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The VIth Polar Expedition "Spitsbergen 1983/84"

ABSTRACT: In the present report worked out in the form of a communication the general description of course and realization of the scientifical and technical programmes of the VIth Expedition to the Polish Polar Station in the Hornsund fiord on Spitsbergen is given. The details of the programme and results of investigations on particulat items constitute already or will constitute within the next time a subject of special publications.

KEY WORDS: Arctic, report on the VIth Polar Expedition of the Institute of Geophysics, Polish Academy of Sciences.

1. Introduction

The subsequent, VIth Expedition to the Polish Polar Station in Hornsund on Spitsbergen was organized by the Instytute of Geophysics, Polish Academy of Sciences, within the framework of the Interbranch Project MR. I. 29 "Investigations of maritime and continental polar regions as a basis for rational utilization of resources and of their environment protection" according to the resolution No. 46/82 of the Ministers' Council of March 5, 1982. The range and way of realization of the Expedition tasks have been determined in the scientific and organizational-technical programme approved by the Scientific Secretary of the Polish Academy of Sciences. The principal aim of the expedition was to continue permanent observations within the programs: magnetic, sejsmic, and meteorological investigations as well as special programmes: geodesico-topographic, photogrammetric, astronomic and additional meteorological investigations. The principal technical task of the expedition was to keep in an appropriate order the Station, to carry out repair and maintenance works as well as to establish the fourth reserve fuel tank.

To ensure an efficient execution of tasks as mentioned above and a correct functioning of the Station the choice of suitable specialists

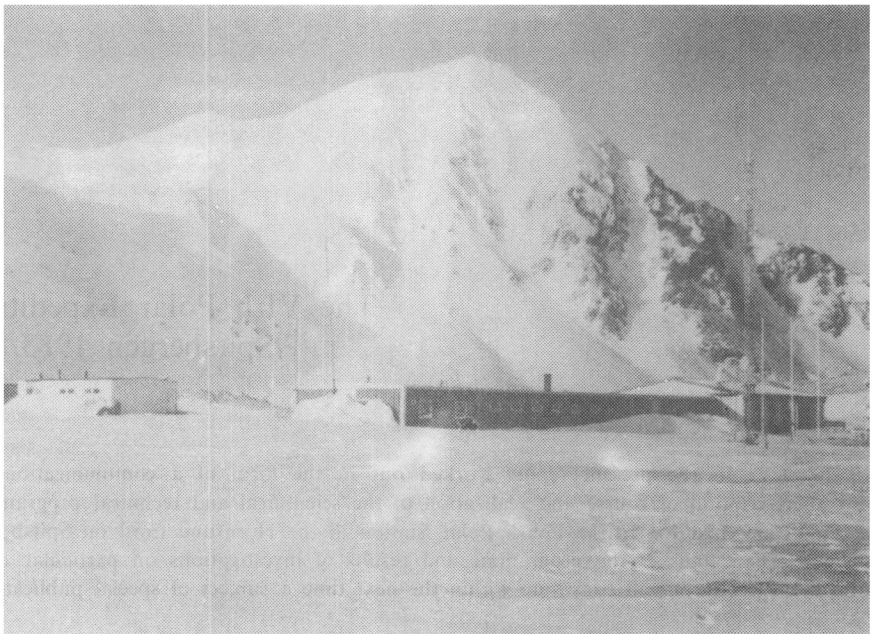

Fig. 1. The Polar Station of the Institute of Geophysics, Polish Academy of Sciences, in winter cover. Phot. S. Barna

as members of the expedition was of importance. Decisions as to the personal composition of the expedition belong to the competences of the Academy authorities and of the expedition leader appointed by the Secretary of the Polish Academy of Sciences.

2. Expedition participants

2.1. Wintering group

Jan Cisak, D. Sc. Eng. — Leader of the Expedition, geodesist, astronomer,
Jan Krzemiński, M. Sc. Eng. — Deputy Leader, mechanic, energeticist,
Cezary Lipert D. Sc. Eng. — geodesist, photogrammetrist (returned home in December 1983 in connection with a heavy disease)
Szymon Barna, M. Sc. Eng. — geodesist, photogrammetrist,
Grzegorz Gregorczyk M. Sc. Eng. — magneticist, electronician,
Krzysztof Adamski M. Sc. Eng. — sejsmologist, electronician,
Michał Ziemiański, M. Sc. — meteorologist,
Zbigniew Pietroń M. Sc. — meteorologist,
Piotr Porada, — physician,
Jacek Wielocha — radio operator.

