

Journal of Geology, Geography and Geocology

Journal home page: geology-dnu.dp.ua

ISSN 2617-2909 (print)
ISSN 2617-2119 (online)

Journ. Geol. Geograph.
Geology,
31(4), 616-627.

[doi:10.15421/112257](https://doi.org/10.15421/112257)

N.A. Horozhankina, V.V. Hrushka, Z.V. Boyko, M.V. Korneyev, N.A. Nebaba

Journ. Geol. Geograph. Geocology, 31(4), 616-627

Antarctic tourism: spatial structure and dynamics of international tourist flows (for the seasons of 2011-2020)

Nataliya A. Horozhankina¹, Viktor V. Hrushka², Zoya V. Boyko¹, Maxim V. Korneyev¹, Natalia A. Nebaba¹

¹University of Customs and Finance, Dnipro, Ukraine

²Oles Honchar Dnipro National University, Dnipro, Ukraine, grush_vv@ua.fm

Received 15.06.2022;

Received in revised form 07.10.2022;

Accepted 25.10.2022

Abstract. The theoretical foundations of the origin and development of Antarctic tourism are considered. The first proposals for Antarctic tourism were recorded in 1910, but it was not until the 1920s that the first tourists were able to visit the mainland. The beginning of commercial tourism to the Antarctic was laid by Lars-Erik Lindblad on his cruise liner «Explorer», which

in 1966 made the first commercial tourist flight to the continent. In the 1980s of the 20th century, Antarctica was visited annually by about 2,000 tourists. In the 1990s, Antarctic tourism became a mass phenomenon, flights over the Antarctic resumed. The Antarctic Treaty system is considered. In 1959, the Antarctic Treaty was concluded, and in 1961, it established the status quo, which prohibits the making of new territorial claims and the expansion of old claims made before 1959. The treaty declares the freedom of scientific research in the Antarctic. It has been analyzed that the current lack of territorial possessions of one or another country in the Antarctic facilitates the conduct of comprehensive scientific research. It has been established that in Ukraine only one dissertation study is devoted to the issues of Antarctic tourism. All other works of scientists are devoted to biological, gravimetric, mineralogical, geodetic, oceanographic, physical, geological research of the Antarctic. It has been proven that modern directions of regional complex geographical research of the Antarctic are closely related not only to the provision of national interests, but also to the solution of global environmental problems. An analysis of the spatial structure and dynamics of international tourist flows to the Antarctic was conducted for the seasons 2011-2020. During this period, 389,800 people visited the continent. There is a constant increase in the number of visitors. Travel by mode of transport is considered. During the entire period of the study, the largest number of visitors (71.5% of the total number) used cruise ships / yachts with a landing on the shore with an excursion to the mainland. An analysis of the distribution of tourists by country of origin was carried out. The Top-20 places of Antarctica, which are the most visited, are considered. During the 2016-2017 – 2019-2020 seasons, the number of visits reached 7,086. The top five are occupied by Cuverville Island (9.07% of the total number of visits during the study period), Goudier Island (8.65%), Neko Harbor (8.55%), Whalers Bay (8.24%), Half Moon Island – Chinstrap Colony (7.83%). The station «Akademik Vernadsky» ranks 13th with 194 visits, which is 2.74%. The most popular tourist destinations in East Antarctica for the 2019-2020 season have been reviewed: Amundsen Sea with ship cruises, Cape Evans with small boat cruises and shore landings, Cape Adare with ship cruises, small boat cruises and shore landings from it to the shore. It is noted that at the current stage of the development of society, it is impossible to forecast the tourist flow to the Antarctic for the coming season with the help of economic and mathematical modeling in connection with the COVID-19 coronavirus pandemic.

Key words: Antarctic tourism, Antarctic Treaty, tourist flows, Ukrainian station Akademik Vernadsky.

Антарктичний туризм: просторова структура та динаміка міжнародних туристичних потоків (за сезони 2011-2020 років)

Н.А. Горожанкіна¹, В.В. Грушка², З.В. Бойко¹, М.В. Корнеєв¹, Н.О. Небаба¹

¹Університет митної справи та фінансів, Дніпро, Україна

²Дніпровський національний університет імені Олеся Гончара, Дніпро, Україна, grush_vv@ua.fm

Анотація. Розглянуто теоретичні основи зародження та розвитку антарктичного туризму. Перші пропозиції антарктичного туризму були зафіксовані у 1910 році, але тільки з 1920-х років перші туристи змогли побувати на материку. Початок комерційному туризму до Антарктики поклав Ларс-Ерік Ліндبلاد на своєму круїзному лайнері «Explorer», який у 1966 р здійснив перший комерційний туристичний рейс на материк. У 1980-х роках ХХ століття Антарктику щорічно відвідували

близько 2000 туристів. У 1990-х антарктичний туризм став масовим явищем, відновились авіарейси, маршрут яких пролягав над Антарктикою. Розглянуто систему Договору про Антарктику. У 1959 році був укладений Договір про Антарктику, а в 1961 році він закріпив статус-кво, який забороняє висувати нові територіальні претензії і розширювати старі претензії, висунуті до 1959 року. Договір проголошує свободу наукових досліджень в Антарктиці. Проаналізовано, що в даний час відсутність територіальних володінь тієї чи іншої країни в Антарктиці сприяє проведенню комплексних наукових досліджень. Встановлено, що в Україні лише одне дисертаційне дослідження присвячене питанням антарктичного туризму. Всі інші праці науковців присвячені біологічним, гравіметричним, мінералогічним, геодезичним, океанографічним, фізичним, геологічним дослідженням Антарктики. Доведено, що сучасні напрями регіональних комплексно-географічних досліджень Антарктики тісно пов'язані не лише із забезпеченням національних інтересів, але з вирішенням глобальних екологічних проблем. Проведено аналіз просторової структури і динаміки міжнародних туристичних потоків до Антарктики за сезони 2011-2020 рр. За цей період материк відвідали 389,8 тис. осіб. Спостерігається постійне збільшення чисельності відвідувачів. Розглянуто подорожі за видом транспорту. За весь період дослідження найбільша кількість відвідувачів (71,5% від загальної чисельності) користувалися круїзними суднами / яхтами з висадкою на берег з проведенням екскурсії на материк. Проведений аналіз розподілу туристів за країною походження. Розглянуто Топ-20 місць Антарктики, які є найбільш відвідуваними. За сезони 2016-2017 рр. – 2019-2020 рр. кількість відвідувань досягла 7086 одиниць. П'ятірку лідерів займають Cuverville Island (9,07% від загальної кількості відвідувань за досліджуваний період), Goudier Island (8,65%), Neko Harbor (8,55%), Whalers Bay (8,24%), Half Moon Island – Chinstrap Colony (7,83%). Станція «Академік Вернадський» посідає 13 місце зі 194 відвідуваннями, що становить 2,74%. Розглянуто найбільш популярні серед туристів об'єкти Східної Антарктики за сезон 2019-2020 рр.: море Амундсена із круїзами на кораблі, мис Еванс із круїзами на маленькому човні та висадкою на берег, мис Адаре із круїзами на кораблі, круїзами на маленькому човні та висадкою з нього на берег. Зазначено, що на сучасному етапі розвитку суспільства неможливим є прогнозування туристичного потоку до Антарктики на найближчий сезон за допомогою економіко-математичного моделювання у зв'язку із пандемією коронавірусу COVID-19.

