The Ice Winter 2016/17 on the Polish Baltic Sea Coast

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Ice season 2016/2017 on the Polish Baltic Sea Coast was mild (Fig. 1). On the open waters ice did not appear during the whole season. Ice formations in the Polish waters during the winter did not cause any problems to navigation, except for the fairway Szczecin-Świnoujście.

Description of ice conditions was based on ice observations of the sea ice in regions covering the entire coastal zone including bays and river estuaries (Fig. 2). Observations were made once a day during morning hours and were coded with Sea Ice Baltic Code – ASTK. Additional information about the situation over open sea were obtained from satellite images and shipping vessels. Information from Maritime Offices, Master's and Bosons' Offices complemented IMGW-PIB ice reports about ice data, difficulties in navigation and also tug and icebreaker work.

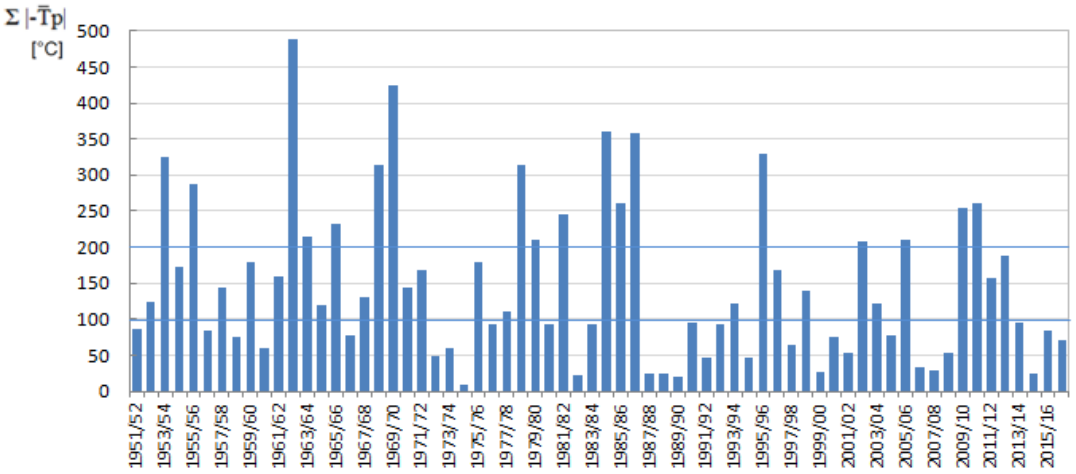

Fig. 1. Totals of negative daily mean air temperature - sum of coldness - *on the Polish coast, 1951-2017*

Ice winter 2016/17 on the Polish Coast was short and milder in comparison with season 2015/2016. There were observed two periods of cold: first at the beginning of January and second in February 2017. However, during these periods mostly light frost has occurred. Monthly mean air temperatures during the winter were positive (except in the January over the western part of the Polish coast) and much higher than the value of monthly mean from the reference period 1961-1990 (Tab. 1. – for the selected stations on the coast). During this winter season the lowest daily mean air temperature occurred in February: in Świnoujście -6°C (9 February), and in Hel on 8 February (-7°C).

