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Two new topographic maps for sites of scientific interest on King George Island, West Antarctica

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Abstract: The objective of this paper is the presentation of two maps that were prepared on the XXXI Polish Polar Expedition (2007) to the *Arctowski* Station. These maps concern areas that have been sites of Polish scientific interest since 1977 when the *Arctowski* Station was established. The first – orthophotomap "Western shore of Admiralty Bay", 1:10 000 scale, was prepared based on archival aerial photos made in 1978/79, the second – topographic map "Turret Point, Three Sisters Point and Penguin Island", 1:12 500 scale was prepared based on a GPS survey. The maps are attached in the inside cover back pocket.

Key words: Antarctica, King George Island, Admiralty Bay, Turret Point, Three Sisters Point, Penguin Island, orthophoto and topographic maps.

Introduction

The Admiralty Bay and King George Bay areas belong to the most valuable regions for multi-disciplinary researches, located on the King George Island (South Shetland Islands). For the sake of localisation of the *Arctowski* Station, these areas are readily available. Since the establishment of the Station in 1977, topographical and cartographic works have been carried out. In the Antarctic summer of 1978/79, aerial photographs were made with two helicopters. The airborne surveys were run at different levels and photographs were taken by using an AFA/BAF camera with a 210 mm focal lens. The extent of works concerned the coasts of Admiralty Bay and King George Bay.

The first Polish topographical map (1:25 000 scale) of the Admiralty Bay was published in 1980 (Furmańczyk and Marsz 1980). In the same year, a 1:50 000 scale topographic map was published (Battke 1980). This map was revised after topographic works conducted in 1988/89 and published in 1990 (Battke 1990).