Ключові слова: антарктичний туризм, Договір про Антарктику, туристичні потоки, українська станція Академік Вернадський.

Introduction

Three of the five most promising areas of international tourism identified by the UN World Tourism Organization for the next decade have exceptional prospects specifically in the Antarctic – these are ecological, adventure and cruise types of tourism.

Scientific stations are actively involved in the tourist process. Practically every cruise is not complete without tourists visiting the coastal (most accessible) scientific stations in the area of the Antarctic Peninsula and nearby islands, including the Ukrainian station of Akademik Vernadsky (Turyzm, 2021).

An important role in the development of Antarctic tourism is played by port cities of the Southern Hemisphere, which accumulate tourist flows from almost all over the world and act as organizers of tourist flows that are directed directly to the Antarctic (Fedchuk, 2007).

The tourist season in Antarctica lasts six months, from October to March. When autumn ends in the northern hemisphere, spring begins in Antarctica.

During the Antarctic spring, tourists can observe the mating season of penguins. The largest flow of tourists visits the icy continent in the period from December to January, which is explained by relatively mild weather conditions, compared to other months of the year, and the season of vacations and holidays. In the last two months of the tourist season, the flow of tourists decreases slightly, as in February and March there is an opportunity to observe whales (Frame et al., 2021).

Tourists who have come to Antarctica can engage in such active recreation as snowshoeing, skiing and snowboarding, diving under the ice of the ice shelves, and flying in a hot air balloon. Active and extreme species attract a large number of organized tourists.

Despite the dynamic development of tourism, the number of tourists in the Antarctic is incredibly small compared to other places on the globe, which is explained by the geographical location, climatic conditions and the short tourist season.

The purpose of the work is to analyze the spatial structure and dynamics of international tourist flows to the Antarctic during the decade of stable growth of Antarctic tourism before the onset of the COVID-19 pandemic.

Research methods

The research uses literary, analytical, mathematical and statistical methods and the method of scientific systematization. Statistical materials presented on the official website of the International Association of Antarctic Tour Operators (The International, 2021) were used for the analysis.

Results and their analysis

Antarctica is a large ice area located in the extreme south of our planet and covers the continent of Antarctica with adjacent territories and glaciers. The Antarctic also includes the waters of the southern parts of the Atlantic, Indian and Pacific oceans, which

are divided into a separate Southern Ocean. Its area is about 52 million km².

The first proposals for Antarctic tourism were recorded in 1910, but it was not until the 1920s that the first tourists were able to visit the mainland. This was thanks to the mail ships of the Falkland Islands, which began to deliver mail and whaling equipment to the mainland, while they could take a small number of tourists with them.

Similar trips were made by tourists on Chilean and Argentine warships, the original purpose of which was to resupply research stations (Voronova, 2012).

The beginning of commercial tourism to Antarctica was laid by Lars-Erik Lindblad on his cruise ship «Explorer», which in 1966 made the first commercial tourist flight to the continent. On January 23, the travelers landed on Smith and Melchior Islands on the Antarctic Peninsula (Walton, 2017).

In the early 1970s, a New Zealand plane carrying tourists crashed into the active Erebus volcano. There were 257 passengers on board the plane at the time of the accident. This incident slowed the development of air tourism in Antarctica for almost ten years (Erebus, 2021).

In the 1980s of the 20th century, Antarctica was visited annually by about 2,000 tourists. Most tourists watched glaciers and penguins from the decks of ships and rarely landed on the mainland. Those who went ashore photographed ice fields and penguins, visited old whaling and research stations (Myronov, 2021).

Antarctic tourism became a mass phenomenon in the 1990s (Tourism, 2021), flights over Antarctica resumed, various types of tourism appeared – tourists began to engage in scuba diving in clear waters and under ice, ride on glaciers, jump from parachutes and go paragliding (a type of parachuting sport in which the client parachutes from a steep slope in tandem with a professional instructor pilot; the tandem performs a glide descent using air currents to increase glide time).

In 1991, with the aim of developing Antarctic tourism, the International Association of Antarctic Tourist Operators was established, which is responsible for safe and environmentally responsible private sector travel to the Antarctic.

This association includes companies that work directly in Antarctica, tour operators, and travel agents who book seats for their clients in the operator's programs.

Thus, three periods (Fedchuk, 2014) of the functioning of Antarctic tourism are distinguished:

- 1) The birth of Antarctic tourism (1950-1969);
- 2) Diversification of tourist activities (1970-1991);

- 3) The modern period of the ecologically oriented strategy for the development of Antarctic tourism (starting in 1992).

In connection with the territorial claims that have arisen among the countries of the world regarding the Antarctic territories (Boyko, Horozhankina, Bezugly, 2021), in the second half of the 20th century there was an urgent need to create an international regulatory document in the field of Antarctic land use.

Thus, in 1959, the Antarctic Treaty was concluded, and in 1961 it entered into force, which consisted of norms and rules, and also established a certain status quo, which prohibits the making of new claims and the expansion of old claims (Secretariat, 2021).

The Antarctic Treaty of 1959 – the main system-forming document of the modern international legal regime of the Antarctic – is the first post-war treaty concerning a region of planetary scale beyond the jurisdiction of any state, and is aimed at solving a number of important geopolitical issues, such as arms control, the postponement of territorial claims, ensuring freedom of scientific research and international cooperation for this purpose. At the same time, the Antarctic Treaty does not regulate the issue of nature management in the Antarctic (Fedchuk, 2007). In order to limit the extraction of resources and minerals in accordance with the Protocol on Environmental Protection to the Antarctic Treaty (The Protocol, 2021), a ban was established on any activity related to mineral resources with the exception of scientific research.

As of 2022, there are 54 states participating in the Treaty, 29 of which have the status of Consultative Parties to the Antarctic Treaty.

In connection with the Treaty, experts distinguish three groups of countries:

1. Before its signing, Australia, Argentina, Chile, France, Great Britain, New Zealand and Norway had territorial claims.
2. The Soviet Union (Russia) and the USA reserved the right to make such claims.
3. That do not have official territorial claims – Belgium, Bulgaria, Brazil, Germany, Netherlands, India, Spain, Italy, China, Poland, Peru, South Africa, Ukraine, Uruguay, Czech Republic, Sweden, Ecuador, Republic of Korea, Finland, Japan (Mancilla, 2018, Headland, 2020).

Let's turn to the official document that regulates international norms and rules in the field of territorial claims. The article I of the Antarctic Treaty states: «Antarctica shall be used only for peaceful purposes. In particular, any types of activities of a military nature, such as the creation of military bases and fortifi-

cations, military maneuvers and testing of all types of weapons, are prohibited».

The treaty declares the freedom of scientific research in the Antarctic. Article II of the Treaty states: «freedom of scientific research in the Antarctic and cooperation for this purpose, as they have been applied during the International Geophysical Year, will continue».

Events in the Antarctic since the entry into force of the treaty have shown that the exchange of scientific information and scientific personnel has become stable and extensive. The Scientific Council for Antarctic Research successfully cooperates with many international organizations, such as the Scientific Committee on Oceanic Research, the Committee on Space Research, as well as with many national organizations and bodies engaged in Antarctic research.