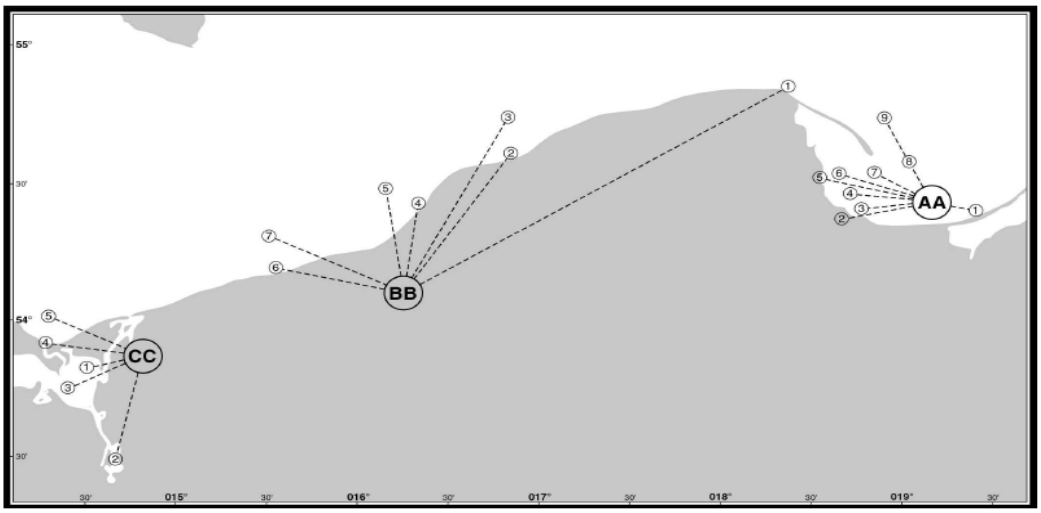

Fig. 2. Ice observation regions over Polish Baltic Sea Coast (www.bsis-ice.de/fairway_areas/poland.pdf)

Tab. 1. Monthly mean air temperatures in winter 2016/17 and deviation from the monthly means from the reference period 1961-1990

Month	Hel		Kołobrzeg	
	Monthly mean 2016/2017	Dev.	Monthly mean 2016/2017	Dev.
XI	4,9	0,1	4,6	-0,1
XII	3,9	2,6	3,5	2,5
I	0,0	0,8	-0,3	0,5
II	0,5	1,1	1,1	1,3
III	4,3	2,6	5,3	2,8

December 2016 on the Polish coast was classified as warm (above long-term average), and on the eastern part of the coast temperatures were much above. From 3 to 5 January, Poland, including the sea coast, was under the influence of the low pressure centre moving from the Norway Sea to Ukraine. The Arctic air mass began to flow over Poland.

From 6 to 11 January the Polish coast was under the influence of the high pressure centre from Scandinavia, which moved over the southern Germany, and then over Ukraine. The weather conditions were again determined by the Arctic air mass, temporary polar maritime air mass. On the Polish coast there was significant cooling and ice phenomena occurred.

The second cold period was observed in February. Between 7 and 16 February Poland was under the influence of the extensive high, with centre initially over Scandinavia and then it started to move south.

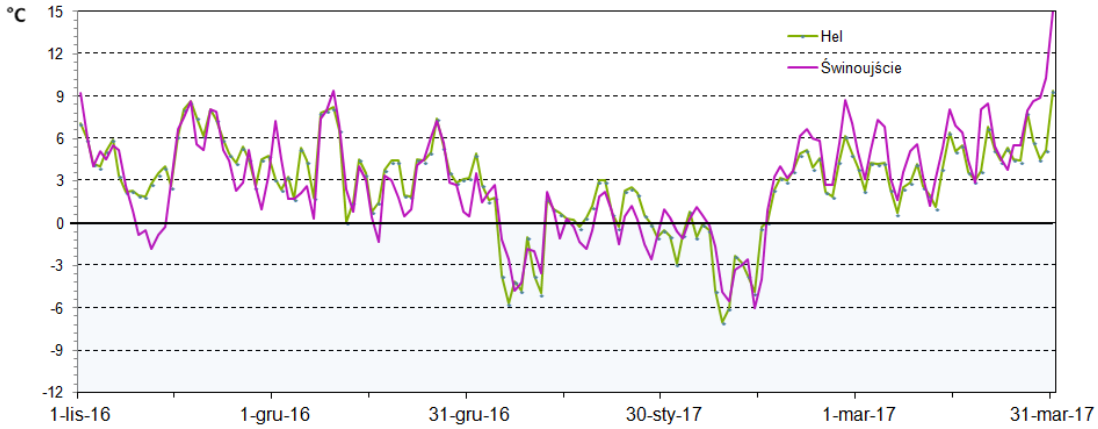

Fig. 3. Daily mean air temperatures in Świnoujście and Hel during winter season 2016/17

