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The Plešné Lake

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Abstract: The main aim was to establish the precise altitude of the Plešné jezero Lake and to draw its ground plan and bathymetric map. Geographic position and morphometric characteristics of catchment area of this Šumava lake are also described.

Keywords: bathymetric map, the Plešné jezero Lake, the Šumava Mountains

1. Position and name of the lake

The Plešné Lake is situated at about 7 km westwards from the Nová Pec Village in a cirque deepened in the north-western slope of the highest mountain of the Czech part of the Šumava Mountains – Plechý (1378 m a.s.l.). According to the Základní vodohospodářská mapa 1 : 50 000, the lake is situated at the altitude of 1089.1 m, according to the Základní mapa ČSSR 1 : 10 000 at the altitude of 1090 m. Because of changes of its surface level during the last years, as it proven by many stones in the lake and on its banks, a new survey of its altitude was done in October 1998. The measured altitude is 1087.2 m, the water gauge showing 68 cm.

The lake got its name after the Plechý Mountain, mentioned for the first time in a manuscript of the Vyšehrad Chapter from 1330 as Plechensteyn (Polák, 1965). It was probably mentioned in connection with the foundation of the near town of Horní Planá by the family of Rožmberk. On the Müller map of 1720, the lake is drawn without any name and it was not even described in a more detailed way in the Josefínský katastr (1786), where it is designed only as "See T".

The wording and the written form of the name of the lake had several variants in the past, the German form "Plöckenstein" being currently established only in the 19th century. Since the beginning of the 20th century, the Czech name "Plešné" has been used, but because of its stony bank, it is also called "Balvanité" jezero (Boulder Lake).

2. History of the research work

If we set apart a series of tales connected with the mountain and the lake, the oldest description of the lake by Václav Březan, biographer of Vilém of Rožmberk, dates from the year 1567. The report about prospecting and measuring done by the well-known builder of ponds Jakub Krčín of Jelčany on 6 June 1567 states:"… its length is 447 m, its width 159 m, its depth of 94 m could not be measured; there live chafers and worms of a size of a grown crayfish. A brook flows away herefrom with such a quantity of water that would be sufficient to move two millstones". Bohuslav Balbín had found this report in the Třeboň archives and considered it so important that he published it in 1697 in his book "Miscellanea historiae regni Bohemiae" ("History of the Kingdom of Bohemia"). Another mention about the Plešné jezero Lake dates also from the second half of the 16th century and is contained in the application of the Vimperk estate administrator Bartoloměj Plánský from 1570 who applied by Vilém of Rožmberk for nobility title with the attribute "of Plekenštejn". The report by Plánský is unique, because it not only describes the Plechý Mountain and its neighbourhood, but it mentions also the existence of chamois that at that time probably still lived in the Šumava Mountains.

Although later in the years 1789–1791 the lake was the most important reservoir feeding the newly constructed Schwarzenberk canal, it was not often mentioned in the literature. At that time, the front moraine was sealed, increased and supplied by a sluice to increase the flow of the Jezerní potok Brook. When the sluice was opened, the level of the lake decreased of nearly 2 m (Švambera, 1912).

Information about the Plešné jezero Lake was coming only slowly to the large public. The number of visitors sensibly increased after the building of an obelisk dedicated to the "Šumava poet", Adalbert Stifter, above the lake wall. This 14.5 m high slender obelisk from unpolished granite ashlars was built on a rock projection of the lake wall in the years 1876–1877. From the same period date also an inscription and a crown hewed into a big stone jutting out from the water near the dam. The inscription was hewed on 13 August 1868 to commemorate the visit of the 8-year-old prince Jan Nepomuk of Schwarzenberk.

The position of the lake was described in detail in a tourist guide by Josef Wenzig and Jan Krejčí (1860), accompanied by xylographs done after the paintings by Eduard Herold. It was the first publication of that type about Šumava. Many poets and writers knew the beauties of the lake. Besides the already mentioned Stifter praising the beauties of the lake in his story "Hoch Wald", we can mention for instance Eliška Krásnohorská and Adolf Heyduk, who compared the lake to a "brown topaz".

The second half of the 19th century was the time of research work on the lake. The first research was aimed especially at establishing the position and the depth of the lake. Very valuable was especially the work by Dr. Bayberger in 1885, by Dr. Frejlach in the years 1894 and 1896 and by Dr. Wagner from the year 1897. The observations of the last mentioned one were at that time the most complex and the most precise. He measured not only the area and the depth of the lake, but also the temperature of water, its transparency, colouring and inclination of the lake wall. The hydrobiology of the lake was studied for the first time by Prof. Antonín Frič in 1871.

Up to now, many findings about the size, depth, volume, altitude and many other data on the lake are taken over from the papers by Prof. Václav Švambera, although he did his measurements at the Plešné Lake, together with university students and with the help of local inhabitants, nearly hundred years ago. After processing his measurements done in the years 1903 and 1906, he found that his results differ so much from the precedent ones, that he decided to examine also the other Šumava lakes that he visited till the year 1928. From 1913, he started to publish also monographs on individual lakes, the one on the Malé Javorské Lake being the first. Unfortunately, the first world war stopped the publication of the monograph on the Plešné Lake, so it remained only under the form of manuscript. This paper was then published as late as in 1939 shortly after the Švambera's death. It was complied on the basis of Švambera's notes by Dr. Karel Kuchař who added a map 1: 2 000 (Kuchař, 1939).