The Antarctic Treaty is open to accession by any State which is a member of the United Nations or by any other State which may be invited to accede to the Treaty with the consent of all the Contracting Parties whose representatives are entitled to participate in consultative meetings.

In order to review the study of the issue of Antarctic tourism by Ukrainian scientists, we analyzed the works of scientists of various fields of knowledge, which are freely available on the electronic website of the V.I. Vernadsky Library (Natsionalna biblioteka, 2021).

It was found that only one dissertation study is devoted to the issues of Antarctic tourism.

A.P. Fedchuk in his dissertation study «Geospatial organization of Antarctic tourism», 2007 (Fedchuk, 2007) formulated a socio-geographical concept of the functioning of Antarctic tourism; analyzed the specifics of the formation and factors of territorial development of tourist activity in the Antarctic. The scientist revealed the essence of the process of regional recreational conversion – the repurposing of non-tourist infrastructure facilities. He characterized the regional sector-belt type of geospatial structure of Antarctic tourism. A.P. Fedchuk carried out the typification of tourist parking lots, showed their importance as objects of local territorial management. He studied the tourist potential of the area of scientific interests of Ukraine in the Antarctic. The scientist proposed a set of measures to ensure the national tourism policy in accordance with the modern organizational and legal regime for the use of the Antarctic.

The researcher defined the term «Antarctic tourism is a segment of international outbound seasonal tourism with its own specialized tourist product, alternative and innovative in nature, the final consumption

of which takes place in the Antarctic Treaty area (to the South of 60 Degrees Latitude Parallel)».

The tourism product is specialized in tours with an ecologically significant content, which are in demand among visitors. The alternative nature of the tourist product involves the use of objects that traditionally did not belong to the category of tourist resources (Fedchuk, 2007).

All other works of scientists are devoted to biological (Striukov, 2004, Berezkina, 2022), gravimetric (Tretiak, 2008), mineralogical (Savenok, 2006), geodetic (Zablotskyi, 2002), oceanographic (Skrypalova, 2005), physical (Hrytsai, 2007), a geological (Bazylevska, 2005) issues of Antarctic research.

It was found that in Soviet geographical science, the comprehensive study of the Antarctic region, the systematization and generalization of information about nature, temporary population, and internal spatial differences of development was initiated as early as 1968 by the economic geographer S. B. Slevich (Slevich, 1973).

The monograph (Shchypytsov et al., 1997), published already after the independence of Ukraine, is devoted to the development of the international legal regime of the Antarctic and highlights such «Ukrainian issues» as the assessment of the geopolitical position of the Akademik Vernadsky station and the analysis of the legal aspects of its functioning.

A. P. Fedchuk in his article «Emergence of a Ukrainian-centric approach in integrated geographic research of the Antarctic» (Fedchuk, 2010b) cites examples of Antarctic topics in domestic research that took place during the 20th century.

Understanding the tourist and recreational development of the Antarctic requires reflection of the mechanism of spatial distribution of tourist flows. Sea cruises, aviation and tourist land routes, which in general are consistently repeated every season, are a vivid example of socio-geographical functional networks in the Antarctic.

National operators of Antarctic programs took an active part in the formation and development of Antarctic tourism. The first tours to Antarctica were carried out by ships of the Naval Forces of Argentina and Chile in 1957-1959. Tourists were able to join the expeditions of these countries on a contractual basis (Fedchuk, 2010a).

The possibility of long-term chartering by tour operators of oceanographic research vessels of the former Soviet Union began having a significant impact on the scale of Antarctic tourism in 1991. Since then, the number of tourists has steadily exceeded the number of scientists and support staff involved in

Antarctic expeditions. At the current stage of society’s development, tourism is the largest human activity in the Antarctic in terms of the number of participants and the number of vehicles involved.

We will analyze the spatial structure and dynamics of international tourist flows to the Antarctic for

the seasons 2011-2020. Based on the statistical data of the International Association of Antarctic Tourist Operators, which are provided on the official website of the association (IAATO) (The International, 2021) freely accessible on the Internet, the number of tourists in the Antarctic is growing every year (Table 1).

Table 1. Number of Antarctic visitors traveling with IAATO member operators by type of visit (Antarctic, 2021, Antarctica key, 2020, IAATO, 2021)

season / number of people	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018	2018-2019	2019-2020
Seaborne tourism with landings ¹	20271	23305	25526	25341	27607	31493	35973	40368	49806
Seaborne tourism, no landings ²	4872	9070	9670	9459	8109	8680	6430	10889	18506
Air & cruise combination, with landings	860	1587	1848	1471	2353	3154	3405	4232	5358
Air & land tourism, Antarctic interior	516	354	361	431	409	558	577	679	731
Total	26519	34316	37405	36702	38478	43885	46385	51707	74401

¹ «Landings» are ashore excursions.

² These ships carry more than 500 passengers and cannot make landings.

In general, during the seasons of 2011-2012 – 2019-2020, there is a constant increase in the number of visitors (during this period, the number of visitors increased almost three times, which indicates the positive dynamics of tourism development in this region (Fig. 1). Such indicators can be explained by the fact

that in the 2011-2012 season, for the first time, positive dynamics of the tourist flow can be observed after its several-year decline due to the global economic crisis of 2008. And the next decline in the tourist flow is observed in the 2020-2021 season due to the COVID-19 pandemic.

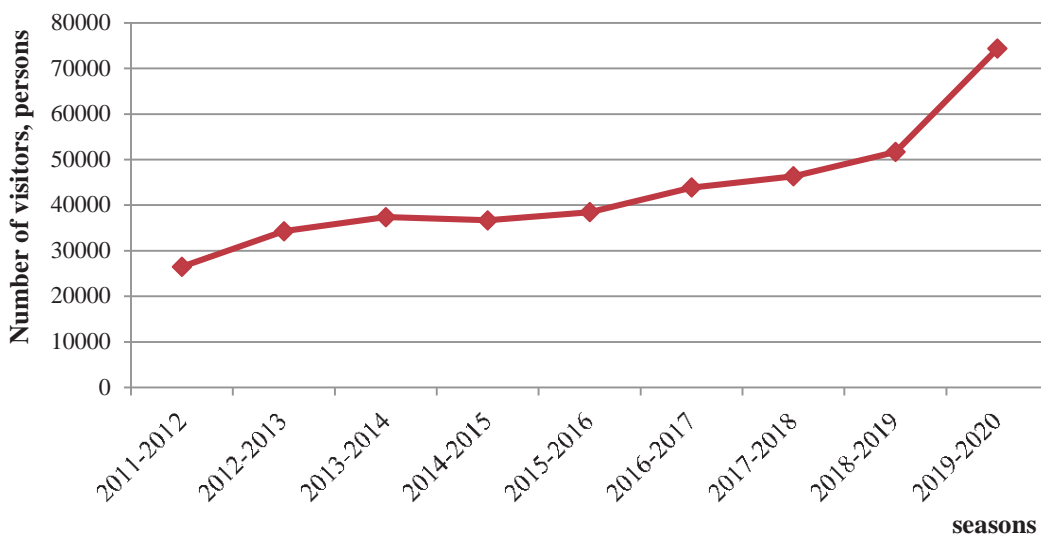


Fig. 1 The number of visitors to the Antarctic by 2011-2020 seasons (Antarctica, 2020, Sheets IAATO, 2020, IAATO, 2021, Tourism, 2019, Tourism, 2020, Antarctic, 2021, The International, 2021)

According to the Antarctic visit rate, we can say that 389,800 people visited the icy continent in the period 2011-2020. The lowest figure was observed during the tourist season of 2011-2012, it was 26.5

thousand people (Sheets IAATO, 2020), but already in the next season, the number of tourists who traveled with IAATO members to Antarctica increased by 8% and amounted to 34.3 thousand people. In the

2013-2014 season, 37,400 people visited Antarctica, which is 9% more than the previous season (Sheets IAATO, 2020).

