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STRUCTURE OF BROAD-SCALE MANAGEMENT IN THE VERNADSKY STATION AREA[1]

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Структура широкомасштабного управління в районі станції Академік Вернадський.
Федчук А.
Реферат. Стаття присвячена актуальним питанням науково-методичного забезпечення антарктичної діяльності, географічне поширення та подальша диверсифікація якої набуває нових загрозливих масштабів, як в Антарктиці в цілому, так і в зоні відповідальності станції Академік Вернадський зокрема. Проаналізовано функціональну структуру основних типів підохоронних територій Антарктики, показано причини їх надмірної концентрації вздовж північно-західного узбережжя Антарктичного півострова. На основі порівняльно-географічного аналізу розкрито організаційно-правовий потенціал району наукових інтересів України в Антарктиці; показано доцільність впровадження в його межах додаткових механізмів територіального управління, притаманних для районів багатопрофільного використання. Як додатковий інструментарій науково-методичного забезпечення, для досліджуваного району виділено модельні території за подібністю ландшафтно-компонентної (острів Анверс і суміжні острови) та управлінсько-компонентної структури (острів Десепшн). З результатами оцінки географічного положення станції Академік Вернадський та видової структури діяльності на наближених острівних групах, визначено, що основними заходами управління мають стати нормативне регулювання морського сегменту антарктичного туризму, а також координація та стимулювання комплексних наукових досліджень на репрезентативних ділянках, які відіграють роль індикаторів регіональних екологічних процесів. Конкретні інструменти управління запропоновано розробляти за методикою СКАР з оцінки екологічних ризиків, а також на базі поетапного підходу, апробованого німецькими вченими на півострові Файлдс (затока Максвелл).

Структура широкомасштабного управления в районе станции Академик Вернадский.
Федчук А.
Реферат. Статья посвящена актуальным вопросам научно-методического обеспечения антарктической деятельности, географическое распространение и дальнейшая диверсификация которой приобретает новые угрожающие масштабы, как в Антарктике в целом, так и в районе станции Академик Вернадский в частности. Проанализирована функциональная структура основных типов подохранных территорий Антарктики, показаны причины их высокой концентрации вдоль северо-западной оконечности Антарктического полуострова. На основе сравнительно-географического анализа раскрыт организационно-правовой потенциал района научных интересов Украины в Антарктике; показана целесообразность внедрения в его пределах дополнительных механизмов территориального управления, присущих районам многопрофильного использования. В качестве дополнительного инструментария научно-методического обеспечения, для исследуемого района определены модельные территории по подобию ландшафтно-компонентной (остров Анверс и близлежащие острова) и управленческо-компонентной структуры (остров Десепшн). По результатам оценки географического положения станции Академик Вернадский и видовой структуры осуществляемой деятельности на приближенных островах, определено, что основными мерами управления должны стать нормативное регулирование морского сегмента антарктического туризма, а также координация и стимулирование научных изысканий на репрезентативных участках, играющих роль индикаторов региональных экологических процессов. Конкретные инструменты управления предложено разрабатывать по методике СКАР по оценке

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экологических рисков, а также на базе поэтапного подхода, апробированного немецкими учеными на полуострове Файлдс (залив Максвелл).

Abstract. The article is devoted to actual issues on methodological provisions for Antarctic activity. Geographical distribution and further diversification of human activities in this region became an environmental threat that needs more comprehensive approach for management in Antarctic in whole and specifically in the region of Ukrainian scientific interests. The functional structure of main Antarctic specially protected and managed areas is analyzed, the reasons of their high concentration along the north-west part of Antarctic Peninsula are shown. It is suggested that the region of Ukrainian scientific interests could be strengthened by a multiple use management system in order to avoid or reduce the risk of interference and minimise environmental impacts, plan and co-ordinate the existing and future activities the region. On the basis comparative-geographical analyses there were identified analogue areas similar to landscape structure (Anvers Island with adjacent islands) and component-based management structure (Deception Island). It is specified that basic measures for environmental protection should be the following: regulation sea-borne tourism, as well as coordination and stimulation research activities at representative sites which play a key role in regional ecosystem processes. It is suggested to develop a management plan by the environmental risk assessment procedures as well as step-by-step approach approved by German colleagues in the Fildes Peninsula Region, King George Island. The most comprehensive ecosystem study conducted within the Fildes Peninsula region provides a basis for further research which needs a long term environmental monitoring and information material compiling.
Key words: human activities, Antarctic areas protected system, multiple-used area, management approaches, Vernadsky station