Fig. 2. Wintering group of 1983/84 from left to right in the first row: 1. Szymon Barna, 2. Zbigniew Pietroń, 3. Michał Ziemiański. In the second row: 1. Piotr Porada, 2. Krzysztof Adamski, 3. Jan Cisak, 4. Jacek Wielocha, 5. Jan Krzemiński, 6. Grzegorz Gregorczyk
Phot. S. Barna

2.2. Technical and repair group

Antoni Mieszczański — Leader
Zygmunt Warchoł — geodesist, topographer,
Antoni Markowski — mechanic,
Marek Dziewit — MPS specialist,
Henryk Machnio — technical workers.

2.3. Geodesic group (summer 1984)

Zygmunt Warchoł M. Sc. Eng. — geodesist, topographer,
Mirosław Kupczyk M. Sc. Eng. — geodesist.

3. Realization of the scientific programme

3.1. Magnetic programme

From July 24, 1983 to August 1, 1984 Grzegorz Gregorczyk M. Sc., who fulfilled the duties of magnetician, performed a continuous registration

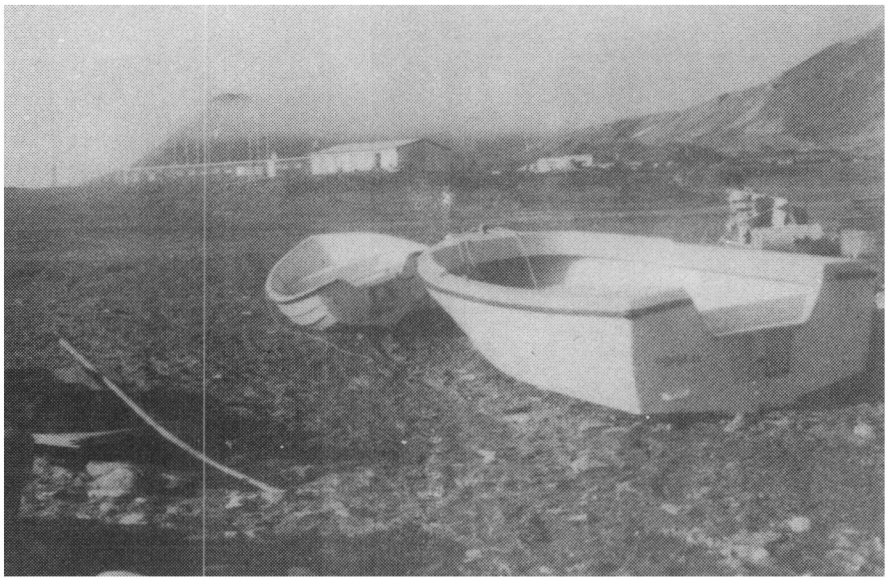

Fig. 3. View of the Polar Station from the side of the landing place. Phot. S. Barna

of the earth magnetic pole elements using a portabl- magnetic station and a protonic magnetometer. The registration on magnetic tapes was made using the Finnish apparatus (Logger-Geodalo), the tapes being sent to the Institute of Meteorology in Helsinki. Apart from that, the other tasks, as the registration of electromagnetic waves of very low frequency, VLF performed using the apparatus of the Institute of Physics, University of Oslo, or attendance of All-Sky camera for registration of aurora borealis, were realized. In autumn 1983 also ozonometric measurements were carried out.

The apparatus sets worked efficiently throughout the whole period of the expedition and the results obtained were transmitted systematically.

3.2. Sejsmographic programme

Since the moment of taking over from the previous expedition, i.e. since July 29, 1983, continuous observations and registrations of the sejsmic activity in the Hornsund region on Spitsbergen were performed, while distinguishing the tectonic activity and the tremors used by nearby glaciers. Automatic apparatus of the "Górnik" type and the sejsmograph with galvanoscopic record on photosensitive paper was applied. The coded

data of the recordings was systematically sent to the Institute of Geophysics, Polish Academy of Sciences. By Krzysztof Adamski M. Sc. Eng., electronician, fulfilling the duties of a sejsmologist, many technical improvements of recorders, repairs of the "Górnik" apparatus and regulation of sejsmographs were made, what ensured an uninterrupted work of the apparatus sets.