At the current stage of the society development, it is impossible to forecast the tourist flow to Antarctica for the coming season with the help of economic and mathematical modeling in connection with the COVID-19 coronavirus pandemic.

Vacationers who visit any region of the world for tourist purposes should receive quality transport services, be able to get to all recreational and tourist facilities, regardless of the location (Hrushka et al., 2021). The importance of transport infrastructure in the economy, its development and operating condi-

tions are quite important for the development of Antarctic tourism.

Let's move on to the consideration of trips by type of transport. According to statistical information provided by IAATO, trips are divided into 4 groups (Fig. 2):

- 1) Seaborne tourism with landings;
- 2) Seaborne tourism, no landings, because the trip is carried out by ships that carry more than 500 passengers and cannot disembark;
- 3) A combination of air and cruise types of transport with landing on the shore;
- 4) Air and land tourism, including visits to the interior of the Antarctic.

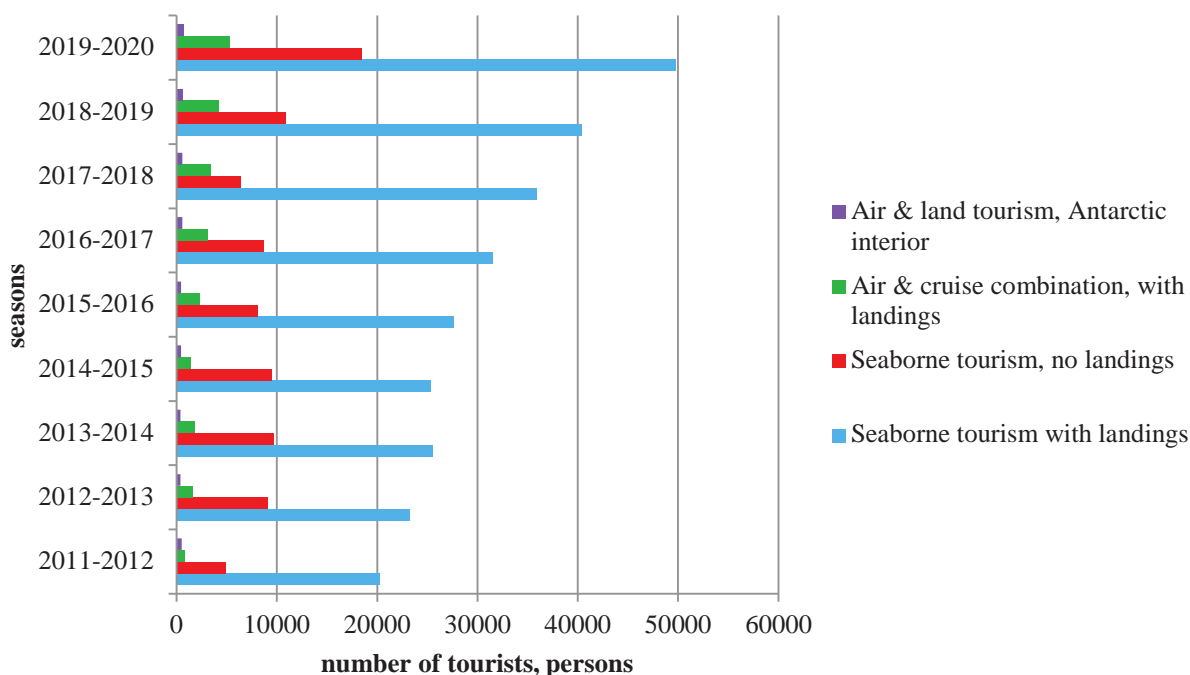


Fig. 2 Travel to the Antarctic by mode of transport by seasons 2011-2020 (Antarctica, 2020, Sheets IAATO, 2020, IAATO, 2021, Tourism, 2019, Tourism, 2020, Antarctic, 2021)

During the 2019-2020 season, the largest number of visitors (66.9% of the total number) used cruise ships / yachts with a landing on the shore with an excursion to the mainland (note that the number of cruise ship passengers in this case did not exceed 200 people).

The second place is occupied by trips made by cruise liners with a capacity of more than 500 passengers without landing on the shore of the mainland. The number of such visitors is about 24.9%.

The third place is occupied by trips that combine the use of air transport and a cruise ship with landing on the shore. The number of such visitors is about 7.2%.

The last, fourth place, is occupied by trips that include the use of airplanes and ground modes of transport with a visit to the inner, hard-to-reach areas of the Antarctic. The number of such visitors is about 1%,

which can be explained by the high cost of such trips and the mandatory absence of medical contraindications for tourists.

The main purpose of visiting Antarctica is to acquaint tourists with untouched nature and the life of the animal and plant world. Adventure tourism is diversified by the further development of yacht (sailing) tourism, kayaking, diving, transcontinental ski crossings, rock climbing and ice mountaineering (Fedchuk, 2014).

Air transportation into the interior of the continent is carried out by air, using airplanes and fixed-wing helicopters. Runways and helipads must be kept clear of snow to ensure safe take-off and landing conditions.

Antarctica has 20 operational runways (Antarctica Airports, 2021), but no developed airports with public access.

Passengers are delivered by sea through the following seaports: Argentina (Ushuaia Port), Australia (Tasmania Island), South Africa (Cape Town), Chile (Punta Arenas), New Zealand (Lyttelton Port).

Flights to Antarctica are operated by three airlines:

- 1) DAP (Punta Arenas, Chile),
- 2) ALCI (Cape Town, South Africa),
- 3) Croydon Travel (Victoria, Australia).

The most popular point of departure to Antarctica is the port of Ushuaia, located in the very south of Argentina. From this port, tourists can reach the icy continent only by sea. For tourists, this is the most economical and shortest way.

It takes about two days to travel from the port of Ushuaia to Antarctica. The duration of cruises originating in Argentina varies from 13 to 19 days. A significant disadvantage of this route is passing through the Drake Passage, which is known as a place of strong winds.

You can also get to Antarctica from the city of Punta Arenas. Sea vessels and commercial flights depart from here to the icy continent. For tourist flights here, airplanes are used with accommodation on board from 7 to 70 people.

Travel from Chile by plane takes one or two days. The advantage of departing from Punta Arenas is the possibility of bypassing the Drake Passage. Such routes pass through King George Island (South Shetland Islands).