The knowledge on the Plešné Lake was progressively completed and enlarged. Not only its size, position, origin of the lake basin, physical and chemical properties of its water, but also its fauna and flora were studied. Very valuable from the scientific point of view were the hydrographic measurements in the years 1934 – 1936 (Marek, 1936), done by the workers of the Schwarzenberk forest direction in Horní Planá in view to ensure a sufficient supply of water for floating timber. In these years, the so-called Luxembourg chalet was also reconstructed and that in its original location where it had been built in 1911. However under mysterious circumstances it burnt down after the second world war. In the 1950's, a building of frontier guard was erected in the same place, but it was demolished in 1989. In 1999, the Šumava National Park Administration started to reconstruct the dam of the lake and at the same time installed there an information research station. The dam was damaged in 1997 when a TV fairy tale "Lake Queen" was being made there and from that time soaked through which caused an unnatural decrease of the lake surface.

After the Second World War, the scientific research in this region was limited because of strict guarding of the border zone. Nevertheless in this period as well, a series of precious papers on this territory were written. Since 1979, the Šumava lakes have been object of systematic research work of many scientific teams, let's us mention at least the Hydrobiologic Institute, Academy of Science of the Czech Republic in České Budějovice, the Hydrobiologic Section of the Faculty of Science, Charles University in Prague, the Czech Geological Institute and since the 1990's also the Limnological Institute of the Austrian Academy of Science. The lake was made accessible to larger public after 1990.

The beauty and the natural value of the lake and of its neighbourhood did not escape to the attention of nature conservation – as soon as in 1933, the State Nature Reservation was established there and after 1950 it was incorporated into the almost 400 ha large State Nature Reservation Trojmezná. Since the constitution of the Šumava National Park in 1991, the lake and its neighbourhood have belonged to the most strictly protected first zone of the National Park, including, under the Nature and Landscape Protection Act No. 114/1992, the most precious and stable territory with natural ecosystems.

3. Catchment area of the lake

3. 1. Geographic position and morphometric characteristics of the catchment

The Jezerní Brook mouthing from the right side to the Lipno dam lake drains the Plešné Lake. Its elongated catchment area spreads in the south-western part of the Trojmezenská hornatina Highlands, its source area touches the north-eastern slope of the Plechý Mountain massif. The shape characteristics of the catchment were characterized on the basis of cartometric measuring done on sheets of the basic map 1 : 10 000 (see Table 1).

Table 1: Shape characteristics of the catchment area of the lake (measured on maps 1 : 10 000)

Catchment area	$P = 0.6668\ km^2$
Total length of the water shed line	r = 3.24 km
Coefficient of the development of the water shed line	k = r / P = 4.86
Area of the lake	$P_j = 0.076\ km^2$
Part of the lake on the catchment area	$P_j / P = 0,1397$
Mean altitude of the catchment area	1 213.5 m a.s.l. [1)]
Mean inclination of the catchment area	27°47' [2)]

[1)] it is the arithmetic average of three data established by different methods (Vránek, T.,1999)

[2)] inclination of the relief in contour line belts was calculated with the help of the formula by A. Penc (in Čapek, R., Kudrnovská, O.,1982)

Table 2: Morphometric characteristics of the catchment area of the lake (measured on maps 1: 10 000)

Contour. line (m a.s.l.)	Length of. contour lines (km)	Altitudinal span of. the belt (m a.s.l.)	Area of the belt (km^2)	Mean. inclination of the belt (°)	Part of the a catchment rea (%)
1 069	0	1 068.5 – 1 087.2	0.071	10°04'	10.65
1 087	1.21	1 087.2 – 1 100	0.040	22°54'	5.99
1 100	1.14	1 100 – 1 125	0.062	26°22'	9.30
1 125	1.04	1 125 – 1 150	0.070	33°24'	10.50
1 150	1.16	1 150 – 1 175	0.064	25°56'	9.60
1 175	1.05	1 175 – 1 200	0.039	38°08'	5.85
1 200	1.08	1 200 – 1 225	0.037	52°46'	5.55
1 225	1.07	1 225 – 1 250	0.038	38°38'	5.70
1 250	1.04	1 250 – 1 275	0.034	40°13'	5.10
1 275	0.95	1 275 – 1 300	0.033	39°14'	4.95
1 300	0.92	1 300 – 1 325	0.074	19°58'	11.10
1 325	1.00	1 325 – 1 350	0.067	18°41'	10.05
1 350	0.62	1 350 – 1 375	0.046	12°18'	6.90
1 375	0.10	1 375 – 1 378.3	0.001	10°25'	0.15

The monitored territory is relatively steeply inclined. In the altitudinal span of 1175 – 1300 m it approaches 42°, while between the contour lines 1200 and 1225 m it reaches its maximum of 52°46'. In the highest parts of the catchment area, the relief inclination decreases again. The mean inclination of the whole catchment (average of all the measured inclinations) is 27°47'.