3.3. Meteorological programme

By the personnel of the meteorological station in Hornsund: Michał Ziemiański M. Sc. and Zbigniew Pietroń M. Sc. the following programme was realized:

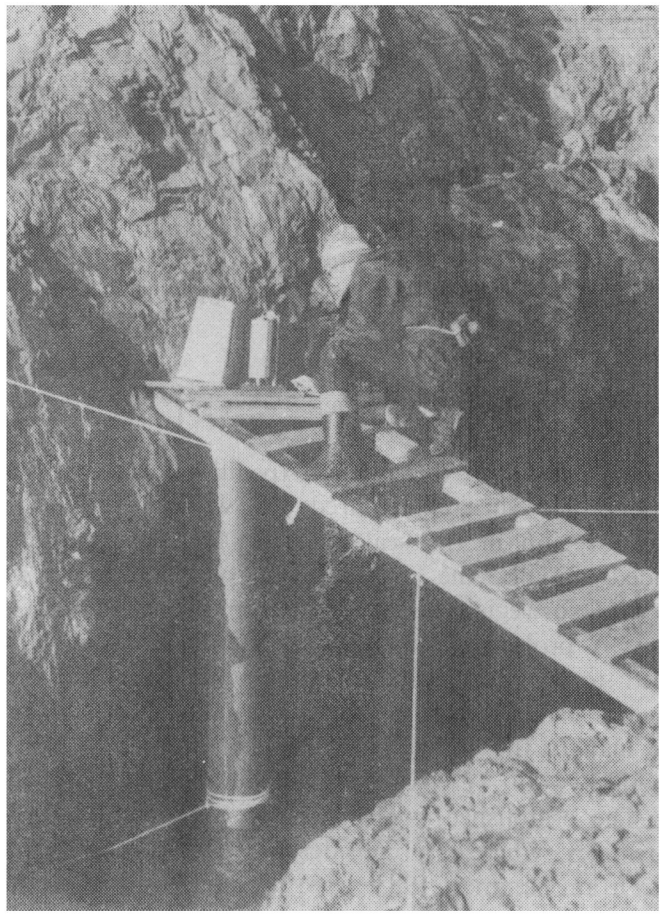

Fig. 4. Establishment of the mareograph by Michał Ziemiański. Phot. S. Barna

— carrying out (every three hours) standard meteorological observations, typical for all synoptical stations, in accordance with the SYNOP key,
— measurements of the soil temperature at different depths using classical thermometers and recording with the use of electric thermometers,
— measurements of the velocity and direction of wind at different heights above soil surface,
— measurements of insolation using three heliographs,
— measurements of the velocity of upper winds using aerologic baloons by the optical method,
— registration of maritime tides by means of a marinograph,
— catatometric measurements of cooling,
— standard meteorological measurements on the board of ship (in accordance with the SHIP key) during cruise to Hornsund and back.

The programme was realized without any interruptions. Currently worked out were the data from recorders and the observatory being of importance for climatologic purposes.

On the basis of observations at 6, 12 and 18 hours GMT the SYNOP telegrams were sent by radio to the Norwegian synoptical network throughout the whole period of the expedition, provided the communication conditions being good. Also information about current weather conditions over Hornsund was sent to Barentsburg. Moreover, on the request of Norwegians on certain days the aerial protection of helicopters flying to the Hornsund environs was ensured, the meteorological telegrams METAR for aviation needs being transmitted every hour.

3.4. Geodesico-topographic programme

The principal task of the VIth Expedition was to make suitable geodesico-topographic surveys required for working out a map of the Hornsund fiord region in the scale of 1:25000. The programme of area works provided initially the measurement of photopoints and bringing up to date the Norwegian aerial photographs on the area of 7 sheets of these maps. A prolonged stay and self-sacrificing work of the geodesic group enabled to carry out the measurements over the area of about 1000 km^2, what made possible working out as well as printing of 9 sheets of the map in the scale of 1:25.000.