New Zealand has two major transport HUBs, Lyttelton and Christchurch, which offer both sea and air connections to Antarctica. Air carriers in New Zealand operate both non-stop flights and flights on the Wilkins Ice Strip. Landing in Antarctica is carried out by aircraft from Australia, but they have only a scientific purpose.

Let's move on to the analysis of the distribution of tourists by country of origin.

The vast majority of Antarctic tourists (according to (The International, 2021) as of 2020) are US citizens (36%), followed by Chinese (11%) and Australians (11%), Germans (8%), which together provide 66% of the tourist flow (The International, 2021) (Fig. 3).

Thus, the analysis of the spatial structure and dynamics of international tourist flows allows us to identify three main regions of the formation of demand for Antarctic tourism:

- 1) North America;
- 2) Western Europe;
- 3) Australia.

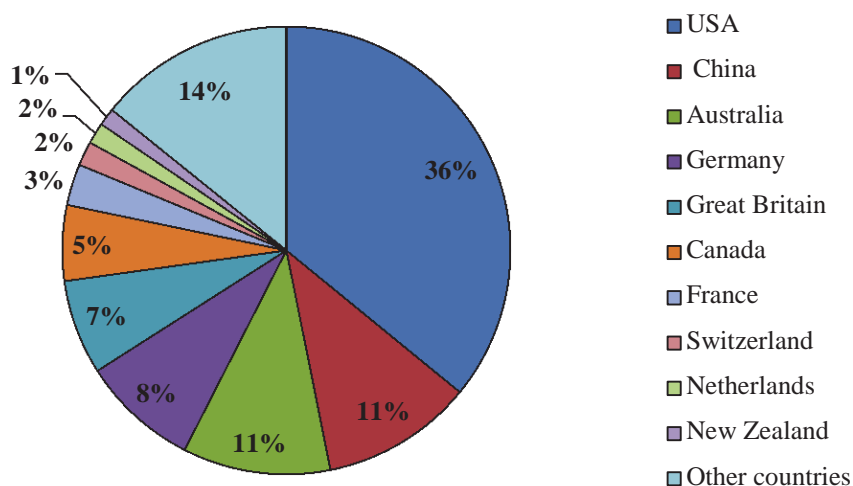


Fig. 3 Distribution of tourists to Antarctica by country of origin for the 2019-2020 season (The International, 2021, Antarctic, 2021)

It should be noted that 18,508 tourists (24.9%) visited the mainland on a cruise ship without disembarking, and 55,875 tourists (75.1%) disembarked. Thus, most tourists try to go ashore in Antarctica to see and «feel» its unique landscape.

In the distribution of tourists by country of origin for the 2019-2020 season who visited Antarctica on a cruise ship, the first place is confidently occupied

by the citizens of the United States (53%), Canadians (11%) are in the second place, Australians (9%) are in the third place (Fig. 4).

In the distribution of tourists by country of origin who landed on the mainland, the first place is occupied by citizens of the United States (31%), the second place is occupied by the Chinese (14%), and the third place is occupied by Australians (11%) (Fig. 5).

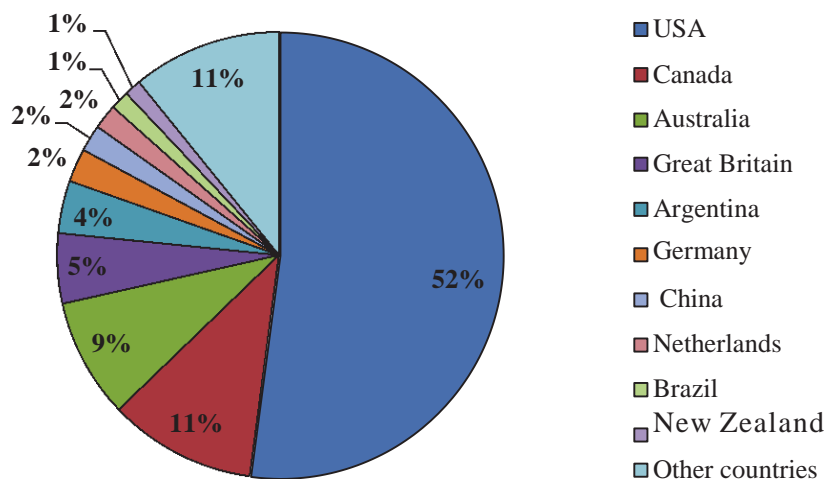


Fig. 4 Distribution of tourists by country of origin who visited Antarctica on a cruise ship during the 2019-2020 season (The International, 2021, Antarctic, 2021)

Moreover, compared to the data of a few years ago, the share of Chinese tourists among tourists in the Antarctic has increased the fastest. During the

2010-2011 season, the share of Chinese tourists did not even reach 10% of the total number of tourists (The International, 2021).

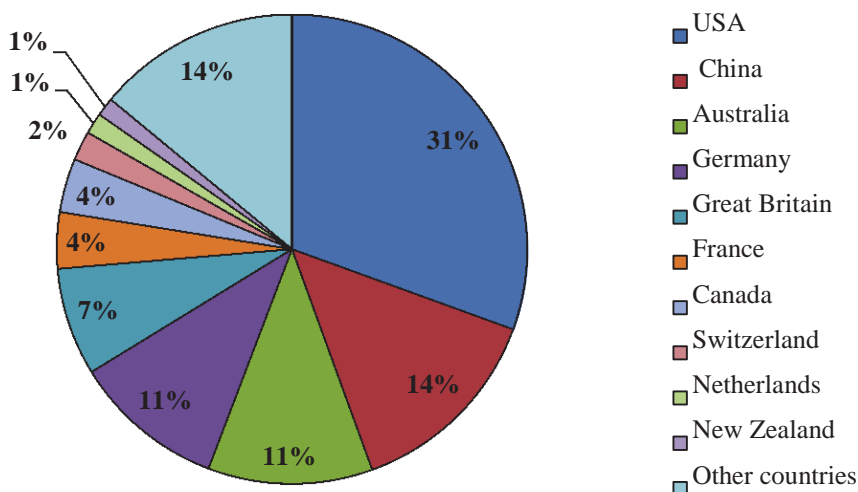


Fig. 5 Distribution of tourists by country of origin who landed on the mainland during the 2019-2020 season (The International, 2021, Antarctic, 2021)

In the report of the International Association of Antarctic Tourist Operators, given on the official website of the association (The International, 2021), there are 283 natural objects that are possible for tourists to visit.

The IAATO lists the Top 20 places in the Antarctic (Fig. 6) that are the most visited, including travel by yachts. These twenty locations account for about 65% of all landings each season (A Five-Year, 2022). It should be noted that during the 2016-2017 – 2019-2020 seasons, the number of visits reached 7,086. The top five are occupied by Cuverville Island (9.07% of the total number of visits during the study peri-

od), Goudier Island (8.65%), Neko Harbor (8.55%), Whalers Bay (8.24%), Half Moon Island – Chinstrap Colony (7.83%). The station «Akademik Vernadsky» ranks 13th with 194 visits, which is 2.74%.

When analyzing the 2019-2020 season, we can note that the specified Top-20 places accounted for 1,990 visits. The top five leaders were distributed as follows: Neko Harbor (9.6%), Cuverville Island (8.69%), Half Moon Island – Chinstrap Colony (7.79%), Whalers Bay (7.39%), Goudier Island (6.58%). Thus, the leading places in terms of attendance remain unchanged. Station «Akademik Vernadsky» ranks 18th with 55 visits, which is 2.76%.