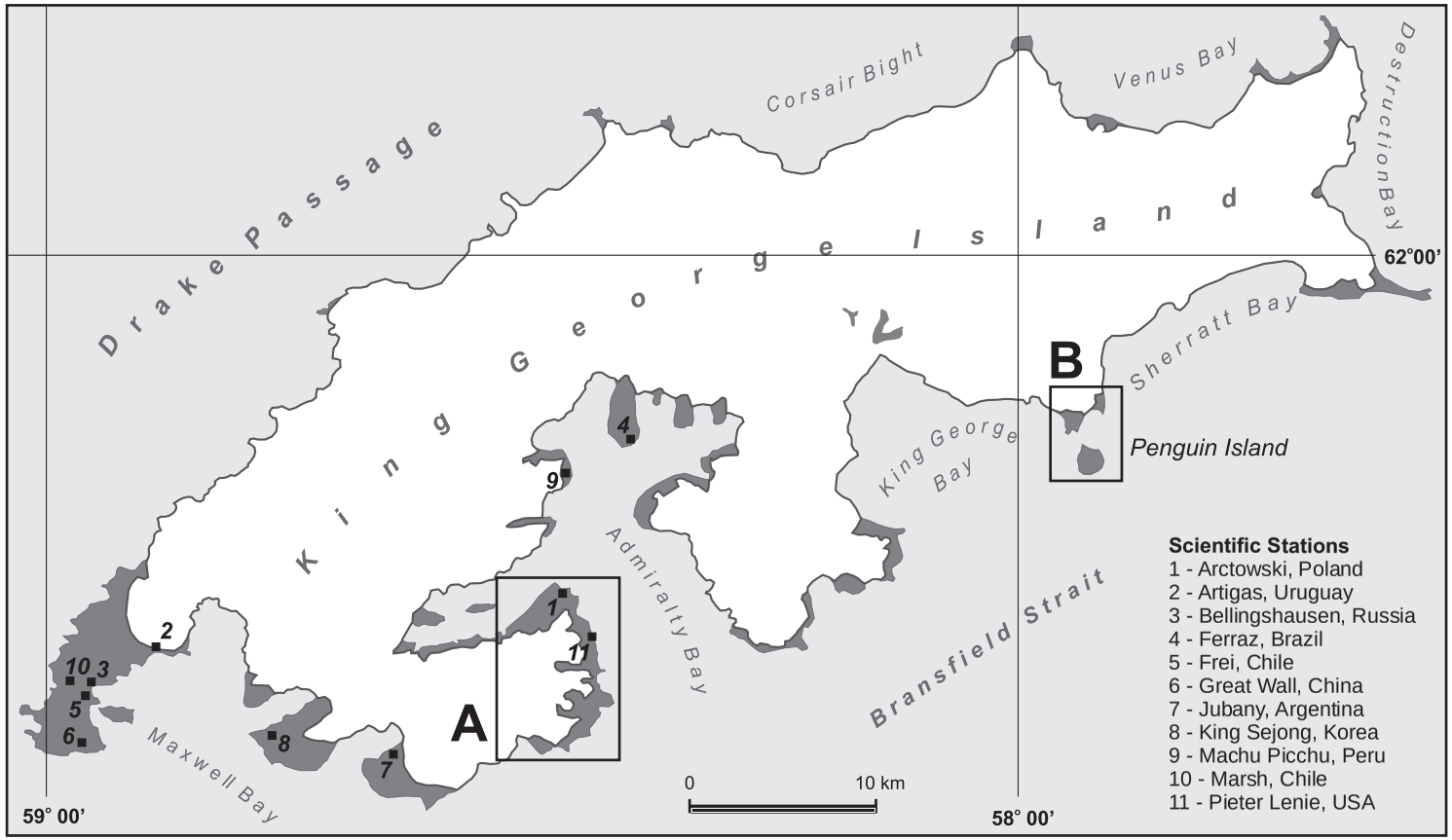

Fig. 1. King George Island. The figure shows maps locations: (**A**) Western shore of Admiralty Bay, 1:10 000 scale, (**B**) Turret Point, Three Sisters Point and Penguin Island, 1:12 500 scale.

Also, in these years, a 1:5 000 scale map of Lions Rump area (at present ASPA 151) was drawn up and published (Battke and Cisak 1988). During the XXV Polish Expedition (2001) a 1:12 500 scale topographical map was prepared for SSSI-8, at present ASPA 128 (Pudełko 2002, 2003). From the remaining cartographic works, many thematic maps were drawn, and the sequence of maps and sketches were used in publications that illustrated the location of the new names (Birkenmajer 1980, 1997, 1998, 2005; Tokarski 1981; Cisak 1992).

During the Antarctic summer of 2007 (XXXI Polish Antarctic Expedition), two maps were prepared (Pudełko 2007 a, b):

1) Orthophoto map: Western shore of Admiralty Bay, King George Island, South Shetlands, 1:10 000 scale,
2) Topographic map of Turret Point, Three Sisters Point and Penguin Island, 1:12 500 scale.

The maps have been added to the SCAR Antarctic map catalogue:

1) http://data.aad.gov.au/aadc/mapcat/display_map.cfm?map_id=13462
2) http://data.aad.gov.au/aadc/mapcat/display_map.cfm?map_id=13461

The area covered by the maps is shown in Fig. 1 and their properties of projection are specified in Table 1.

Table 1

Projection properties

Projection	Transverse Mercator (TM)
Spheroid	WGS 84
Central meridian	57^0 W
Reference latitude	0^0
Scale factor	1
False Westing	500 000 m
False Northing	0 m

The orthophotomap of Western shore of Admiralty Bay, King George Island, South Shetlands, 1:10 000 scale

The map was made based on the selection of fifteen aerial photos taken on 6 February 1979. The photos were orthorectified according to the ground control points, which were obtained by the GPS survey conducted in 2007. A georeferenced image was made after a mosaicing process. All procedures were done using Erdas Imagine software. The map was drawn in a 1:10 000 scale, 98 × 68 cm sheet size. The digital version was prepared in the GeoTiff format and it was implemented to the Geographic Information System (GIS) (Fig. 2). A picture of the map (jpg) is available for download from: www.geostat.iung.pulawy.pl/arctowski/orthophoto79.jpg