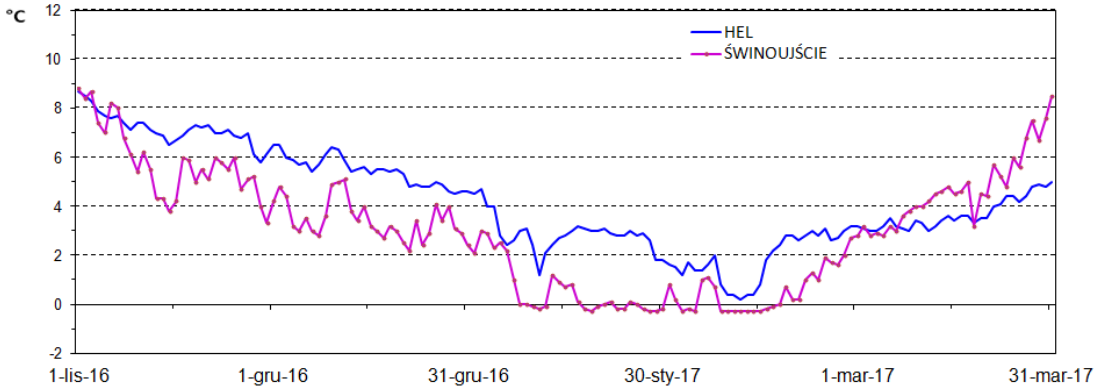

Fig. 4. Water temperatures (06 UTC) in the Polish coastal waters during winter season 2016/17, Świnoujście and Hel

In the second part of this cold period high centre moved over Poland. The polar-continental air mass flowed. There were days with frost and the development of ice phenomena in the Polish coastal zone was observed again.

At the beginning of January, the first decrease of air temperature below 0 °C (Fig.3), caused occurrence of the first ice over the Firth of Szczecin, the Vistula Lagoon and the Bay of Puck (Fig.3). The water temperature was at that time relatively high (Fig.4). In the middle of January ice covered the Fairway Szczecin – Świnoujście and harbors of the western coast and Szczecin Harbor. The next flow of the frosty air at the beginning of February caused the re-development of ice phenomena or growth in areas where ice already existed. Over open waters ice phenomena did not occur (Tab. 2).

Over the Firth of Szczecin and the Vistula Lagoon ice occurred continuously, therefore for these areas the number of days with ice is equal to the ice season length. However, on the Bay of Puck, ice appeared in two separate periods. Pack ice, shuga and young coastal ice were reported most often in the ice reports. Fast ice was observed over the bay of Puck, the Firth of Szczecin and the Vistula Lagoon.

Most days with ice occurred over the Firth of Szczecin (50 days) and the Vistula Lagoon (53 days), however it was much smaller amount of days with ice in comparison with the long-term average. The last ice phenomena were noted on the Firth of Szczecin and on the Fairway Szczecin – Świnoujście (after 20 February). The longest ice cover was observed on the Vistula Lagoon (until 27 February).

Tab. 2. Ice conditions over Polish Baltic Sea Coast during winter season 2016/17

Station	First ice	Last ice	Season duration	Days with ice	Max thickness
Harbours:					
Darłowo	7.01	18.02	43	17	5
Kołobrzeg	11.02	15.02	5	5	5
Dziwnów	16.01	21.02	37	35	10
Świnoujście	16.01	19.02	35	34	10
Szczecin	16.01	21.02	37	37	10
Lagoons /inland waters:					
Zalew Wiślany	6.01	27.02	53	53	20
Puck, port i wody przyl.	6.01	22.02	48	34	15
Zalew Szczeciński	7.01	25.02	50	50	20
Tor wodny Szczecin - Świnoujście	16.01	23.02	39	39	15