1. Introduction

At the VIII Meeting of Committee for Environmental Protection, Stockholm, 2005, Ukraine introduced informational paper containing draft proposal for discussion concerning potential ASMA for Petermann Island, Wilhelm Archipelago (Draft proposal, 2005). Several National Antarctic programs and non-governmental organisations have strong scientific interests in this area. Petermann Island is designated as extremely important site for a long-term environmental monitoring. The southernmost breeding colony of gentoo penguins is the most important value of this island (Ignatyev at al., 2006; Naveen, 2003). Petermann Island has exceptional importance for long-term studies of the human activities impact on the physiology, populations and behaviour of its plants and animals. At that time, more than 12 thousands tourist visits during the summer season make the Petermann Island the most visited site in the Vernadsky station area. Several CEP Members supported Ukrainian proposal, and expressed their interest in this project.

At present a multiple-use is typical not only for Petermann Island but also for surrounding islands, where the scientific activity and subsidiary logistic support are widened for the last years and the continuing growth of tourist visits is also registered. This stipulates the necessity of elaboration of a broad-scale and comprehensive management system with regards not only to separate islands but to the whole area being under the influence of Vernadsky station (Possibilities, 2009).

Thus, the aim of this article is to evaluate the potential of Antarctic management regime as well as designate the role and structure of a possible broad-scale management in the area of Ukrainian scientific interests in the Antarctic.

2. Methods and Materials

On the basis on the comparative-geographical approach and method of analog areas it is analyzed the spatial organization and triple functional structure (landscape, activity-based and management structure) of all Antarctic Specially Managed Areas, which have already been adopted by Consultative Parties or are under final stage of project documentation. Basic materials for this research are electronic data sets completed by the Antarctic Treaty Secretariat (http://www.ats.aq/devPH/apa/).

To solve the raised issue it was won the research grant supported by the German Academic Exchange Service (July, 2009) in order to improve author's professional skills at the Institute of Ecology, University of Jena. Another research project commissioned by the German Federal Environment Agency and carried out by scientists of the Polar and Bird Ecology Group (under the supervision of Dr. Hans-Ulrich Peter) composed a draft of management plan for proposed Antarctic Specially Managed Area 'Fildes Peninsula Region'. The findings of that field research might be considered as a model for development of the present conformable studies in the Vernadsky station area because of many similarities. Hence, in this article were applied the following: a) methodology using by German colleagues concern comprehensive study of the environmental situation in specific Antarctic areas; b) risk analysis procedures according to the methods of German colleagues; c) procedures on establishment of a new Antarctic Specially Managed Area, revision and evaluation of existing areas with specially regime of management, establishment of zoning system and code of conduct for scientific research and for visitors, and planning of long-term monitoring activities as well (see Peter at al., 2003, 2008).

3. Antarctic Protected Areas System

Current Antarctic legislation designates this region as a natural reserve, devoted to peace and science. Protection of the Antarctic environment has been a central theme in the cooperation among Antarctic Treaty Parties. A variety of instruments have been developed within the Antarctic Treaty system to help protect special places such as important wildlife breeding areas, fragile plant communities, cold desert ecosystems and historic places. These instruments have included the Agreed Measures for the Conservation of Antarctic Fauna and Flora in 1964 and numerous recommendations to Parties. Under these and subsequent measures the following categories of protected areas were established:

- Specially Protected Areas (1964);
- Sites of Special Scientific Interest (1972);
- Historic Sites and Monuments (1968);
- Sites of Special Tourist Interest (1975);
- Specially Reserved Areas (1989);
- Multiple-use Planning Areas (1989).

Subsequently the ATCM adopted a number of measures on various issues to widen, complement and strengthen the protection of the Antarctic environment. In 1991 the Consultative Parties adopted the Protocol on Environmental Protection to the Antarctic Treaty to ensure comprehensive environmental protection in Antarctica. Annex V to the Protocol (entered into force in 2002) rationalises the protected area system. It introduces two new site designations: Antarctic Specially Protected Areas (ASPAs) and Antarctic Specially Managed Areas (ASMAs). On entry into force of Annex V, all earlier categories of protected areas will become ASPAs.