The cameral works were carried out in Poland parallelly to works in the area. The established coordinates of photopoints were transmitted to Poland by telex, whereas a considerable part of the data of measurement results from summer 1983 was brought by the technical group. At the same time also supplementing topographic surveys for working out maps of the Fugleberget catchment area in the scale of 1:5000 and

Fig. 5. Szymon Barna at the measurement of photopoints. Phot. S. Barna

of environs of the Station in the scale of 1:500 were worked out. The respective material appeared in print in multicoloured publication edited by the Institute of Geodesy and Cartography in June 1984. Sheets of these maps reached Spitsbergen as early as in July 1984 and were made use of in various research works.

The area measurements were carried out by Szymon Barna, Zygmunt Warchoł, Mirosław Kupczyk, Jan Cisak and in the summer season of 1983 by Cezary Lipert.

3.5. Photogrammetric programme

The registration of momentary states of the fronts of the Hornsund glaciers on photogrammetric plates was continued in the period of the VIth Expedition. Szymon Barna M. Sc. Eng. and Cezary Lipert D. Sc. Eng., made in summer and autumn 1983 photogrammetric surveys and necessary measurements of all twelve glaciers of the Hornsund fiord and the Werenskiold glacier. These measurements were repeated also in spring of 1984. Moreover, Szymon Barna made systematic surveys of the Hans Glacier front at 10-day intervals. A novelty constituted winter photograph at moonlight exposed for over 70 minutes. These photographs constitute

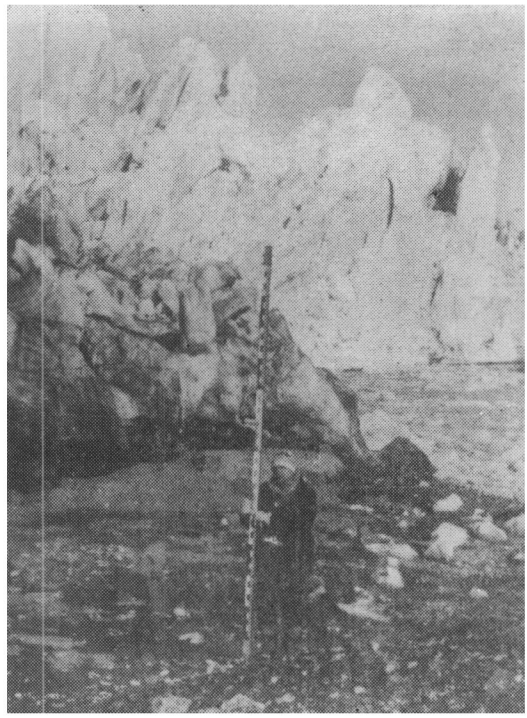

Fig. 6. C. Lipert at the geodesic geasurement of the Hansa glacier front.

a very valuable material for working out dynamics of glaciers within the annual cycle. All photographs were developed as well as appropriately arranged and described at the spot, in Hornsund. At present the respective materials are worked out at the Institute of Geodesy and Cartography jointly with the Silesian University; they will soon appear in print as a separate publication. The ground surveys will be used for supplementation and bringing up to date the map in the scale of 1:25.000 plotted on the basis of aerial photographs of 1960.

3.6. Astronomico-geodesic programme

In 1958 an astronomico-geodesic measurement stand near the Hornsund Station was established by Associate Prof. Jerzy Jasnorzewski taking part in wintering, who carried out suitable measurements and determined its geographical latitude and longitude with the highest possible accuracy estimated for about 0.5 m in the position of the above stand. It has been assumed that this measurement would be repeated every 20, 30 years. Twenty six years passed since that time in the year of our expedition.

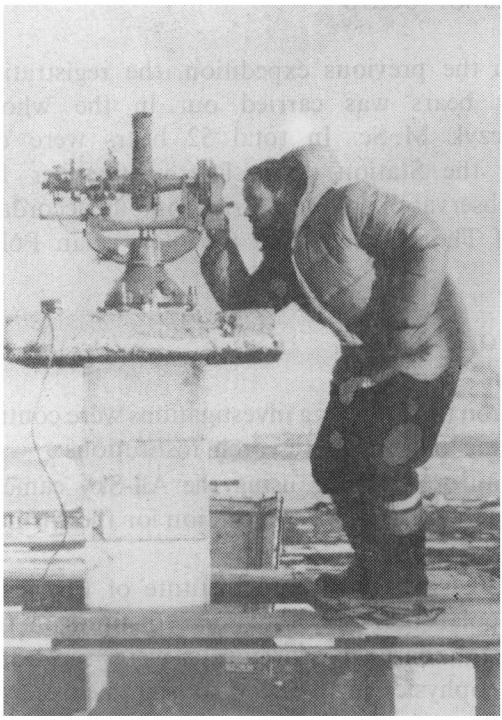

Fig. 7. Measurement of the astronomic coordinates at the age point with the use of the Wild T4 instrument. Phot. J. Cisak