On the Polish coastal waters the maximum ice extent occurred on 23 January (Fig. 5). The maximum ice extent for the Baltic Sea was about 102 000 km^2 (mild winter) on 12 February 2017 (Fig.6). The maximum ice volume occurred on 7 March 2017 and was about 16,4 km^3

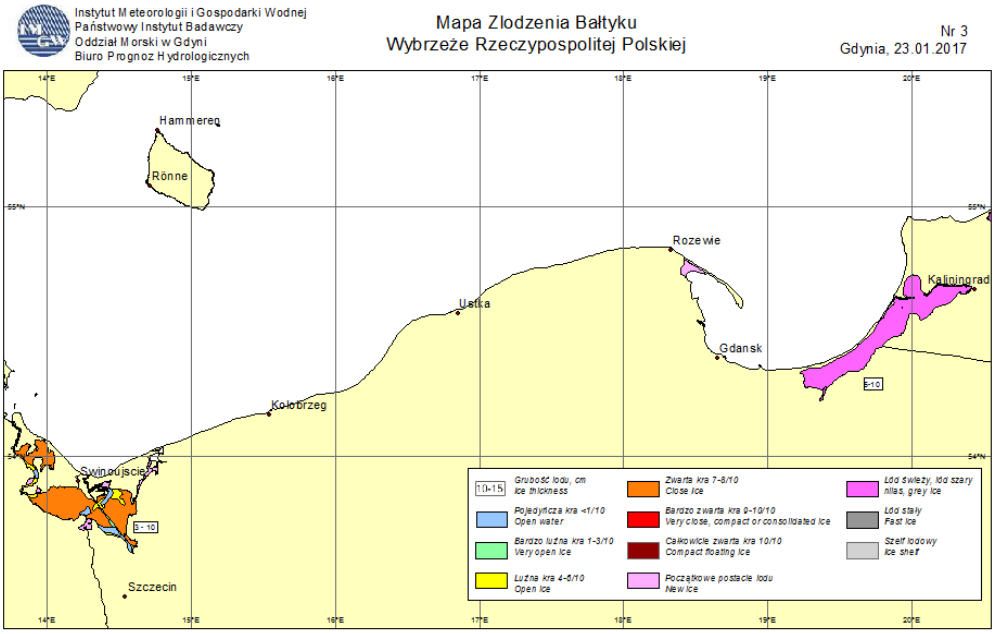

Fig. 5. Maximum ice extent in Polish Baltic coastal zone, winter season 2016/2017

Ice did not cause any obstruction to navigation in the winter 2016/2017 on the Polish waters of the Baltic Sea. There were minor difficulties on the Fairway of Szczecin – Świnoujście.