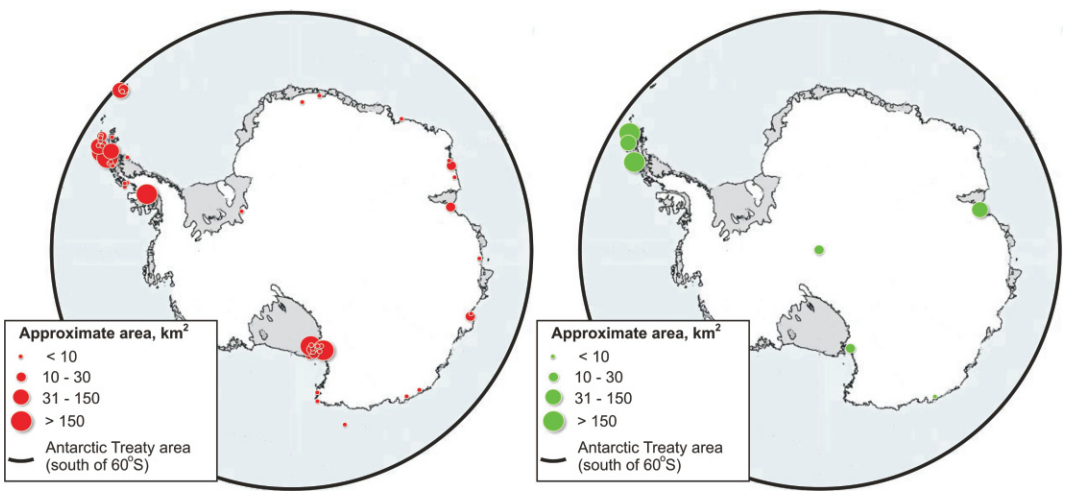
An area of Antarctica may be designated an ASPA to protect outstanding environmental, scientific, historic, aesthetic or wilderness values, any combination of those values, or ongoing or planned scientific research. An area where activities are being conducted or may be conducted in the future may be designated as an ASMA, to assist in the planning and co-ordination of activities, avoid possible conflicts, improve co-operation between Parties or minimize environmental impacts.

Annex V of the Protocol requires Management Plans to be produced for ASPAs and ASMAs for which Management Plans were not previously adopted. Annex V also prohibits entry into ASPAs except in accordance with a permit issued by an appropriate national authority in accordance with the requirements of the Management Plan. The aims of the Plan might be to:

- avoid certain specified changes to the site;
- prevent any human interference with specified features or activities in the area;
- allow only certain types of research that would not interfere with the reason for the site's designation.

International presence in Antarctica is characterized by considerable increase, geographical extension, and further diversification of human activities (Gozhik at al., 2009). That's way it is necessary to permanently improve forms and methods of spatial management based on the principles of sustainable development. Take this into account, ASMA can be considered as a package plan, which could supplement the existing regime of protection. Moreover, under current Antarctic environmental legislation designation an ASMA is legitimate mode to ensure national priorities and strategic views on further development of multiple activities in oversized territories, which spread far outside national stations and have an area of thousand square kilometres.

The most number of these areas confined to the Antarctic Peninsula and the group of islands surrounding it (fig.1). The intense human activities (such as scientific and logistic activity, and tourism) in this region are the result of the following factors combination: the least average distance from the South America sea ports (about 1000 km); easy accessibility of the region's water area (presence of free ice water or limited quantities of pack ice in summer months); semi-comfortable weather conditions and mild climate compared to other areas of the Antarctic (average temperature 0°...+2°C in summer); and high biodiversity (the richest variety of terrestrial plant and animal life in the Antarctic). As a result there is the large number of research stations, historic sites as well as tourist visits in this region.



a) b)

Figure 1. Diffusion of the Antarctic protected areas: a) ASPAs, clustered together by proximity in space; б) ASMAs (improved by author; source: http://www.cep.aq/apa/aspa).

The ATCM also issues specific guidelines for the sites the most visited by tourists. These Guidelines supplement general principles on Antarctic areas multiple-use management. They include practical guidance for tour operators, taking into account their environmental values in those sites. The Site Guidelines have the standard set of management measures such as zoning, visitor code of conduct, landing requirements as well as other seasonal limitation for visitors etc. In the recent years the Antarctic Treaty Parties adopted specific Guidelines for 26 the most visited sites in Antarctica, each of them can be visited by up to 15 thousands tourists per season.

The location of Vernadsky station in the north-west part of Antarctic Peninsula, i.e. in the region with the highest concentration of the different areas with special regime of management, have made it necessary to identify such areas around Vernadsky station within a systematic environmental-geographical framework. Such areas then will be included in the existing Antarctic protected areas system as Ukrainian contribution to environmental protection.

4. Human Activities Within The Area of Ukrainian Scientific Interests in Antarctica

The research area (approximately 1800 km^2) is extended from North to South from Booth Island and Girard Bay along the Graham Cost to Cape Perez including adjoining groups of small islands – Wilhelm, Argentine, Yalour, Barthelot and Darboux Island. Each of them is 1 to 2,5 kilometres long and rises up to approximately 50-150 meters above sea level, except for the Yalour Islands, which are a group of scattered and low lying rocks. Argentine islands has appeared as a result of the volcanically activity and contains the magmatic and metamorphic rocks. The island's relief is typical hilly with the relict ice caps (Grischenko at al., 2005).