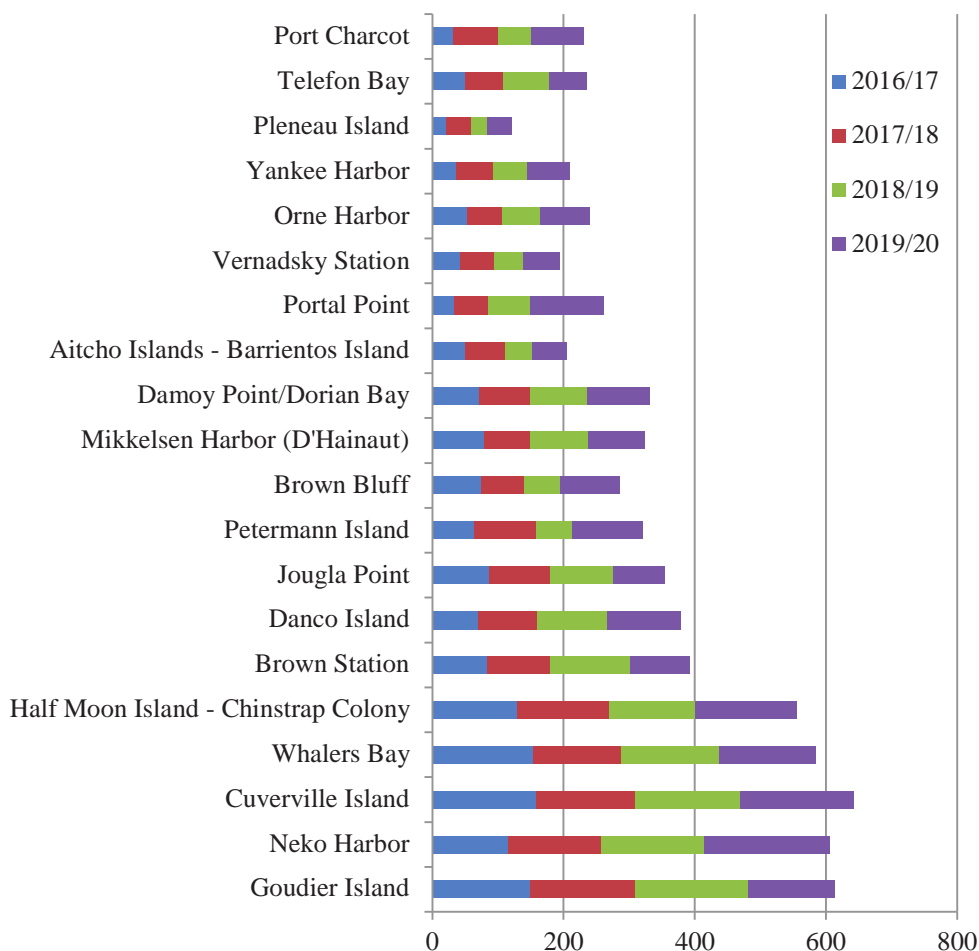


Fig. 6 Top 20 places in Antarctica that are the most visited for the seasons 2016-2017 – 2019-2020 (A Five-Year, 2022)

Let’s move on to the consideration of the most popular tourist attractions on the Antarctic mainland for the 2019-2020 season, the total number of visitors was 8,056, i.e. 10% of all visits (Fig. 7).

According to statistical information, there are 32 most popular destinations, the top three of which are: Amundsen Sea with ship cruises, Cape Evans with small boat cruises and shore landing, Cape Adare with ship cruises, small boat cruises and disembarking from it on the shore.

Practically every cruise is not complete without tourists visiting coastal scientific stations, including the Ukrainian one. The station «Akademik Vernadsky» is highly popular among foreign tourists due to its convenient geographical location.

Among the types of Antarctic tourism, the most popular are:

- 1) Sea cruises along the Antarctic Peninsula from the port of Ushuaia;
- 2) Yachting – traveling on private yachts, because the archipelago of the Argentine islands has convenient bays for parking yachts;

- 3) various types of adventure tourism: diving, sailing on ocean kayaks, skiing, visiting the «Wordie House», which is a museum of the early British scientific base, staying for several days in tent camps on the shores of the picturesque islands of Booth, Hovgaard, Petermann, the Argentine archipelago, and also on Graham Coast (Fedchuk, 2010a).

Conclusions

The first proposals for Antarctic tourism were recorded in 1910, but it was not until the 1920s that the first tourists were able to visit the mainland. This was thanks to the mail ships of the Falkland Islands, which began to deliver mail and whaling equipment to the mainland, while they could take a small number of tourists with them. Such trips were made by tourists on Chilean and Argentine warships, the original purpose of which was to replenish the supplies of scientific research stations.

In 1991, with the aim of developing Antarctic tourism, the International Association of Antarctic Tourist