Thus the winter programme of the VIth Expedition provided a repeated measurement of the position of this niain astronomico-geodesical point the measurement was carried out in the period from October 1983 to July 1984 while performing 200 observations of the couples of stars at application of the methods of Kavraisky. Pievcov and Zinger using the astronomic Wild T4 theodolite. The time registration and the receipt of time signals were automatized while making use of a portable quartz clock of the Heuer's make and the Polon printer. These observations require tiresome reductions and calculations. Up to now mean observation moments of every star were calculated and the calculation algorythms were prepared. Observations were performed by Jan Cisak D. Sc. Eng.

3.7. Educational scientific programme

Scientific seminars were run in the Station throughout the whole period of the expedition. All expedition participants as well as Polish and foreign guests delivered in total 25 lectures. Systematic English language lessons were run as well.

4. Observations of bears

Similarly as in the previous expedition, the registration of visits of the Station by polar bears was carried out in the whole-year period by Grzegorz Gregorczyk M. Sc. In total 52 bears were observed; the first bear appeared at the Station doors late in October 1983, the last — in June 1984. The observations were carried out in accordance with the wish and instruction of Thor Larsen from the Norwegian Polar Institute.

5. Scientific cooperation

During expedition the following investigations were continued in accordance with the programme of foreign research institutions:
— registration of aurora borealis using the All-Sky camera,
— rhyometric measurements of VLF radiation for the Institute of Meteorology in Helsinki,
— registration of VLF waves for the Institute of Physics in Oslo,
— registration of polar bears for the Polar Institute in Oslo.

The data of stationary measurements were sent directly or through the Institute of Geophysics in Warsaw to suitable receivers. In connection with the cooperation the Station was visited by: Jan Holtet D. Sc. with his assistant from the Oslo University, Thore Larsen D. Sc. from the Polar Institute and Björn Kaltenborn from the same Institute. Our Station was also used as a base for research works by scientists from various research centres. Soviet geologico-hydrological expeditions worked two times at the Station. Three American ornitologists from the Point Bird Observatory, two Swiss periglaciologists from the Basles University carried out their research at the Station. Two weeks stayed at the Station Dutch ornitologists. Moreover, Swiss, Norwegian and French tourists and mountain climbers visited the Station. Several days spent at the Station three Hungarian and two Norwegian film producers, preparing films on the polar landscape. Over two months the guest of the Station was Prof. Stanisław Siedlecki, nestor of Polish polaristics, who was of assistance in our research works and gave to our disposal his boat with the engine of the Yamaha make. In the summer and autumn seasons of 1983 cooperation with regional expeditions from Silesian University, Universities of Cracow and Gdańsk as well as from Mining and Metallurgic Academy of Cracow took place. In the spring-summer season of 1984 our expedition cooperated with regional expeditions from the Institute of Ecology, Polish Academy of Sciences, Białystok Branch Division of the Warsaw University, University of Cracow and the Mining and Metallurgic Academy of Cracow. During the autumnal cruise of d/e Perkun cooperation with the sejsmo-acoustic

group of the Polish Academy of Sciences investigating the bottom profiles of the Hornsund fiord and other Spitsbergen fiords and during the summer cruise of m/s Jantar in 1984 — with the Gdańsk group investigating atmosphere during the cruise took place. Moreover, Polish mountain climbers: Jacek Jezierski and Krzysztof Paul and the 8-people group of Prof. Schramm sailing along the Spitsbergen coasts on small motor boats were also guests of our Station.

6. Realization of the technical programme

Jan Krzemiński M. Sc. Eng., mechanic and electronician, took care of entirety of the technical outfit of the Station. To his duties belonged:
— service and maintenance of current-generators,
— service and maintenance of cooling generators,
— supervision over and maintenance of boat-attached engines,
— supervision over and maintenance of the vehicular equipment,
— supervision over the fuel utilization,
— service, maintenance of and supervision over technical, mechanical and electrical installations of the Station,
— share in the supervision over safety and hygiene of work.