First scientific research has been started here as far back as the end of the century before last (Ignatyev, 2004). Historical sites and monuments No. 27, 28 и 62 are the evidence of the heroic age of Antarctic exploration. In particular, there are features of the relics of the British, Argentine and French Antarctic Expeditions on Petermann Island (Fedchuk, 2006). Scientific station on Argentine Islands (from the point of view of functioning continuity) is one of the oldest in the Antarctic Peninsula area and possesses inter alia valuable continuous meteorological data, which have been collected since 1947 till present (Krakovskaya, 1998; Turner, 2005). Now Ukrainian Vernadsky station (former British Faraday station) consists of dwelling and technical buildings. It is logistic center of the whole research area. Within the radius of 25-30 km from the station the emergency stores network that determine external boundaries of the research area are located. Besides, two refuges have been erected here – Argentine base on Petermann Island and British Rasmussen-Hut in the Antarctic Peninsula.

Geographic location, configuration and accessibility of nearby islands, as well as availability of emergency stores and huts allow to start up in the area an extensive scientific-prospecting work and to set up a network of scientific fields in designated representative sites. Executing scientific programs include mainly geologic-geophysical, glaciological and complex biologic investigations. Scientific research being undertaken within this area is important for considering ecosystem interactions and long-term environmental changes in the Antarctic Peninsula region.

The rich moss turf on Green Island is considered to be the most extensive examples of this vegetation feature in the west Antarctic Peninsula region. Moreover, the blue-eyed cormorant colony also was one of the largest along the Antarctic Peninsula. Tease values are the primary reasons for designation of Green Island as ASPA No 108. Management at Green Island aims to:

- preserve the ecosystem of the Area for its potential as a largely undisturbed reference;
- allow scientific research on the ecosystem in the Area, which cannot be served elsewhere, in particular research which is expected to improve knowledge of the features and communities identified of special value, and which gathers baseline data on the island's features for which information is poor or not available;
- avoid degradation of, or substantial risk to, the values of the Area by preventing unnecessary human disturbance and sampling in the Area;
- minimise the possibility of introduction of alien plants, animals and microbes to the Area;
- allow visits for management purposes only in support of the aims of the management plan.

At present, there is only one ASPA in the area of Ukrainian scientific interests (table 1).

For last ten years, the number of tourist visits on islands has grown, except scientific activity. More than 60% of visitors of the area give preference to six islands – Petermann, Pleno, Booth, Winter, Galindez, and Yalour. These islands are generally the southernmost landing sites in the Antarctic Peninsula region. The Site Guidelines was already adopted for Pleno, Petermann and Winter Islands.

Vernadsky Station may be considered representative of other stations in the vicinity in that it has been regularly visited by seaborne tourists since 1968. In the period when Faraday Station was operated by BAS, the tour ship visits were strictly limited up to four per season. The limitations were imposed to reduce potential threats to the Antarctic environment, especially in the areas where research stations are concentrated; threats to the station's science programs (such as disruption of planned research activity and/or station work schedules). Contrariwise, visits to the station have not been restricted and limited since the station was transferred to Ukraine in 1996. As a result, in the period 1995-2008, when the station was managed by NASC, both visits of cruise ships and yachts have increased considerably (Fedchuk, 2007/2008).

Table 1

Distribution of the Antarctic areas with special management regime

Area Category	Number of areas	
	In a whole of Antarctica	In the area of Ukrainian scientific interests
Antarctic Specially Protected Areas (ASPAs)	71	1
Antarctic Specially Managed Areas (ASMAs)	7	-
Historic Sites and Monuments	84	3
Guidelines for Visitors Sites	25	3
National operator management regime (at the scientific stations)	11	-

The table 1 shows that in spite of intensive scientific, logistical, environmental, and tourist activities, the potential of Antarctic protected system in the areas of Ukrainian scientific interests is only partly evaluated and used.

5. Search for an Adequate Management Mechanism

The following possible alternative approaches to conduct management activities in the area could be considered (see Progress, 2007): 1) retention *status quo* in the area (no changes in the current system); 2) development special guidelines on various human activities; 3) development of new ASPA on the basis of representative research fields requiring special protection regime; 4) designation ASMA with broad-scale management system. Each of these alternative themselves has both advantages and disadvantages.

