with its subject matter. For example, the fact that an organization like the Convention for the Conservation of Living Marine Resources (CCAMLR) uses an ecosystem approach to decide fishing quotas could be seen as fitting for its purpose—if the aim is to keep fishing practices in the Southern Ocean sustainable. The “problem of fit”, accordingly, arises when an institutional arrangement is insufficient or inadequate for dealing with its subject matter. This is arguably the case, I claim, with the Environmental Protocol of the Antarctic Treaty. While highly restrictive regarding the activities that might be conducted in the continent, the Protocol does not protect Antarctica and its nonhuman inhabitants from their biggest threat, i.e. rapid climate change. What it would require to make the Antarctic regime “fitting” is the question for which I then offer a preliminary answer.

861

Ecosystem services in terrestrial Antarctica: on the quantification of unmeasurable values

Luis R. Pertierra[1], Javier Benayas[2], Kevin A. Hughes[3], Antonio Quesada[2]
[1]Universidad Rey Juan Carlos, Mostoles, Spain, [2]Universidad Autonoma de Madrid, Madrid, Spain, [3]British Antarctic Survey, Cambridge, United Kingdom

Ecosystem services describe the many benefits provided by healthy functioning ecosystems, including food provision, climate regulation and recreational benefits. An assessment and understanding of ecosystem services has directed effective conservation and/or management in many areas across the globe. Policymakers are starting to embrace ecosystem services studies that focus on the Southern Ocean, but equivalent studies for Antarctic terrestrial environments are still largely absent. Here we present a first screening of ecosystem services in terrestrial Antarctica, with all socioecological features provided from the conservation of Antarctica under the Antarctic Treaty (AT), particularly attending to the inclusion of indirect, non-monetary bequest values. Ecosystem services assessment frameworks provide robust and widely applicable mapping tools to assist with the long-term sustainable decision-making adopted by the AT parties. Moreover, these evaluations offer a valuable framework to integrate the region into global assessments and conservation planning agendas.
Pertierra LR & Hughes KA (2019) Antarctic Science, 31, 229-230.

1051

Thresholds of wilderness

Rupert Summerson[1]
[1]*Independent scholar, Canberra, Australia*

The Protocol on Environmental Protection to the Antarctic Treaty (the Madrid Protocol), requires the protection of the wilderness and aesthetic values of Antarctica (Article 3). There has however been little progress in protecting these values (Summerson & Tin, 2019).
Previous research (Summerson & Bishop, 2011) has postulated that, given the hostile nature of the Antarctic environment and lack of permanent settlement, all of Antarctica should be considered wilderness except for those areas that have been degraded by human activity. It is proposed that the principle form of degradation is the construction of infrastructure (e.g. stations) which is perceived by its visibility. This begs the question whether there is a distance threshold at which an item of infrastructure is no longer perceived as having an impact on wilderness? Or is the threshold complete invisibility or absence?
A research project designed to answer this question has not been logistically possible which has meant using existing data. An Internet survey on perceptions of wilderness using three sets of 30 images of Antarctic landscapes, 50% of which include a variety of types of human presence and distances (Summerson 2013), has provided over 13,000 responses. This dataset has been analysed with a random forest using the Knime Analytics Platform to attempt the prediction of non-wilderness from the combination of intensity of human presence and distance. Preliminary results indicate that for complex infrastructure visibility is the most important factor in determining perception of non-wilderness with distance a less important factor.

1370

Protection of the intrinsic value of Antarctica - a way forward

Rupert Summerson[1], Alan Hemmings[2], Sira Engelbertz[3]
[1]Independent scholar, Canberra, Australia, [2]University of Canterbury, Christchurch, New Zealand, [3]Independent scholar, Wellington, New Zealand

The Madrid Protocol requires the protection of the intrinsic value of Antarctica (Article 3) but to date there has been little understanding or substantive debate about what intrinsic value means or how its protection can be effected.
The Action Group on Intrinsic Value in Antarctica (AGIVA) was formed under the auspices of the SCAR Standing Committee on the Humanities and Social Sciences to develop and promote a better understanding of the concept of intrinsic value across multiple cultures and to model a framework for implementing the duty towards intrinsic value enshrined in the Madrid Protocol.
In this paper we outline a framework rooted in the field of philosophy from which the concept of intrinsic value was derived, namely Ethics. An ethical framework is widely applied in biological and social sciences for any project involving the use of humans and animals. Practitioners in these fields are well accustomed to responding to questions related to ethics in project proposals and grant applications, which are generally considered by formally constituted ethics committees. We propose a similar framework for all research and operations proposals in which proposed activities would be considered for their potential impacts on the intrinsic value of the environment. These would then be formally balanced against the benefits argued for the proposed activities. Whilst this may already be done partially via EIA, the ethics of the proposed activities have hitherto not been considered. We propose a number of indicators to close this gap and assist the process.

ISBN: 978-0-948277-59-7

www.scar2020.org