3.2. Geological structure and geomorphologic conditions of the lake catchment

From the regional geographical point of view, the studied territory is a part of the Plechý massif district situated in the south-western part of the Trojmezenská hornatina

Highlands sub-unit that is a part of the Šumava unit. The geological conditions of the studied region are uniform. The major part of the territory is formed by light double-mica coarse-grained granite to adamelite (of Eisgarn type) that is medium to coarsely grained, locally porphyric. The size of grains is about 5 mm. It contains dull feldspar phenocrysts of a size up to 1.5 cm. The quartz is usually in clusters, sometimes of a size superior to 1 cm. Irregularly limited biotite and muscovite form scales of a size up to 3 mm. This type of granite, according to F. Hochstetter of Plekenštejn type, is late synkinematic to postkinematic of Varrisan age. From the geological point of view, the centre of this territory is one of the oldest and solidest parts of the Český masiv that, since the Upper Proterozoic, has been neither covered by sea transgression, nor affected by internal deformation of rocks (Votýpka, J., 1981).

In the neighbourhood of the Plešné Lake, there are maintained also Quaternary glacigenous and fluvial sediments. They form on the one hand a bouldery moraine damming the lake, on the other hand go on along the valley of the Jezerní Brook as stony-bouldery sediments of a stone sea, floated away and mixed with deluvial-fluvial clastic.

The region of the Plešné Lake was morphologically formed mainly by glacial and cryogenic processes, by erosional, denudational and fluvial activities. The most pronounced glacial form in the mapped territory is the *cirque of the Plešné Lake* situated in the north-eastern slope of the Plechý Mountain in the altitudinal span of 316 m. The total area of that form is 46.5 ha, the Plešné jezero Lake taking not even a seventh of it (7.6 ha). The plotted lengthwise profile makes evident a great inclination of the relief in the area of the lake wall closing this cirque. This one is in its higher parts steeper and its inclination is progressively getting milder from the altitude of 1160 m to the lake surface. In the higher parts of the wall, there is a greater number of rock outcrops, the material of which is by erosion and gravitational processes transported to the lower parts of the wall. The in this way formed slope sediments cause milder inclinations in the lower part of the wall. The bases of the cirque were formed by extraglacial weathering in the summit part of the principal ridge in the Pleistocene still before the spreading of the Würm glacier. Only as late as in the alluvial climate, a glacier got formed there for a shorter period and contributed to a redeepening, evacuation and damming of the present lake basin. After its retreat, the glacier left there a lake dammed by a moraine that is now the dam of the Plešné Lake. Because of the thickness of this moraine, the glacier is supposed to have been the widest in the whole Šumava region (Kunský, J., 1933).

Among the other glacier landforms in the immediate proximity of the Plechý cirque, Votýpka, J. (1981) determines five main types. Their occurrence was confirmed also by our field research:

On the slope situated northwards to north-eastwards from the lake, there spreads a *basal bloc accumulation* reaching the length of up to 900m. Extraglacial weathering and transport formed its basis at the time when the valley closure below the Plechý was being formed.

In the period of the maximal extent of the Würm glacier the tongue of which was elongated 800 m to the north-east, the *frontal moraine* was formed. It is the best maintained on the basal bloc accumulation. Its closure has been nevertheless recently considerably damaged by erosion of the Kamenný Brook.

At the time when the glacier filled only the present lake basin, a *passive moraine* was formed. Quantities of blocs were getting out from the cirque at the surface of the glacier by extraglacial weathering. The glacier transported them to the north-east where they were progressively closing the lake basin. The pressure of accumulating material probably enlarged the mound into a fan shape and at the same time sealed the mound by finer material. After the retreat of the glacier, the moraine formed a 30 m thick natural dam of the lake. The lake water was getting progressively accumulated behind it.

About 600 m eastwards from the Plechý Mountain, there begins in the steep slope a more than 200 m wide *frost slope*. It is oriented to the north-east, covered by blocs of different sizes and grown over by dense vegetation. About 200 m south-eastwards from the dam of the Plešné Lake, a *stone sea* is basely linked to it. It is formed by boulders of Plekenštejn granite fissured by intensive frost weathering. Unfavourable soil conditions in the debris boulder terrain did not allow a continuous forest to grow as it is the case in the environs. The whole stone sea finally merges together with the basal bloc accumulation. The fading glacial activities in the interior of the cirque result then into *foot bloc dumps*.

The most frequent *destruction fluvial forms* are erosional channels and V-shaped ravines. The forms of this young erosion are the most frequent in the 1.5 km wide belt running from the Hučina mouthing to the Plešné Lake.

Accumulation forms occur mainly in the Vltava River alluvium. In the studied region, they fill above all the flush depression of Kotlina situated at 2 km northwards from the Plešné Lake. Besides the Jezerní Brook, a whole system of erosional valleys mouth into it through which water brings weathered material into the depression. The most pronounced accumulation forms are dejection cones formed at mouthing of erosional forms into the alluvium.

Many *anthropomorphic forms* occur in the region as well. They are the most pronounced on the dam of the lake, where there are some ruins of the border guard building, including its foundations. Human activities affected also the moraine – it was dug through at the outflow of the Jezerní Brook and a 50-cm diameter steel pipe preventing water to flow over the dam filled the outflow. In addition, works in view to consolidate the damaged dam started in the spring 1999. In the last years, it soaked through and the surface of the lake oscillated in an unnatural way.

Other anthropomorphic forms are the military ones. Their remnants date from the period prior to 1989, when there was a military garrison of border guard. In the near proximity of the lake we can found for instance remnants of walls into which targets for training shooting were installed.