5.1. Retention status quo in the Area

According to this option the existing ASPA boundaries could be kept, and no further management activities would be discussed, if Ukrainian Antarctic Authority agrees that no additional protection measures are necessary. However, data collected in recent years suggest the need to update the management of human activities. It is especially necessary to consider the continuing increase in science, logistics and tourism in the area and the uncertainties attending the future development of these diverse activities. So far this alternative will not be considered in the sequel.

5.2. Development Special Guidelines on Various Human Activities

Development of practical tools, such as special guidelines for operations both at the station and refugees, as well as code of conduct for visitors, will give detailed information on the access to the area, activities, installations, waste management, scientific practise and environmental issues. The growing tourism activity within the Vernadsky station requires to prepare guidelines for visitors in the first place. Recommendations of spatial and temporal area use could help to minimize cumulative effects on wildlife, management policies at the most visited stations (Fedchuk, 2007/2008). In general, regulation approaches towards tourist visits fall into two distinct categories:

1) establishment of a specific tourist trail to divert visitors from stations toward alternative attractions; the trail provides an interesting educational experience for all tourists and draws attention to the research on the station – Arctowski (Poland) and Ferraz (Brazil);

2) a combination of restrictions or limitations on such visits directly at the station – Palmer (USA), Rothera (UK); moreover, tourists activities at McMurdo station (USA) are coordinated by National Science Foundation representative which is at the station during the summer season.

As the Galindez Island has a small surface area and covered with the ice cap, it is not possible to apply a special tourist route to divert visitors away from the station buildings toward alternative attractions, as it was established at the Polish or Brazil stations. Therefore, the main provisions of tourist policies directly at Vernadsky station were developed by Fedchuk in his thesis (2007).

At the XIX CEP Meeting (Edinburg, 2006) it was recommended that National Antarctic operators having specific knowledge of visited sites not already covered by visitor guidelines, or other forms of site management, should be undertake site reviews and draft Site Guidelines, using a consistent format, as appropriate. In the area of Ukrainian scientific interests the diversification of seaborne tourism is exhibited in a wide activity spectrum: boating and kayaking, diving, climbing, camping and walks in the ice-free areas. Such activity, particularly during birds and seals breeding, leads to a potential conflict of interests between nature-conservative, scientific and non-governmental activities.

Thus, developing site-specific guidelines, which were proposed at the XXIX Antarctic Treaty Consultative Meetings (ATCM), would be the primary means of managing on-land tourism. Two of the twelve rule sets for managing in Antarctica included in the Site Guidelines were specifically developed for the area around the Vernadsky Station that includes Petermann Island and Pleneau Island.

In the framework of effective co-operation between NASC and BAS the new Guidelines for Historic Site and Monument No. 62, the "Base F", Winter Island, was prepared (Lytvynov at all, 2008). During the last two years it was carried out by author the following specifications concerning this site: topographical description, identification of those species, which are regularly sighted on the Winter Island, landing requirements for both ships and yachts, and specific behavior inside the base as well. In addition, selection and processing of cartographic materials for this site were provided. The main quantitative restrictions are the following: landing is allowed for ships carrying 500 or fewer passengers; maximum 2 ships per day, of which no more than one can carry over 200 passengers; no more than 36 visitors ashore at any time, and no more than 12 visitors are allowed inside the base at one time (Fedchuk, 2009). The results of this work were appreciated at the 31th and 32nd Antarctic Treaty Consultative Meetings (Kyiv 2008, and Baltimore 2009). The International Association of Antarctic Tour Operators (more then 100 members) introduced the Visitor Site Guidelines for Wordie House into their domestic procedures.

Therefore Site Guidelines, just as it was adopted for Pleno, Petermann and Winter Islands, should be elaborated for other frequently visited islands and include separate Graham Cost dominating peaks, where tourists are actively climbing – Mt. Demaria (638 m), Mt. Mill (735 m), Mt. Scott (882 m). This, in turn, actualizes investigation of avalanche hazardous zones and creation of safe routs for climbing (Grischenko at al., 2005).

5.3. Development of New ASPA

Comparison of Green Island as a largely undisturbed ecosystem with other neighbouring sites causes the necessity to establish special protection regime for the biggest biogeographic field in this researched region located in the Galindez Island oasis. The choice of this area is caused by combination of location, landscape features and hypsometric sequence of its interface, namely a glacial cap, an oasis and bottom terrace. Favourable circumstance for designation as an ASPA are the following: proximity to Vernadsky station (less than 1 km), small polygon area (approximately 0,14 km^2), presence of proved structure for long-term measurements (meteorological station, snow measuring point, biogeographycal polygon), presence of landscape and microbiological data collated by GIS technologies (Usenko at al., 2009).