In the summer season of 1983, stayed, at the Station, as it was mentioned already, the technical group, by which many repairs of water supply network, windows and roof of the base were carried out as well as an additional reserve fuel tank was established. All four tanks for fuel were cleaned in- and outside and coated with oil paint. This group shared the normal life of the Station being of attendance for area groups in their works and in preparing the Station for wintering as well as carrying out necessary repairs of the boat-attached engines and the vehicular equipment.

Thanks to works of the technical group and to high qualification of the mechanic — Eng. J. Krzemiński, whole technical outfit of the Station and measuring instruments worked without any breakdowns and efficiently, what contributed considerably to the success of the expedition, and particularly of difficult geodesic programme.

7. Debarking and embarking works

All the expedition participants, irrespective of their normal occupation, took part in debarking of all three ships, which entered Hornsund. By our expedition pumping of fuel was accomplished for the first time with the use of electric pumps and the 2000-litre tank placed on the

tractor's trailer. This fuel debarkation way appeared to be very effective, facilitating and making more efficient the respective works. The autumnal cruise of d/e Perkun was considerably delayed, what made that the debarkation of the delivered equipment and food occurred under conditions of frost of $-10°$ C at a far distance from the base, reaching of which with the use of the vehicular equipment of the Station was impossible. The transport was to be carried out in own capacity of the Station under very severe atmospheric conditions. In the embarkation of heavy equipment of the Station to be transported to Poland for repair, a great support was ensured on the part of the mine direction and consulate at Barentsburg. The current-generator engines for boats and many accumulators were transported by Russians to Barentsburg, where they were embarked onto the d/s Perkun sailing back to Poland. The de- and embarking works in summer season were carried out by participants of the expedition leaving Hornsund and of the new one, taking up its duties. In 1983 we made use of the help and experience of the group under the leadership of D. Sc. S. Rudowski and in 1984 we served with help and advice for the group led by D. Sc. M. Węsławski.

One of the most important deeds aiming in putting in order the area of the Hornsund Station was disposal of barrels with rubbish. In 1983 over 250 and in 1984 about 50 barrels with rubbish and refuses were disposed. In this difficult dangerous task of the successive expedition took part. In spring 1984 jointly with the groups of Prof. Klekowski and D. Sc. Taylor the yard of barrels with fuel for generators was put in order, while tightering the screws and putting barrels in such a position, so as to prevent fuel leakages. Also wood and scrap yards as well as interiors of all of the Station buildings were put in order. The repair and orderly works comprised also repairs and putting in order trapper's huts within the radius of 25 km from the Station.

8. Activity of Radio Station and Radio Operator

The duties of radio operator of the Station were fulfilled by Jacek Wielocha, who took them over on July 31, 1983 from Henryk Ignasiak and gave over on July 30 1984 to his successor, Krzysztof Dąbrowski. To the radio operator's duties belonged:

— keeping in touch thrice a day with Svalbardradio to transmit the meteorological telegrams of SYNOP,

— keeping in touch twice a day with the central radio station at Barentsburg transmitting and/or receiving telegrams and for considerations of safety,

— to keep in touch everyday or according to needs with the centre in

Warsaw for transmitting and/or receiving official telegrams as well as to keep radiotelephonic contacts,
— to receive everyday the periodical "Głos Marynarza i Rybaka" ("Voice of Sailor and Fisherman"),
— to receive the forecasts from Tromsö,
— to keep, depending on needs, the radiophonic contact through Gdynia, Szczecin or Warsaw radio,
— to keep the USW contact with own and regional groups,
— to keep in touch with the vessels cooperating with the expedition and with Soviet and Norwegian area groups according to needs,
— to receive standard time signals,
— to carry out current repair and maintenance works on implements and antennae of the radio station.

During our expedition certain throubles of diplomatic character, connected with the activity of our radio station took place. We were visited three times by representatives of the Norwegian radio inspection, the letters of which were given over to the authorities of the Polish Academy of Sciences.