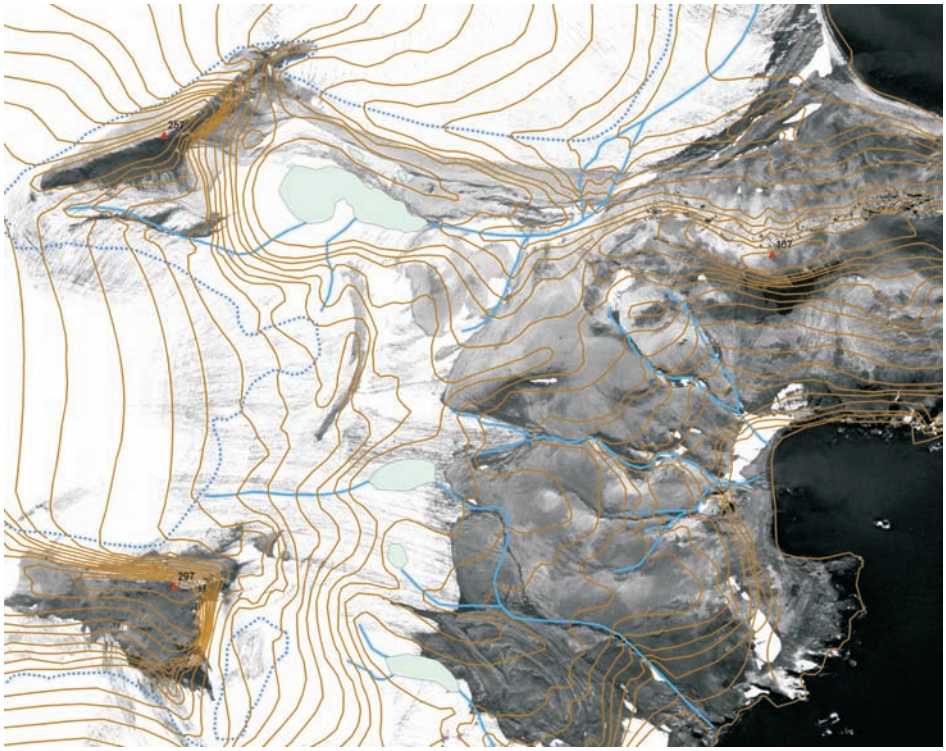

Fig. 2. Orthophoto map (see Fig. 1, part of A) covered by the vector's geographical data.

The map document states many important parts of the geoecosystem in 1979. The current position of the glacial border (2007) and fronts (1956) of the glaciers were marked. For evaluations the front range of the Dera Icefall, Ecology and Baranowski Glacier the FIDASE aerial photography taken in 20 December 1956 were used. Comparing historical data with the current data collected in the GIS database since 2001, allow to evaluate many aspects of geomorphological and glaciological processes.

The topographic map of Turret Point, Three Sisters Point and Penguin Island, 1:12 500 scale

The field surveys were carried out using GPS receivers Leica 500. The first one with a fixed location, served as a base receiver. The second receiver carried into the field, gathered information at 10-second intervals. The coordinates of points (X, Y, Z) obtained during field surveys were calculated in real time. The precision of the measurements has been estimated as better than 10 cm. The essential conditions for a correct measurement were the observation of at least four satellites by two receivers, the PDOP index below 4.0, and a radio-modem connection.

Table 2

A list of places official names, where the coverage is 58.00° W to 57.85° W and 62.00° S to 62.15° S – with a proposal of more precise coordinates taken from the Turret Point, Three Sisters Point and Penguin Island, 1:12 500 scale map