Designation of this scientific field together with relict ice cap as a new ASPA will allow to improve understanding the characteristics of elementary landscapes and communities of this island and also to provide with systematic gaining of complex data base on environmental changes. In terms of these data tendencies of global climate changes impact at Antarctic ecosystems will be determined.

5.4. Designation ASMA with Broad-scale Management

Multiple and continuous human activities in the researched area tend to be within the next decade. Therefore, the Vernadsky station area needs a multiple use management system and an ASMA for the Vernadsky region would provide the most comprehensive approach for managing the area. Designation of new ASMA in the Argentine Islands area allows to solve a complex of problems, as the following. Firstly, assisting in the planning and co-ordination of activities in the area, encouraging co-operation between scientific research and associated logistic support operated by Ukraine as Antarctic Treaty Party and other stakeholders, and managing the potential or actual conflicts of interest between different activities, including science, logistics and tourism. Secondly, to ensure the long-term protection of scientific, ecological, and other values of the area through the minimization of disturbance or degradation of these values, including disturbance to fauna and flora, and to minimize the cumulative environmental impacts of human activities. Thirdly, prevention unnecessary disturbance, destruction or removal of historic buildings, structures and artefacts. Fourthly, improving the level of mutual assistance and co-operation among Parties operating in the area.

Development of the integrated Management Plan of a possible ASMA is called to harmonize the existing and planning regimes of protection and management for the whole research area. The Code of Conduct will outline all management activities within the ASMA. In particular, planning and coordination of existing and future human activity in this area will allow to avoid potential conflicts between different fields of scientific activity, logistic operations, protection activity and tourism (Possibilities, 2006). Development of zoning system including seasonal buffer zones on islands with the purpose of elaboration the additional management measures by restricting and reducing access to sensitive wildlife concentrations, to support field research and facilitate logistic activities within the station area. The area should comprise the whole of Argentine Archipelago Island (where Vernadsky station situated) and furthermore include small islands in the vicinity of the Peninsula which hold important seabird concentrations and fragile plant communities.

6. Protected Values and Structure of Existing ASMAs for Designation Analog Areas

While current seven ASMAs have incommensurable area, all of them are notable for unique or typical for Antarctica environmental, scientific, historic and aesthetic values. Table 2 shows that overwhelming majority of ASMAs are situated in coastal zone, where the main values are outstanding biogeographical sites with easily accessible assemblages of marine and terrestrial flora and fauna (except ASMA No 5).

It is significant that all ASMAs have a complex structure composed of previously designated ASPAs and zoning system call to manage and coordinate activities more effectively within the areas.

In the activity-based structure dominates scientific activity provided by one or several National Antarctic Programs. Usually preliminary research started in the beginning of last centuries and has been performed in a more permanent way in post IGY times. Important artifacts of the heroic age of Antarctic exploration protected as Historic Sites and Monuments (HSM). One of the principal sites of early human activity in Antarctica is ASMA No 3 'Cape Denison'. It was the base of numerous early explorations inland. Present logistical centers are based on airfield and developed permanent infrastructures operated by several National Antarctic Programs are ASMA No 6 'Larsemann Hills' (for East Antarctica) and designed ASMA 'Fildes Peninsula' (for West Antarctic). Fildes Peninsula is the largest ice-free area of King George Island (South Shetland Archipelago), where is the highest density of research stations in the Antarctic and various different interests overlap, such as science, conservation of flora and fauna, protection of places of geological and historical value, station operations and transport logistics as well as ship-borne tourism with landing.

In addition, aesthetic values of all ASMAs are the main resources for Antarctic tourism that develops on a case-by-case basis (fig. 2). The ASMA No 4 for Deception Island is one of the most frequently visited sites in Antarctica by tourists. There is the only place in the world where vessels can sail directly into the centre of a restless volcanic caldera, providing the opportunity for visitors to learn about volcanoes and other aspects of the natural world, as well as early Antarctic exploration, whaling and science.