9. Medical care

The duties of the expedition's physician were fulfilled by Piotr Porada, surgeon. He started his activities as early as at the stage of preparations of the expedition, taking part in medical examinations performed at the Military Institute of Aerial Medicine. During the expedition stay periodical controls of the health state and condition of the expedition participants were carried out by him, particularly in the case freezing hands by Zbigniew Pietroń and during the illness of Cezary Lipert, taking part in the medical consultations at Barentsburg jointly with representatives of Soviet and Norwegian medicine. To his duties belonged also the care over food and its rational distribution.

The health state of the expedition participants was estimated as good. Nobody, except for C. Lipert and Z. Pietroń, suffered any sickness. Some dentical troubles occurred. In two cases the Spitsbergen's Governor was requested for help. In either case a cost-free transfer and treatment were ensured. We were visited two times by a lady-dentist from Barentsburg, who carried out a dentical survey of all expedition participants and performed necessary measures in the case of need.

10. Official visits and guests of the expedition

Apart from the case of home and foreign guests staying in Hornsund within the framework of scientific cooperation, the Station of the Polish

Academy of Sciences fulfilled the duties of the Polish representative unit in Spitsbergen. As far as this activity concerns we had as guests:
— two times an official delegation of the USSR Consulate in Spitsbergen with the General Consul, S. Luzan and them V. Jurgens and the delegation of the "Arcticugol" Trust with director Volkov from Barentsburg. The visits were connected with celebrations of the 40th anniversary of the Polish People's Army and the Polish People's Republic,
— three times the delegation of the Consulate guided by D. Petrov, Vice-Consul, and representatives of other institutions from Barentsburg, such as those of the hospital, guided by F. Bayratchny, senior physician,
— five times C. Wendt, the Spitsbergen's Governor and the workers of his Office,
— once a month representatives of the Governor's Office,
— three times the radio inspection guided by T. Oewre,
— three times representatives of the church at Longyearbyen guided by Kjell, pastor,
— senior physician from Longyearbyen.

Moreover we vere visited by:
— a group of Hungarian film producers,
— a group of Norwegian film producers,
— a group of Norwegian tourist skiers,
— a group of French tourists from the DIVA yacht,
— a group of Dutch tourists and ornitologists,
— a group of Swiss mountain climbers,
— the crew of the Dutch m/s PLANCIUS,
— the crew of the Norwegian m/s POLAR STAR,
— the crew of the Norwegian m/s LANCE,
— the crew of the Soviet m/s ZARYA,
— the crew of the Polish d/e PERKUN,
— the crew of the Polish m/s JANTAR,
— a group of Norwegian tourists from Longyearbyen coming on snow scooters,
— trappers coming by dog apan.

11. Calendor of important events

July 16, 1983 — Salling of the wintering and technical groups on the board of d/e Perkun,
July 24, 1983 — entering Hornsund and debarkation start,
August 2, 1983 — sailing for Barentsburg and Longyearbyen,
August 3, 1983 — visit at Barentsburg,

Fig. 8. Visit of a trapper with the dog span. Phot. S. Barna

Fig. 9. An extremely rare visit of a sea-horse in the Hornsund fiord. Phot. J. Cisak

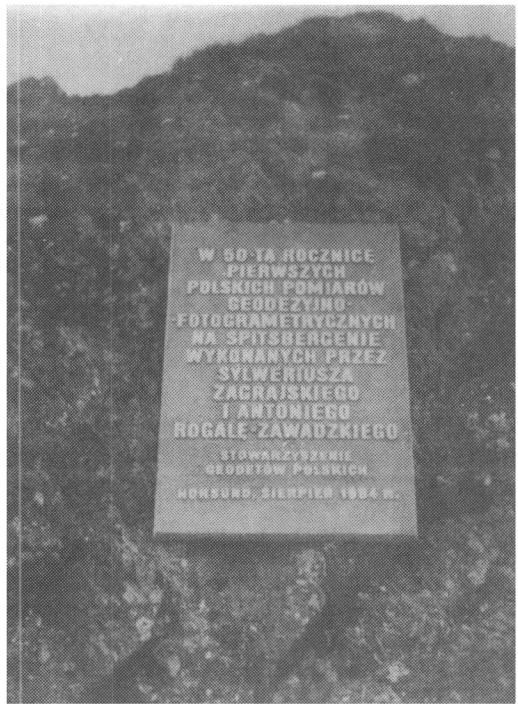

Fig. 10. Commerotation plate of the 50th anniversary of work of Polish geodesists on Spitsbergen with the following inscription: "In the 50th Anniversary of the first Polish geodesico-photogrammetric measurements on Spitsbergen carried out by Sylwester Zagrajski and Antoni Rogala-Zawadzki, the Society of Polish Geodesists, Hornsund, August 1984". Phot. M. Kupczyk