Name	Original source	Reference	Latitude	Longitude	Proposed Latitude	Proposed Longitude
Deacon Peak	GBR	3430	62°06'00" S	57°56' 00" W	62°06' 14" S	57° 56' 01" W
	USA					
Deacon, Monte	CHL					
Deacon, pico	ARG					
Depot Crag	POL	3536	62°05'00" S	57°57'00" W	62°04'51" S	57°56' 46" W
Elephant Seal Cove	POL	4167	62°05'30" S	57°57'00" W	62°05'15" S	57°56' 45" W
Flame Point	POL	4675	62°05'00" S	57°58'00" W	62°04'49" S	57°57' 27" W
González Point	POL	16953	62°05'45" S	57°56'30" W	62°05'40" S	57°56' 10" W
Katsui Strait	POL	16970	62°05'40" S	57°57'00" W	62°05'30" S	57°56' 20" W
Marr Point	POL	16979	62°06'30" S	57°56'00" W	62°06'33" S	57°56' 05" W
Mersey Spit	USA	9468	62°05'00" S	57°55'00" W	62°05'15" S	57°56' 27" W
	GBR		62°05'00" S	57°57'00" W		
Mersey, Punta	CHL		62°05'00" S	57°54'00" W		
Mersey, lengua	ARG		62°05'00" S	57°53'00" W		
Penguin Island	GBR	11070	62°06'00" S	57°56'00" W	62° 06' 10" S	57°55' 40" W
	USA		62°06'00" S	57°54'00" W		
	RUS		62°06'00" S	57°53'00" W		
Penguin, Isla	CHL		62°06'00" S	57°52'00" W		
Three Kings Cove	POL	14659	62°05'00" S	57°56'00" W	62°04'50" S	57°55' 50" W
Three Sisters Point	GBR	14667	62°05'00" S	57°55'00" W	62°04'48" S	57°54' 44" W
	RUS		62°04'00" S	57°52'00" W		
	USA		62°04'00" S	57°53'00" W		
Tres Hermanas, Punta	CHL		62°03'00" S	57°54'00" W		
Tres Hermanas, punta	ARG		62°05'00" S	57°55'00" W		
Trzy Stawy	POL	15018	62°05'00" S	57°56'00" W	62°04'53" S	57°56' 26" W
Turret Point	GBR	15086	62°05'00" S	57°57'00" W	62°05'20" S	57°57' 00" W
	USA		62°05'00" S	57°55'00" W		
Turret, Rocas	CHL		62°04'00" S	57°57'00" W		
Turret, punta	ARG		62°05'00" S	57°55'00" W		
Zbyszek Glacier	POL	16458	62°04'30" S	57°56'00" W	62°04'30" S	57°55' 45" W

The measurements were carried out in such a way as to allow the determination of a range of objects (including creeks, lake borders, ice ranges, ridges, shorelines, *etc*.), and to achieve a density of point cover, sufficient to interpolate contour lines. Over ten thousand points were measured and then the obtained GPS data were processed using GIS software – ArcGIS 9.1. The map was drawn to a 1:12 500 scale, A3 format. All objects shown on the map have digital version in the GIS database (SHP format). A picture of the map (jpg) is available for download from: www.geostat.iung.pulawy.pl/arctowski/turret_topo.jpg

Two new place names, Tatur Hills and Olech Hills, were introduced. The other names used on the map were taken from the SCAR Catalogue of Antarctic Names maintained by the Australian Antarctic Data Centre: (http://data.aad.gov.au/aadc/gaz/search_names.cfm).

The large-scale development of the map enables specific localization of all named objects. Most of the SCAR base objects for this area have not had precisely determined geographical coordinates. Table 2 compares official and proposed coordinates – based on the new map.

The location of Deacon Peak and Depot Crag were determined for their highest ground point, according to the GPS measurement. The coordinates for Turred Point, Three Sisters Point, Mersey Spit, Flame Point, González Point, and Marr Point were determined for the most characteristic place of these objects with a precision of up to one latitude and longitude second. Coordinates for Penguin Island and *Trzy Stawy* were determined for their centroids, and calculated on the base of the shape. For other objects, the locations were determined arbitrarily with consideration of their spatial features, with a precision of up to a fifth latitude and longitude seconds.

New place names introduced in 2007 for Turret Pt. and Three Sister Pt. areas:

Tatur Hills. 62°04'50''S, 57°56'25''W. Hills *ca* 50–60 m a.s.l., Turret Pt. area. Named in honour of Assoc. Professor Andrzej Tatur, geologist and ecologist, member of the Polish, Argentine and Russian expeditions to Antarctica. Polish name: *Wzgórza Tatura*.

Olech Hills. 62°04' 30''S, 57°54' 50''W. Hills *ca* 50–60 m a.s.l., Three Sisters Pt. area. Named in honour of Professor Maria Olech, biologist, member or leader of Polish polar expeditions to the *Arctowski* Station. Polish name: *Wzgórza Olech*.

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Internet services sharing maps and GIS data for King George Island:
KGIS Project: http://www.kgis.scar.org/mapviewer/kgis.phtml
Australian Antarctic Data Center: http://data.aad.gov.au
Arctowski GIS: http://www.geostat.iung.pulawy.pl/arctowski.htm

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