Table 2

Component-based Structure of the Antarctic Specially Managed Areas

No	Area, km^2	Geographical indication	The main values to be protected	Protected areas and managed zones within the ASMAs
1	360	Admiralty Bay, King George Island	Glaciated mountainous landscape with the most typical examples of bay/fjord settings. Terrestrial, bird and marine mammal communities. Relics of sealers and whalers in the 19th and early 20th centuries	ASPA 128, HSM 51; Tourists and Scientific Zones
2	15	The McMurdo Dry Valleys, Victoria Land	The largest relatively ice-free area in Antarctica; An unique example of cold desert ecosystem, biological communities of endolithic and Cryoconite systems	ASPAs 123, 131, 138, and 154 Facilities, Tourism Zone, and Special Features
3	1	Cape Denison, Commonwealth Bay, George V Land	Considerable historical, cultural and scientific significance; the base of numerous explorations inland	ASPA 162; Visual Protection Zone, Helicopter Zone
4	113,04	Deception Island, South Shetland Islands	The volcanic landscape with restless volcanic caldera; unique biological communities associated with the island's geothermal area; relics of sealers and whalers in the end of 19th centuries	ASPA 140, 145; HSM 71, 76; Facilities Zone
5	26,4	Amundsen-Scott South Pole Station	Landscape of a polar plateau; an important monitoring and research area	HSM 1, 80; Operational, Scientific, Historic, and Hazardous Zones

6	40	Larsemann Hills, Vestfold Hills, Princess Elizabeth Land	The southernmost coastal “oasis” in this geographic sector; widespread exposed geological and geomorphological features with more than 150 lakes; represents a significant biogeographical location, the logistical base of explorations inland	Helicopter Zone, Magnetic Quiet Zone, and Restricted Zones
7	3275	South-west Anvers Island and Palmer Basin	The only deep basin in the area, with a maximum depth of ~1400 m; Terrestrial, bird and marine mammal communities	ASPAs 113, 139; Restricted, Visitor, and Operations Zones
ASMA on final stage of project documentation				
8	63	Fildes Peninsula, Maxwell Bay	The largest ice-free area in Maritime Antarctica; terrestrial, bird and marine mammal communities; the logistical base of explorations Antarctic Peninsula area	ASPAs 125, 150; HSM 50, 52; Facility, Visitor, Sensitive, Restricted, and Wilderness zones

Because of topological and structural similarity, the nearby ASMA No 7 'South-west Anvers Island and Palmer Basin' is recognized as model area for further research. Regional ecosystem processes within the Anvers area are conformable to the Argentine Island area. Both areas have associated island groups with relict ice caps and ice-free coastal sites, which are biologically important and also the focus of most human activity in the region. To facilitate determination of boundaries and navigation inside the possible ASMA, it would be reasonable to define the north boundary of the area along the south and partially south-east boundary of existing ASMA No.7 'South-west Anvers Island and Palmer Basin' (fig.3). Such designation of the boundary will allow to exclude the territories, which can be found beyond any of management regimes. The eastern boundary of the area could be defined as a line extending parallel to and approximately one km inland from the coastline.

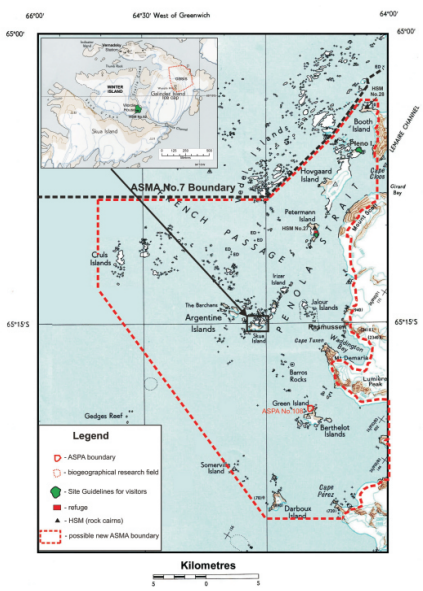


Figure 2. The area of Ukrainian scientific interests in Antarctica

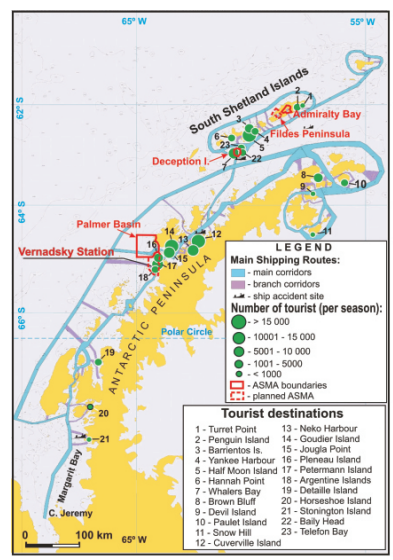


Figure 3. The main tourist sites where Guidelines for visitors were adopted Source: IAATO web-site http:\\iaato.org. Basic map by (International, 2007)

While the United States, as well as Ukraine, maintains the only permanent research station within the Area, research in these fields has been undertaken by scientists from a broad range of Antarctic Treaty Parties, often as collaborative projects with US scientists. The main aim of ASMA No 7 management plan is to support the research projects in long term, which can be disturbed by marine harvesting activities. While this human activity is not currently being conducted within the Area, but it should be carried out in such a way that it would not impact on the important scientific and other values present within the area.