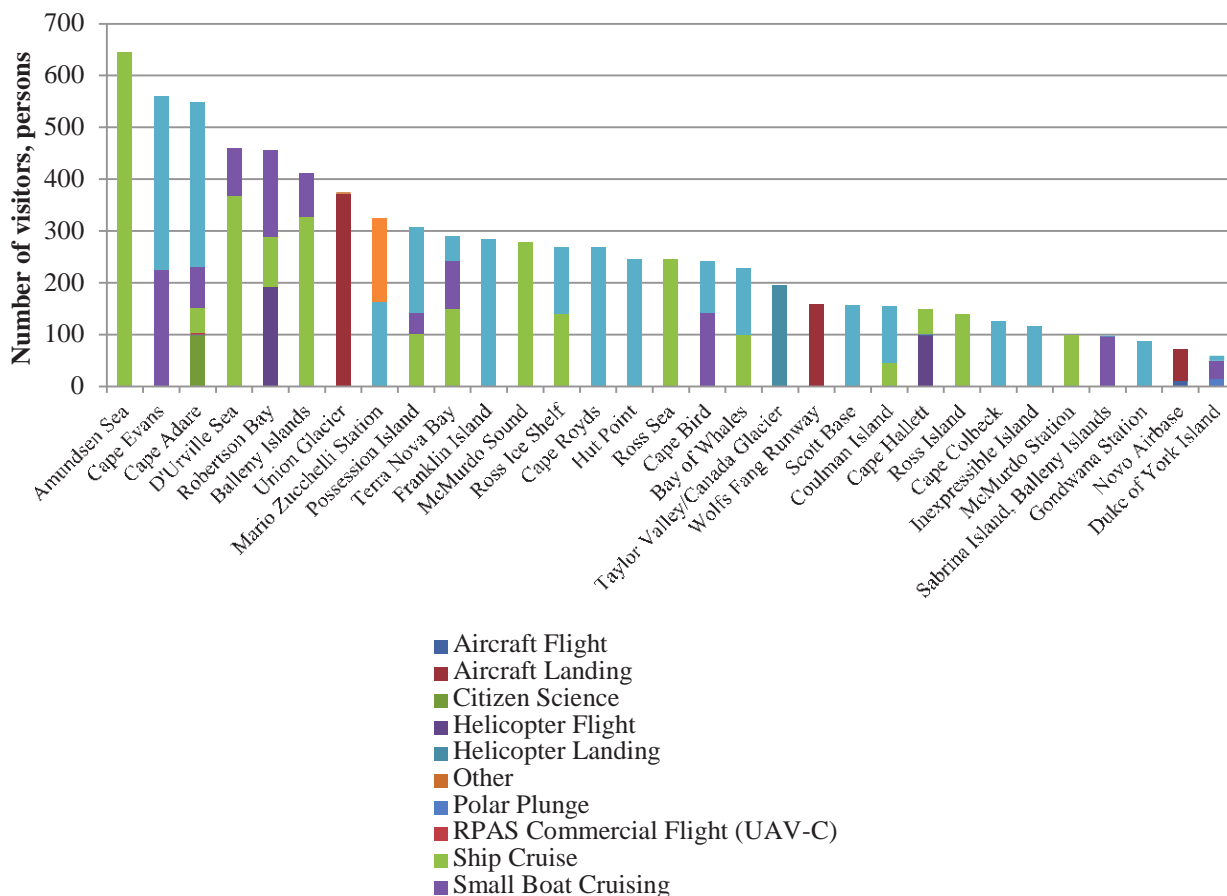


Fig. 7 The most popular tourist attractions on the Antarctic mainland for the 2019-2020 season (Sheets, 2020)

Operators was created, which was responsible for the safety and ecology of private sector trips to Antarctica.

In 1959, the Antarctic Treaty was concluded, and in 1961 it entered into force, which consisted of rules and regulations, and also established a certain status quo, which prohibits the making of new claims and the expansion of old claims. The treaty declares the freedom of scientific research in the Antarctic. Article II of the Treaty states: «freedom of scientific research in the Antarctic and cooperation for this purpose, as they have been applied during the International Geophysical Year, will continue».

At present, the lack of territorial possessions of one or another country in the Antarctic facilitates complex scientific research.

The place of Antarctic tourism issues in the research of scientists is considered. It has been established that in Ukraine only one dissertation study is devoted to the issues of Antarctic tourism. All other

works of scientists are devoted to biological, gravimetric, mineralogical, geodetic, oceanographic, physical, geological research of the Antarctic.

The tourist season in Antarctica lasts six months, from October to March. When autumn ends in the northern hemisphere, spring begins in Antarctica.

An analysis of the spatial structure and dynamics of international tourist flows to the Antarctic for the seasons 2011-2020 was carried out.

It can be noted that more than 95% of the tourist flow comes from sea cruises. Antarctic tourism is constantly diversifying – small ships (up to 200 passengers) that carry out expedition cruises with a rich ecological and educational program are gradually being replaced by large non-ice-class cruise liners (with a capacity of more than 2,000 passengers); sight-seeing air tours (without landing) are becoming more common, as well as combined tours with a combination of air travel and sea cruise.

References

A Five-Year Overview and 2021–22 Season Report on IAATO Operator Use of Antarctic Peninsula Landing Sites and ATCM Visitor Site Guidelineshttps. (2022).

Retrieved from URL: <https://iaato.org/wp-content/uploads/2022/06/ATCM44-IAATO-Site-Guidelines.pdf>
 Antarctic visitor figures 2019-2020. (2021). Retrieved from: <https://iaato.org/information-resources/data-statistics/>

- Antarctica Airports & List of Airports in Antarctica – Antarctica Airport Codes, 2021. Retrieved from URL: <https://www.prokerala.com/travel/airports/antarctica/>
- Antarctica key facts on tourism 2017-2018. (2020). Retrieved from: <https://iaato.org/wp-content/uploads/2020/01/IAATO-Fact-Sheet-2017-18.pdf>
- Bazylevska, M.S. (2005). Utvorennia, rozpodil ta pereznesennia halohenvuhlevodniv v heolohichnomu sere-dovyshchi [Formation, distribution and transfer of halo-genated hydrocarbons in the geological environment]. Abstract of the dissertation ... Candidate of Geological Sciences: 21.06.01. – ecological safety. Retrieved from URL: <http://irbis-nbuv.gov.ua/aref/20081124053084> (In Ukrainian)
- Berezkina, A. Ye. (2022). Populiatsiina struktura ta re-sursy cherevonohoho moliuska *Nacella concinna* (Strebel, 1908) u pryberezhnykh vodakh Ukrainiskoi antarktychnoi stantsii «Akademik Vernadskyi», arhipelag Arhentynski ostrovy, Zakhidna Antarktyka [Population structure and resources of the gastropod mollusk *Nacella concinna* (Strebel, 1908) in the coastal waters of the Ukrainian Antarctic Station «Akademik Vernadskyi», Argentine Islands archipelago, West Antarctica]. Abstract of the dissertation ... Doctor of Philosophy: 091. – biology. Retrieved from URL: <http://irbis-nbuv.gov.ua/aref/0822U100344> (In Ukrainian).
- Boyko, Z., Horozhankina, N., Bezugly, V. (2021). Terytorialni pretenzii ta spory yak faktor vplyvu na formuvannia politychnoi karty svitu [Territorial claims and disputes as a factor influencing the formation of the political map of the world]. *Efficient economy*. Issue 11. Retrieved from: <http://www.economy.nayka.com.ua/?op=1&z=9541>. DOI: 10.32702 / 2307-2105-2021.11.82 (In Ukrainian).
- Erebus disaster. (2021). Retrieved from URL: <https://nzhistory.govt.nz/culture/erebus-disaster>
- Fedchuk, A. P. (2007). Heoprostorova orhanizatsiia antarktychnoho turyzmu [Geospatial organization of Antarctic tourism]. Abstract of the dissertation ... Candidate of Geographical Sciences. 11.00.02-economic and social geography. K.: KNU. T. Shevchenko, 20 (In Ukrainian).
- Fedchuk, A. P. (2010a). Rozvytok turyzmu na antarktychnykh stantsiakh: analiz pozytsii konsultatyvnykh storin i perspektyvy Ukrainy [Tourism development at Antarctic stations: the analyze of Consultative Parties' positions and perspectives for Ukraine]. *Ukrainian Antarctic Journal*. Issue 9, 302-320 (In Ukrainian).
- Fedchuk, A. P. (2010b). Stanovlennia ukrainotsentrychnoho pidkhodu u kompleksno-heohrafichnykh doslidzhenniakh Antarktyky [Formation of a Ukraine-centric approach in complex geographical studies of Antarctica]. *Geography and tourism*. Issue 5, 159-165. Retrieved from: http://nbuv.gov.ua/UJRN/gt_2010_5_31
- Fedchuk, A. P. (2014). Dyversyfikatsiia turystychnoi diialnosti v Antarktytsi [Diversification of tourist activities in the Antarctic]. *Ukrainian Antarctic Journal*. Issue 13, 288-296 (In Ukrainian).
- Frame, B., Liggett, D., Lindström, K., Roura, R.M., van der Watt, L.M. (2021). Tourism and heritage in Antarctica: exploring cultural, natural and subliminal experiences. *Polar Geography*. Retrieved from: <http://dx.doi.org/10.1080/1088937X.2021.1918787>.
- Headland, R. K. (2020). Territory and Claims in the Antarctic Treaty Region: A Disquisition on Historical and Recent Developments, *The Cartographic Journal*, 57:2, 160-174, DOI: 10.1080/00087041.2019.1677035
- Hrushka V., Horozhankina N., Boyko Z., Korneyev M., Nebaba N. (2021). Transport infrastructure of Spain as a factor in tourism development. *Journal of Geology, Geography and Geocology*. Volume 30. Issue 3, 429-440.
- Hrytsai, A.V. (2007). Planetarni khvyli u rozpodili zahalnoho vmistu ozonu nad Antarktykoiu [Planetary waves in the distribution of total ozone content over the Antarctic]. Abstract of the dissertation ... Candidate of Physics and Mathematics Sciences. 04.00.22. – geophysics. Retrieved from URL: <http://irbis-nbuv.gov.ua/aref/20081124034604> (In Ukrainian).
- IAATO Antarctic visitor figures 2019-2020. (2021). Retrieved from: <https://iaato.org/wp-content/uploads/2020/07/IAATO-on-Antarctic-visitor-figures-2019-20-FINAL.pdf>
- Mancilla, A. (2018). The Moral Limits of Territorial Claims in Antarctica. *Ethics & International Affairs*, Volume 32, Issue 3, 339-360. DOI: <https://doi.org/10.1017/S0892679418000527>
- Myronov, Yu. B. (2021). Problemy ta perspektyvy rozvytku antarktychnoho turyzmu [Problems and prospects of Antarctic tourism development]. *Entrepreneurship and trade*. Issue 28. Retrieved from: <http://journals-lute.lviv.ua/index.php/pidpr-torgi/article/view/785> (In Ukrainian).
- Natsionalna biblioteka Ukrainy imeni V.I. Vernadskoho (In Ukrainian) [National Library of Ukraine named after V.I. Vernadsky]. Retrieved from: <http://www.nbuv.gov.ua/>
- Savenok, S.P. (2006). Heokhimichni osoblyvosti tsyrkoniv ta monatsytiv z lodovykovykh ta aliuvialnykh vidkladiv, yak indykatory petrofondu provintsii postachannia (na prykladi Skhidno-Yevropeiskoi platformy i Zakhidnoi Antarktydy) [Geochemical features of zircons and monazites from glacial and alluvial deposits as indicators of the petrofund of supply provinces (on the example of the East European Platform and West Antarctica)]. Abstract of the dissertation ... Candidate of Geological Sciences: 04.00.02. – geochemistry. Retrieved from URL: <http://irbis-nbuv.gov.ua/aref/20081124006840> (In Ukrainian).
- Secretariat of the Antarctic Treaty. (2021). Retrieved from URL: <https://www.ats.aq/e/antarctic.html>
- Shchypstov, A. A., Antselevich, G. A., Efremov, V. S. (1997). Antarktika: istoriya, sovremennost, perspek-