4. Morphographic conditions of the lake

4. 1. Survey of the ground plan of the lake

The first map where the outlines of the lake have a though rough but approximately correct shape is the cadaster map of the year 1826. From the same time dates a map of the Český Krumlov estate, lithographed in 1829 in a scale 1 : 57 600 by J. Falta. For the first time, we find there the surroundings of the lake which are correctly drawn and contain even some details.

The cadaster map was also the basis for the measuring by J. Frejlach, who in 1894 established the area of the lake as being 10 ha. Two years later, P. Wagner considered this cadaster map as erroneous and based his research on the forest map of a scale 1 : 5760 with the help of which he calculated the area of the Plešné Lake as being 6.0552 ha. In 1903, V. Švambera established the area of the lake as 7.4845 ha on the basis of his own map 1 : 1000, the scale being then reduced to 1 : 2000.

Our resulting ground plan was done on the basis of the levelling order that is a spatially broken line determined by horizontally measured lengths of sides and by horizontal angles they include. In total, measuring of angles was done in 49 polygon points (n = 49). Conformably with the formula $\Sigma = (n+2) \cdot 200^g$, the sum of the internal angles of the polygon is 10 200 grades, that is 9180°. Documentation on measured internal angles of the polygon and a survey of lengths of polygon sides are contained in the diploma thesis of the co-author (Vránek, T., 1999). The polygon sides served then as bases from which perpendiculars were dropped to the bank line of the lake. For the total length of all polygon sides (1242 m) there were 370 measured perpendiculars, that is in average one perpendicular for 3.4 m of the length of the polygon perimeter.

On the basis of these measurements, a ground plan was done at a scale 1: 1000. The area of the lake was consequently calculated, and that on one hand with using millimetre square network, on the other hand with the help of Reiss polar planimeter. The resulting area was determined as the average of the results of both these methods. Determination of the course of the bank line of the lake is not always explicit because at some places dense dwarf pine vegetation grows above the water surface. In addition, the bank beneath the lake wall is strongly waterlogged and the bank line is changing according the level of the water surface. For that reason, we determined on one hand the area of the lake limited by the strengthened bank as 7.643 ha and on the other hand the area limited by the non strengthened bank as 7.627 ha (the water gauge always showing 65 cm).

4. 2. Bathymetric measurements and morphometric characteristics of the lake basin

J. Frejlach did the first modern measurements of depths in August 1894. In ten lengthwise profiles in total, he proceeded to more than 150 measurements of depth. On the basis of his measurements, he published then a plan of the lake in a scale 1 : 2500. However, the profiles were introduced to the cadaster map that was not precise enough.

Two years later, P. Wagner measured there the depth. In five transversal and one lenghtwise profiles, he measured 54 depths in total that he transferred into the forest map 1 : 5700. The maximal depth established by his measurements was 18.5 m. Valuable are also the data contained in his book "Die Seen des Böhmerwaldes" (1897), where he published also the data on depth measuring done by his predecessors – Möchel, Boch (32 m); Moechel, Fuehrer (58 m); Řivnáč (30 m); Frič (57 m); Bayberger (estimates 30 m).

In 1903, the founder of the Geographical Institute at Charles University, Prof. V. Švambera, started the most complex and most precise research on the Šumava lakes.

Although he accepted the depth measurements by Dr. Wagner, he did not considered them to be detailed enough to serve for basis for drawing a precise bathymetric map. Then, after having measured 555 depths in sixteen crosswise and one lengthwise profiles, he drew a new map of depths of the Plešné Lake, and that at first at a scale 1: 5000 with the isobaths after five metres, later at a scale 1: 2000 with the isobaths after one metre. The greatest depth established by his measurements was 18.3 m.

Our measurements of depths were done in July 1999. They were done at 48 profiles lead among 46 individual points of the bank line of the lake. Because of the fact that one measurement covers an area of 51.6 m^2 or that there are 194 deep measurements per 1 ha, this measuring of depths can be up to now considered as the most detailed in the history of the research on the Plešné Lake.

We used for our measurements a boat moving along a kevlar fibre with marks at a distance of each 5 metres. In those points the depth was measured with the help of an acoustic depth gauge with the precision of centimetres. The quality of measuring was verified by a control mechanic measuring in the profile 7 – 5' with the help of a flat weight suspended on a calibrated rope. The mechanic way of measuring was also used in some parts near the banks, because it was not possible to use there echoless, especially in the area beneath the lake wall where water plants did not allow using the ecoless.

The in this way obtained depth data were then used as a basis for construction of a bathymetric plan 1 : 1000 with depth lines in the 1 m interval (Fig. 1). This plan was then used for cartometric measurements serving to determine the basic numeric and morphometric characteristics of the lake basin (see Tables 3, 4a, 4b).