August 4, 1983 — visit at Longyeyarbyen,
August 7, 1983 — sailing of d/s Perkun with the previous group towards home,
October 17, 1983 — repeated entering Hornsund by d/e Perkun,
October 21, 1983 — debarkation and embarkation end,
October 26, 1983 — visit at Barentsburg,
October 27, 1983 — visit at Longyearbyen,
October 28, 1983 — sudden illness of C. Lipert on the return way,
October 29, 1983 — repeated visit at Barentsburg and leaving Lipert in the hospital of Barentsburg; also J. Cisak and M. Ziemiański remain at Barentsburg,
D/e Perkun sails back for Gdynia,
November 11, 1983 — arrival by air of Piotr Porada, the expedition's physician, to Barentsburg,

November 18, 1983 — return of the group from Barentsburg to Hornsund by the Norwegian helicopter,
April 27, 1984 — departure of the delegation consisting of J. Cisak, P. Porada and S. Barna to Barentsburg to take part in the 1st May celebrations,
May 4, 1984 — return of the delegation to Hornsund,
May 24, 1984 — arrival by plane of a group of the Institute of Ecology and of the Białystok Branch Division of the Warsaw University,
June 14, 1984 — arrival of American ornitologists,
June 29, 1984 — arrival of Swiss periglaciologists,
July 29, 1984 — entering Hornsund by the m/s Jantar with the next expedition,
July 31, 1984 — sailing for Barentsburg and Longyearbyen,
August 2, 1984 — visit at Longyearbyen,
August 2, 1984 — visit at Barentsburg,
August 3, 1984 — return to Hornsund,
August 15, 1984 — return voyage to Poland,
August 24, 1984 — entering Gdynia, completion of the expedition.

12. Conclusion

It is to stress that the scientific programme, particular in its geodesic part, was realized in the 50th anniversary of the first Polish geodesico-photogrammetric works on Spitsbergen, carried out by Sylweriusz Zagrajski and Antoni Rogala Zawadzki in 1934. Thus geodesy as a separate discipline entered the history of polar research while marking the Poland's activity in this region evident by entering new names on the Spitsbergen's map. To commerorate this anniversary, on the initiative of D. Sc. Eng. Cezary Lipert, member of the Central Board of the Society of Polish Geodesists in consequence of persistent solicitations on the part of Eng. T. Kuźnicki, Secretary General of the Society, the commemoration plate was founded by the said Society on a rock situated near the Station. The act of building in of the plate took place in September, at beginning of the subsequent Polish Polar Expedition of 1984/85.

All our geodesic works are intensively elaborated at present and a real chance exists that by the end of 1986 all main sheets of the map would be printed in multicolour edition, what would mean an enormous success of the expedition and of all its participants.

13. Резюме

VI-ая полярная экспежиция „Шпицберген 1983/84" должна была продолжать реализацию программы постоянных наблюдений: магнетических, сейсмических и метеорологических. Самой важной целью экспедиции было, однако, проведение всех геодезических, топографических и фотограмметрических измерений, необходимых для составления карты Горнсунда (9 листов) в масштабе 1:25.000. В настоящей отчете описывается ход работ экспедиции и приводится ее личный состав, календарь событий, обсуждение реализованной программы и участие гостей в работах Польской полярной станции на Шпицбергене.

14. Streszczenie

VI Wyprawa polarna "Spitsbergen 83/84" kontynuowała stałe programy obserwacyjne — magnetyczny, sejsmiczny i meteorologiczny. Najważniejszym jednak celem wyprawy było wykonanie wszystkich pomiarów geodezyjnych, topograficznych i fotogrametrycznych, koniecznych do opracowania mapy Hornsundu (9 arkuszy) w skali 1:25000. W komunikacie znajduje się opis przebiegu całej wyprawy, jej skład osobowy, terminarz, omówienie realizowanego programu oraz udział gości w życiu Polskiej Stacji Polarnej na Spitsbergenie.

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