- tyviy [Antarctica: history, modernity, prospects]. Kiev: Naukova dumka, 258 (In Russian).
- Sheets IAATO. (2020). Retrieved from: <https://iaato.org/wp-content/uploads/2020/04/IAATO-Fact-Sheet-2016-17.pdf>
- Skrypalova, O.O. (2005). Tsyrukuliatsiia i struktura vod pivdenno-zakhidnoi chastyny Atlantychnoho okeanu i prylyhlykh akvatorii Atlantychnoho sektora Antarktyky [Circulation and structure of the waters of the southwestern part of the Atlantic Ocean and adjacent water areas of the Atlantic sector of the Antarctic]. Abstract of the dissertation ... Candidate of Geographical Sciences. 11.00.08. – oceanology. Retrieved from URL: <http://irbis-nbuv.gov.ua/aref/20081124057157> (In Ukrainian).
- Slevich, S.B. (1973). Osnovnyie problemyi osvoiniya Antarktiki [The main problems of Antarctic exploration]. L.: Znanie, 32 (In Russian).
- Striukov, O.O. (2004). Akantotsefaly spravzhnikh tiuleniv tykhookoetskoho sektoru Antarktyky [Acanthocephals of true seals of the Pacific sector of the Antarctic]. Abstract of the dissertation ... Candidate of Biological Sciences: 03.00.08. – zoology. Retrieved from URL: <http://irbis-nbuv.gov.ua/aref/20081124000748> (In Ukrainian).
- The International Association of Antarctica Tour Operators., (2021). Retrieved from: <https://iaato.org>.
- The Protocol on Environmental Protection to the Antarctic Treaty, 2021. Retrieved from URL: <https://www.ats.aq/e/protocol.html>
- Tourism in Antarctica, 2018. (2019). Retrieved from: https://iaato.org/wp-content/uploads/2020/04/IAATO_factsheet_2018_final_Tourism_in_Antarctica.pdf
- Tourism in Antarctica, 2019. (2020). Retrieved from: https://iaato.org/wp-content/uploads/2020/04/Tourism_in_Antarctica_2019.pdf
- Tourism in Antarctica. (2021). Retrieved from: <http://uac.gov.ua/en/vernadsky-station-en/tourism-en/>
- Tourism in The Polar Regions. The Sustainability Challenge, 2021. Retrieved from URL: <http://library.arcticportal.org/1626/1/PolarTourismUNEP.pdf>
- Tretiak, N. P. (2008). Modeliuvannia hrovitatsiinoho polia ta topohrafii okeanu v rehioni Antarktyky [Modeling the gravity field and ocean topography in the Antarctic region]. Abstract of the dissertation ... Candidate of Technical Sciences: 05.24.01. – geodesy, photogrammetry and cartography. Retrieved from URL: <http://irbis-nbuv.gov.ua/aref/20090520000799> (In Ukrainian).
- Turyzm v Antarktydi. (2021) [Tourism in Antarctica]. Retrieved from URL: [http://uac.gov.ua/vernadsky-station/tourism/\(in Ukrainian\)](http://uac.gov.ua/vernadsky-station/tourism/(in Ukrainian)).
- Voronova, I. P. (2012). Istoricheskie aspektyi stanovleniya mezhdunarodnyih otnosheniy v sfere otkryitiya, osvoiniya i issledovaniya Antarktiki [Historical aspects of the formation of international relations in the field of discovery, development and exploration of the Antarctic]. Kazan: Kazan State University. V. I. Ulyanov-Lenin, 106-108 (In Russian).
- Walton, D. W. H. (2017). Antarctica: the frozen continent's environment, changing logistics and relevance to India. Jagadish P. Khadilkar Bloomsbury, New Delhi, 496. Retrieved from URL: https://www.researchgate.net/publication/325692004_Antarctica_the_frozen_continent's_environment_changing_logistics_and_relevance_to_India_Jagadish_P_Khadilkar_Bloomsbury_New_Delhi_2017_ISBN-13_978-93-86432-00-1_hbk_25
- Zablotskyi, F.D. (2002). Modeliuvannia vplyvu atmosfery na astronomoheodezychni vymiry v poliarnykh rehionakh [Modeling the influence of the atmosphere on astrogeodetic measurements in the polar regions]. Abstract of the dissertation ... Dr. of Technical Sciences: 05.24.01. – geodesy, photogrammetry and cartography. Retrieved from URL: <http://irbis-nbuv.gov.ua/aref/20081124023917> (In Ukrainian).