Table 3: Basic numeric characteristics of the lake basin (measured on a plan 1 : 1000)

Area of the lake	P = 7.643 ha
Length of the bank line (circumference of the lake)	O = 1320 m
Length of the lake	L = 514 m
Maximal width of the lake	B_{max} = 183 m
Mean width of the lake	$B_{prům}$ = P/L = 148.7 m
Degree of articulation of the bank line	$R = O/2\pi . \sqrt{P/\pi} = 1.35$
Maximal depth of the lake	h_{max} = 18.7 m
Mean depth of the lake (volumometric)	h_s = V/P = 8.04 m
Depth coefficient	h_s/h_{max} = 0.43
Relative depth coefficient	$h_{max}/\sqrt{P}$ = 0.068
Mean inclination of the ground	I = 14°23'

Tables 4a, 4b: Morphometric characteristics of the lake basin

Depth line (m)	Area (ha)	Area (%)	Depth line circumference (m)
0	7.627	100	1 320
1	6.673	87.5	1 195
2	5.703	74.8	1 120
3	5.328	69.9	1 085
4	5.0	65.6	1 055
5	4.6905	61.5	1 035
6	4.4	57.7	1 010
7	3.991	52.3	985
8	3.841	50.4	955
9	3.4805	45.6	940
10	3.182	41.7	920
11	2.8033	36.8	885
12	2.4	31.5	820
13	2.039	26.7	755
14	1.628	21.4	705
15	1.118	14.7	650
16	0.7	9.2	515
17	0.283	3.7	257.5
	0.082	1.1	175

Depth step	Area of the depth step (ha)	% of the surface area	Volume of the depth step (m^3)
0 – 1	0.954	12.5	71 920
1 – 2	0.970	12.7	61 600
2 – 3	0.375	4.9	55 120
3 – 4	0.328	4.3	52 480
4 – 5	0.3095	4.1	48 640
5 – 6	0.2905	3.8	45 600
6 – 7	0.409	5.4	42 160
7 – 8	0.15	2.0	39 520
8 – 9	0.3605	4.7	36 960
9 – 10	0.2985	3.9	33 520
10 – 11	0.3787	5.0	29 760
11 – 12	0.4033	5.3	26 560
12 – 13	0.316	4.1	22 240
13 – 14	0.411	5.4	18 560
14 – 15	0.51	6.7	13 760
15 – 16	0.418	5.5	8 640
16 – 17	0.417	5.5	4 560
17 – 18	0.201	2.6	2 080
18 – 18,7	0.082	1.1	640

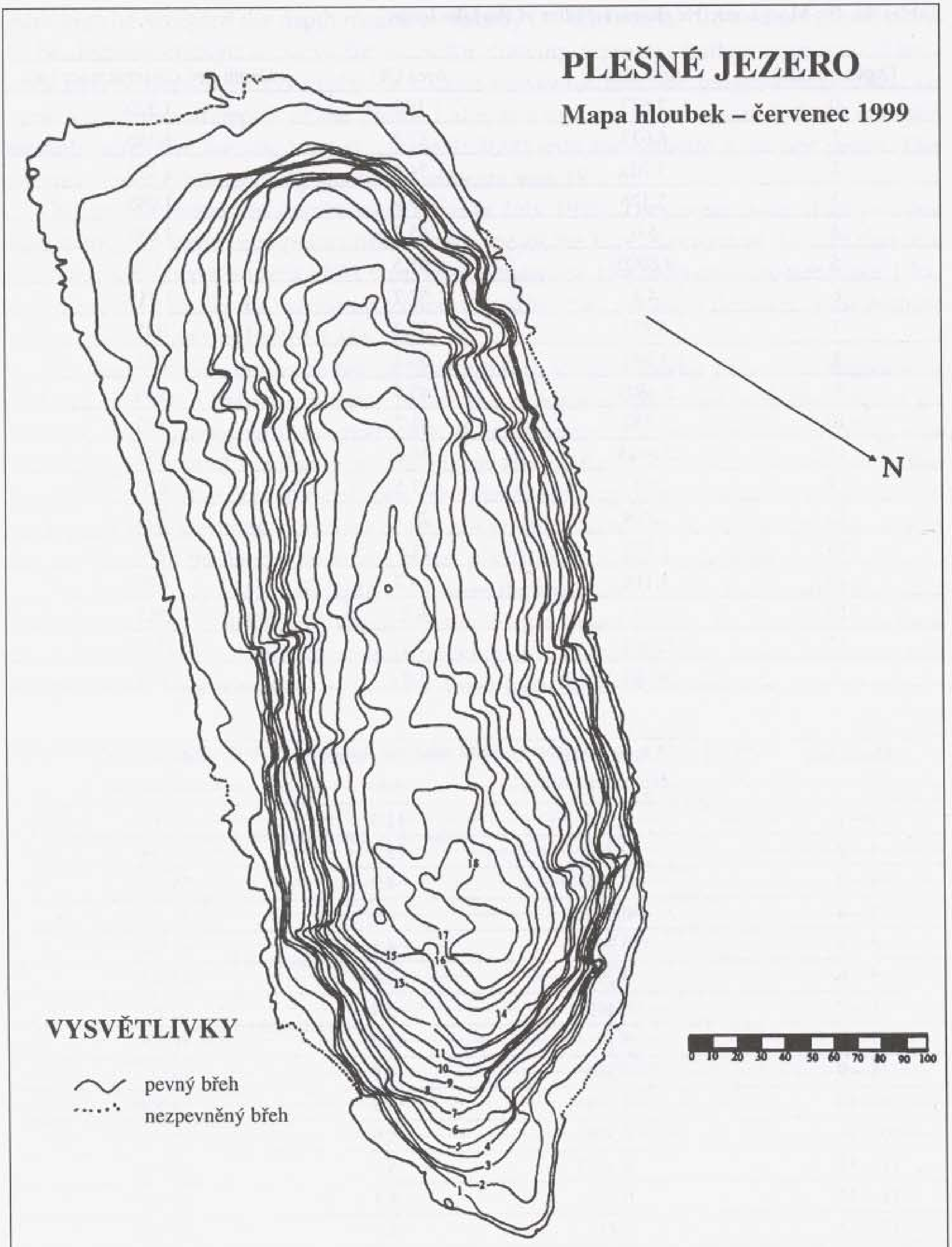

Fig. 1: Bathymetric map of the Plešné Lake

The point values of depths were further used for construction of individual crosswise deep profiles contained in the master thesis of the co-author (Vránek, T., 1999). All the data concerning the depths are related to the surface level equal to 77 cm registered by the water gauge.