As the area of Ukrainian scientific interests has not such extensive water component, the main potential threat for monitoring research is unregulated sea-borne tourism. Three the most visited tourist sites have already been designated in this area. Their number can be increased during next decade. The accessibility of the Argentine Islands has been significantly improved due to regional climate warming, namely deviation to the southward of fast ice edges and the reduced sea ice cover duration. As result, the delayed freezing of the ice-pack extends the season for cruise-ship tourism and benefits tourism in the region (Krakovskaya, 1998; Turner, 2005). Moreover, putting into operation Ukrainian seasonal research base on the mountainous Graham Coast may facilitate increased numbers of visits, including the potential for land-based (overnight) tourism. Therefore, the ASMA No 4 'Deception Island' also should be considered as another model area, in view of unique concentration of the most tourist destinations in Antarctica as well as good practice of visitor management.

7. Further Research Needs

Considering presented volume of insufficiently systematized data concerning biocenosis and Antarctic ecosystems within the researched area (Tashyrev at al., 2009), the most preferable should be the step-by-step approach approved by the German colleagues in the Fildes Peninsula region, King George Island (Peter at al., 2008). The proposed ecosystem approach is to start with the development of specific guidelines, followed by a zoning system and finally by a multiple use management system within a new ASMA, which could supplement the existing regime of protection.

Collecting and evaluating data on environmental parameters and human activities, including their impact, is a necessary requirement before applying this approach in accordance with Resolution 1 (2000). By the first step, the protection potential of an area has to be analysed. If the area contains values worth protecting and managing, then further investigations should be carried out. The checklist includes the intrinsic, environmental (ecological), scientific, historical, wilderness, aesthetic and tourist values. Next step, certain components or attributes of areas (e.g. ecosystems, species assemblages and habitats, abiotic features, landscapes, history, wilderness) should be defined as necessary to be protected. The detailed checklist of quality criteria is to determine what should be protected i.e. the reasons for protection. Criteria are representativeness, ecological importance, diversity, special features, stability, degree of interference and the importance of scientific work in the analysis area (Peter, 2003). By the third step, an environmental risk assessment plan based on several parameters such as the intensity of an impact, and its temporal and spatial scale could be the final process in the framework. It should clearly designate all human activities and their cumulative effects on the local ecosystem, namely both vegetation and behavior-physiology of selected bird species (impact assessment of changes in breeding pair numbers, breeding success and the distribution), natural processes, variability and viability, as well as the urgency for protection and management and the scientific uncertainty.

The scientific data sets obtained from this project will be analysed to give prognoses for future human developments for the Vernadsky station area. This approach would provide the most comprehensive study for managing this area in order to assist in the planning and co-ordination of human activities, as well as to avoid possible conflicts and minimize environmental impacts.

8. Conclusions

Argentine Islands Archipelago has exceptional importance for long-term studies of the natural variability in Antarctic ecosystems. At that time, increasing human activity have made it necessary to minimise potential environmental impacts by means of more effectively manage and coordinate activities.

For this paper's aim the following three research objectives were devised: 1) an acceptable management approach; 2) a geographical area, which should be covered; and 3) management activities, which should be follow by such an approach. The first sub-goal is proposed to use the previously proved step-by-step approach, beginning with the development of site-specific within an ASMA, which could supplement the existing areas with a special regime of protection and management.

Geographical boundaries of possible ASMA obviously overlap on the area of Ukrainian scientific interests in Antarctica. The area should comprise the Argentine Archipelago and adjacent smaller islands in the vicinity of the Graham Coast, which hold important seabird and mammals concentrations and fragile plant communities. In general, the ASMA boundary defined by thirty-kilometre-long radius of logistical accessibility as well as a configuration of the nearest ASMA.

As additional methodological tools to support further development, it is designated analogue areas similar to landscape structure (Anvers Island with adjacent islands) and component-based management structure (Deception Island). Also exceptional importance has methodology and materials used by German colleagues concerning comprehensive study of the environmental situation in specific Antarctic areas like the Fildes Peninsula region.

It is designated that basic measures for environmental protection should be the following: regulation sea-borne tourism (adoption of spatial and seasonal quantitative limits on tourist visits), as well as coordination and stimulation research activities at representative sites, which are important indicators of regional ecosystem processes. Specific management tools will be developed by means of the environmental risk assessment procedures.

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