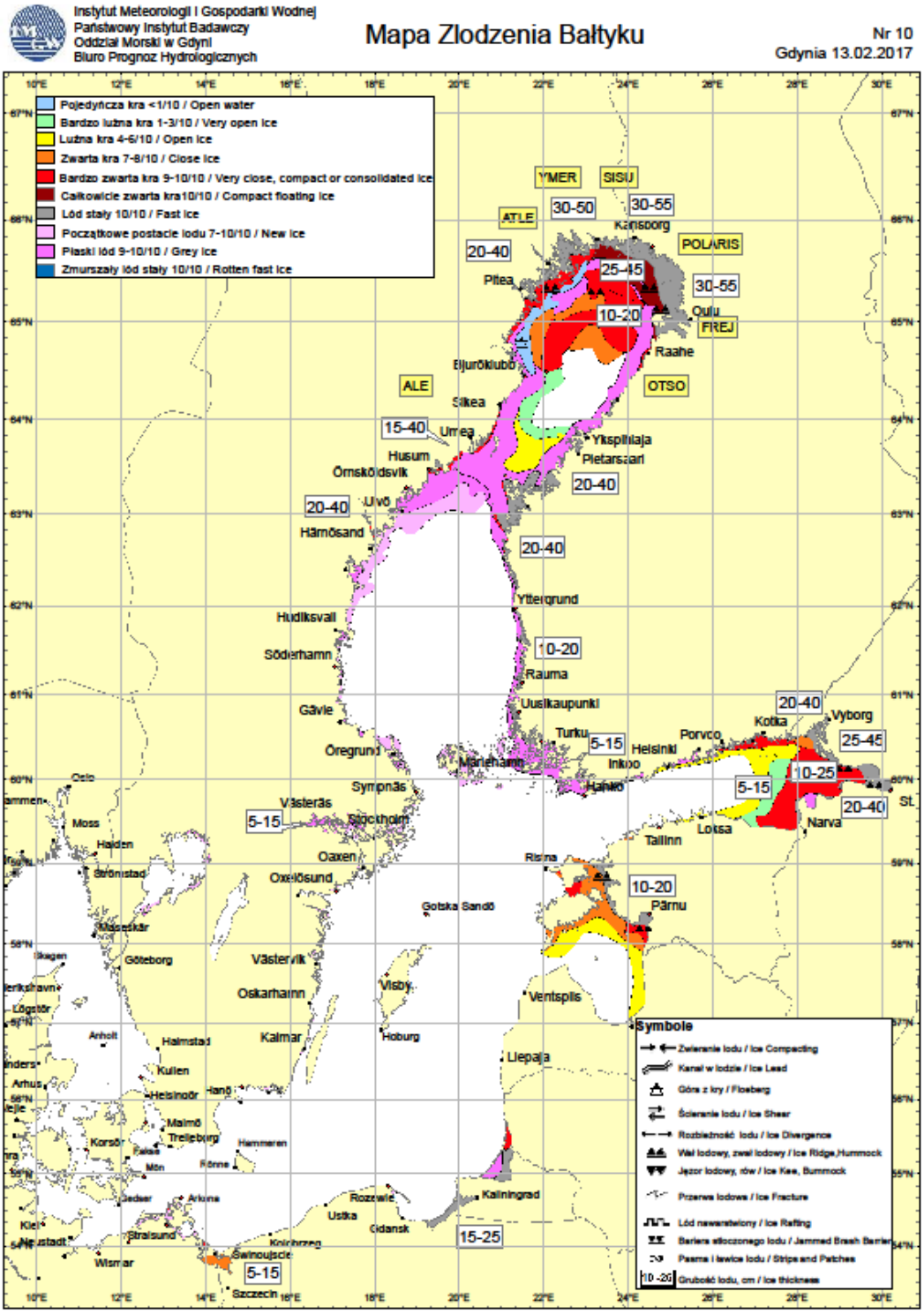

Fig 6. General ice chart showing maximum ice extent in the Baltic Sea in the winter season 2016/2017

Summary

Ice season on the Polish Baltic coast was classified as mild. On the whole Baltic area ice season 2016/2017 was also mild.
The analyses of some meteorological parameters which determine ice cover process, and ice cover conditions on the coast (days with ice, duration of the ice season, lasting of ice cover, sum of coldness) allowed to judge severity of the whole ice season, and classify it as mild.

During the ice season 2016/17 IMGW-PIB OM in Gdynia issued the following information about ice situation and expected ice development over Polish coastal waters:

- 43 reports – Polish Ice Report (detailed description of ice situation, official reports issued daily when ice appears over Polish Coastal Zone – international exchange)
- 24 general ice charts "Baltic Sea" (once a week)
- 17 ice charts (Polish Baltic Sea Coast) (once or twice a week)
- 51 Ice Bulletins (twice a week).

All current reports and charts are additionally published on the Internet, free of charge: www.baltyk.pogodynka.pl//index.php?page=2&subpage=64