The Plešné Lake reaches its greatest depth in its frontal central part, into which the ground slopes relatively steeply, in the same way as in the place beneath the rocky lake wall. On the contrary, in the southern corner of the lake the ground slopes slowly and the depth of 2 m can be measured only at 60 m from the bank. The ground is formed by sediments the thickness of which decreases proportionally from the deepest places of the lake to the mostly bouldery margin. The more coarsely grained sediments occur mainly as far as in the 32 m thick passive moraine (Votýpka, J., 1980) forming the dam of the lake.

The spatial volume was determined from the bathymetric curve (Fig. 2). The volume equals to the quantity of square millimetres closed by the co-ordinate axes and the bathymetric curve according to the appropriate scale. After the in this way constructed bathymetric curve, the resulting volume of the Plešné Lake is 614 320 m^3. If we divide this value by the area of the surface, we obtain the total mean depth of the lake: 8.06 m. The percentage of the mean depth in the maximal depth is 43.1 %.

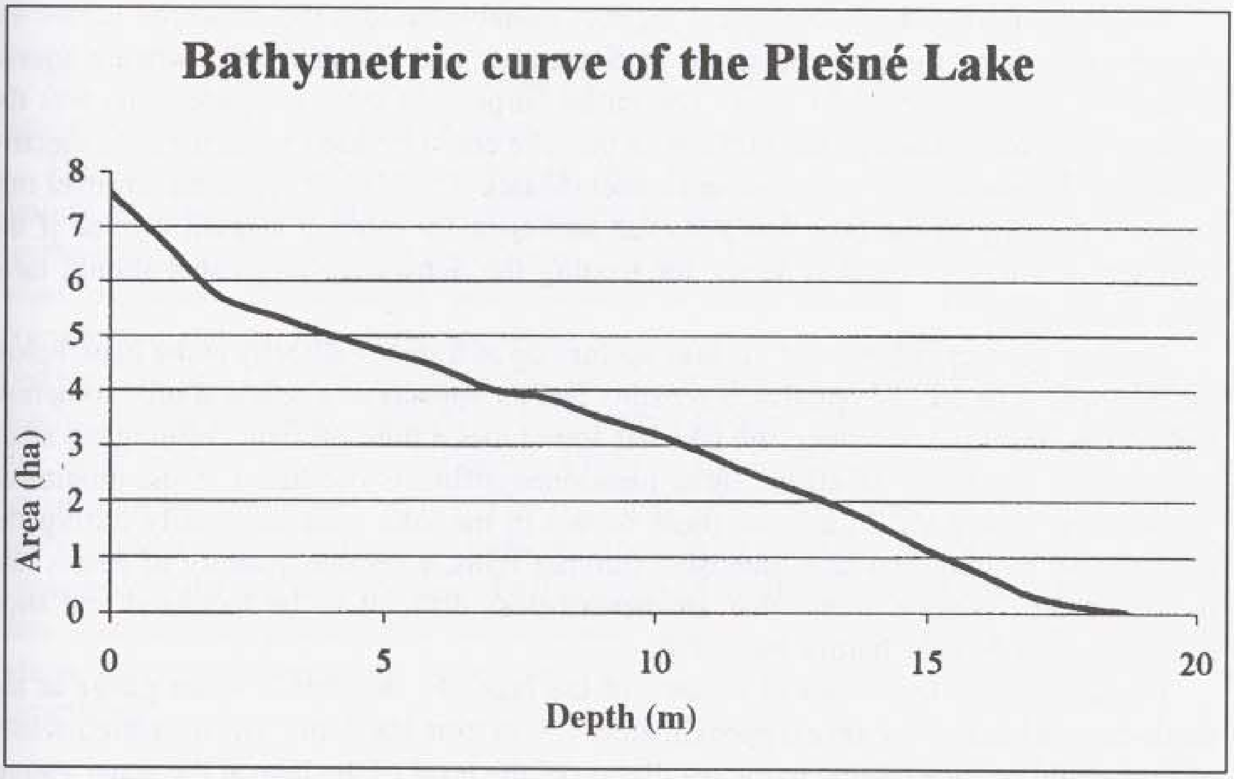

Fig. 2: Bathymetric curve of the Plešné Lake

If we take the oldest bathymetric map of the Plešné Lake done by Doc. J. Frejlach, we can say that it was quite good for its time, but because it was constructed only on the basis of measurements in ten profiles, it is little detailed. Another bathymetric map done by Prof. V. Švambera is already more precise. Although it was drawn as soon as at the beginning of the 20th century, it has been often used up to now. The up to now most detailed and precise data are the results of the measurements done in July 1999. Thanks to a dense network of profiles (48) and to the measurements done on them (1477), the resulting bathymetric map shows also erosional channels of water courses that used to mouth into the lake basin and that do not exist anymore. A greater density of measurements may be also the reason of establishment of a greater maximal depth (18.7 m) than 100 years ago, although rather a lower maximal depth could be supposed because of the steadily continuing processes contributing to silting of the lake basin. On the basis of more bathymetric measurements, it would be interesting in the future to compare the evolution of the lake basin in a given time horizon.

5. Hydrological regime of the lake

The Plešné Lake is an outflow lake. Three irregular affluents occur in its southern and south-western part. The Jezerní Brook the flow of which was in the past regulated by a sluice drains it. The discharged water served to feed the Schwarzenberg canal at the time of floating timber. The Plešné Lake was used for that reason as one of the principal accumulation basins.

When monitoring the hydrological regime, valuable besides the measured values are also the data from the past registered in September and October 1935 when a tourist chalet was being constructed there. The initial purpose of these measurements was the effort to determine whether the outflow of the lake could be used for generating electric power for illumination of the projected chalet (Marek, J., 1936). It appeared however that the flow capacity of the lake was not even sufficient for moving a small turbine if the sufficient quantity of outflow water for feeding the Schwarzenberg canal should have been maintained.

The first apparent affluent of the lake springs up as a source directly at the bank below the lake wall. The second one that is sensibly feebler appears as a debris source somehow higher. Besides these two ones, the lake has sometimes a third affluent draining the steep cirque wall. The flows of all the three mentioned affluents oscillated in the monitored period from 0 to 2 l/s. Moreover, there occurs in the lake wall, especially during the spring snow melting and after intensive summer rains, a greater quantity of debris and fissure springs (source areas) that are nevertheless difficult to be localized and their abundance can be only hardly measured.

To establish the hydrological balance of the lake, we installed a water gauge at the north-eastern bank of the lake (approximately 150 m from the dam). The measured values of flow could be then related to the oscillation of the level of the lake at the water gauge. To measure the flow at the outflow, we used a 12 m long pipe of a diameter of 60 cm that was installed into the dam in 1989 in the place of the former sluice. The flow was then established as the product of the area of the flow profile and of the mean flow velocity (average of 10 measurements). With lower flows, the in this way established values were verified by direct measuring with the help of calibrated vessel. The flows at the affluents were only estimated because of their irregularity and inaccessibility in the winter period.

Table 5: Measured flows at the outflow from the Plešné Lake

date	Water gauge of the lake (cm)	flow Q (l/s)
11 November 1997	42	2.07
6 December 1997	50	1.80
19 February1998	65	7.30
15 March 1998	72	11.48
11 April1998	67	23.47
14 May 1998	65	4.51
2 June 1998	63	3.24
4 July 1994	64	11.00
16 October 1998	68	29.64
28 March 1999	*75	46.05
17 April 1999	75	21.19
28 May 1999	65	15.66
17 July 1999	77	12.19

*Only estimation, the precise state could not be determined (there was a three-metre thick snow cover in the place of the water gauge).

The values of the Table 4 were used for construction of a graph of dependence of the flow quantity of the Jezerní Brook (outflow) on the state of the level of the lake.

The mentioned observations indicate that the level of the water surface depends mainly on atmospheric precipitation causing an increase of the surface level, as well as on the spring melting. Visible oscillations of even 15 cm were observed also by stronger wind. Although the affluents and evaporation reach in some periods of the year considerable values, they have not much impact on the mean annual level of the water surface. The last factor influencing the oscillation of the water level in the past was the discharging of lake water in view to help timber floating when a one metre decrease of the water surface was not exceptional. Flows at the outflow from the lake were much variable in the monitored period. The maximal values were reached during the spring snow melting and after intensive rains, the minimal ones at the end of autumn. It can be explained by the fact that because of a damaging of the dam, water is soaking through the dam also in other places as at the regulated outflow where the flows were measured. Many sources springing up below the closing of the passive moraine confirm this hypothesis.

5.1. Snow conditions

The water accumulated in the snow cover significantly influences the hydrological balance of the lake, mainly in the spring period. This was the reason of our inquiry into the distribution and time changes of the thickness of the snow cover and of the volume of water contained in it.

Our research was based on the methods by Barták, Z. (1995) used in the catchment area of the Nýrsko waterworks. When selecting the measuring places, we tried to choose localities that would correspond to the mean snow conditions of the lake catchment area. The measurements were done in one profile at eight measuring places, and that at different altitudes, at different slope orientations and in different vegetation covers. The selected profile was situated in a gorge between the steep lake wall and the Stifter memorial and it was progressively sloping down to the lake. The measuring sites in this profile were located both in free space and under forest vegetation. The measurements themselves consisted in determination of snow cover by a calibrated bar always in three places of the measuring site and in determination of water equivalent of the uptaken snow column. The snow sampling was done by a plastic pipe of a diameter of 4 cm that was used as a substitution of the standard weight snow sampler. The water equivalent of the snow cover that was established after melting of the snow sample was then related to the total volume of the snow column.

Although we did not have a sufficient quantity of data from more profiles and the measuring went on only during a shorter period of time, we tried to establish the total volume of the water in the Plešné Lake catchment area in the months with snow cover (Table 6).

Table 6: Volume of water in snow cover

	19 Feb. 1998	15 March 1998	11 April 1998	17 April 1999	12 May 1999
Volume of water. in snow cover (mil. m^3)	115.74	96.30	48.79	327.49	88.83

The resulting eqivalent of water volume in the snow cover in individual months was calculated on the basis of the mean water equivalent of snow cover for the given catchment area according to the relation:

Vp = Ap . Hspn / 1000... Vp....................volume of water in the snow cover (mil. m^3)
Ap....................catchment area (km^2)
Hspn.................mean water value (mm^3)

In different months, the in this way calculated volumes oscillated in a large span varying from 48.79 to 327.49 mil. m^3. These levels are probably largely overestimated, because for instance in the rocky part of the lake wall , there are quite different snow conditions than in the majority of the rest of the catchment area. A much greater significance has rather the comparison of the water equivalent of the snow cover and of its total volume. The graph shows an increase or decrease of the water equivalent in dependence on the total volume of snow. An exception is the monitoring of 15 March 1998 done under dense snowfall, so that samples with the preponderance of freshly fallen powdery snow the water equivalent of which is generally lower were taken.

The aim of our monitoring was not to precisely determine the water equivalent in the snow cover in the Plešné Lake catchment area, which would need a much larger and a more regular research, but rather a testing of this method in the studied region. It would be useful above all to determine the spring outflow from the catchment, which is very complicated in the given period.

6. Physical properties of accumulated water

6.1. Thermal regime of the accumulated water

The Plešné Lake can be considered as a single thermal unit with approximately the same temperatures in the given depth degree. This thermal system is nevertheless affected in its south-western part by three irregular surface affluents that mainly in summer cause a certain cooling of water along the coast.

The lake presents a typical thermal regime in the course of the whole year, usual for lakes of the mild climatic belt. The changes in distribution of temperatures are due both to a low heat conductance and to the thermal anomaly of water (the density of water grows up to 3.98 °C and when further cooled it decreases again). Given the considerable molecular mobility of water, its layers get arranged according to their density that depends mainly on the temperature. Therefore in summer, when the water is warmer than 4°C, the warmer layers are situated above the colder ones. On the contrary in winter, when the water temperature reaches 0 °C to 4 °C, the colder layers lay above the warmer ones. In summer, there is the period of direct thermal stratification, in winter then of inverse thermal stratification.

In the years 1998 – 1999, temperatures of the water column of the Plešné jezero Lake were measured in the vertical water column above the area of the greatest depths. The GT-2 thermometer with depth probe enabling to determine temperatures with a high precision was used for that purpose. The final result of this work should have been mainly to monitor the annual course of the thermal stratification in the lake.

The graph of thermal stratification manifests all the parameters typical for the winter inverse thermal stratification. The thermocline (metalimnion) is situated at a relatively small depth. This is typical for winter period when, differently from the situation in summer, the thermocline is shifting to greater depths as consequence of progressive warming and of the impact of the wind. At the time of measuring (19 February 1998) the weather was sunny, the air temperature was +9 °C, the thickness of the ice 16 cm. The values measured on 2 June 1998 and on 17 July 1999 are on the contrary typical for the summer thermal stratification when three layers differentiated by their temperature get formed – the well illuminated epilimnium, the not very thick metalimnium where the temperature quickly decreases and the deep hypolimnion with temperatures approaching 4 °C.

We tried to measure the temperatures also in the period of spring and autumn homothermy when water in vertical column gets exchanged. The measurement of 16 October 1998 established the thermocline in the depth of 9 to 11 metres with the difference of temperatures of 2.5 °C. It is thus clear that the curve is only approaching the state when the water temperature will have a constant level in the whole vertical profile. On the contrary, the measurement of 12 May 1999 shows clearly that it was done shortly after the period of spring circulation. The obtained results allow to presume that the spring and the autumn homogeneity of temperatures in the Plešné Lake occur for a short time only, and that at the turn of April and May or at the end of October.

On 17 July 1999, measurements in the whole length of the crosswise profile7–5' were done. In the right part of the profile, there is a visible thermal increase of isotherms, mainly in the surface layer of water. It is due to the exposition to sunbeams at the time of measuring (morning), while the other part was still in shadow. It is however surprising that the 5 °C isotherm reached at the bank exposed to sunbeams to the depth of 15 m, while in the shadowy parts only into the depth of 8 m.

The following Table 7 gives the data on oscillations of surface temperature of the lake surface in the period 1997 – 1999.

Table 7: Temperatures of the surface layer of water of the Plešné Lake in the period 1997 – 1999

	6 Dec. 1997	19 Dec. 1998	15 March 1998	2 June 1998	16 Oct. 1998	28 March 1998	17 April 1999	12 May 1999	17 July 1999
air temperature (°C)	-0.5	9	4	18	8	6	1.8	18	19
water temperature (°C)	0.0	0.3	0.3	16.1	7.6	0.1	0.1	7.5	14.8

Its freezing also influences the thermal regime of the lake. The first freezing-over occurs under inverse thermal stratification and under decreasing air temperature when the temperature of the upper layer of the water reaches 0 °C. Ice is usually at first formed at the bank and in shallow places, from where it progressively spreads to the whole surface. In 1997, the first ice appeared as soon as at the beginning of November. The ice cover did nevertheless last long, because on the 11th of November, there were only last remnants of ice in the back part of the lake. At the beginning of December, the whole lake was already covered by a 4 cm thick layer of ice. In autumn 1998 (8 November) the lake was covered to a distance of 150 m from the dam by a 0.5 cm layer of ice. The whole lake was completely frozen on 14 November 1998. Because the Plešné Lake is not much large, the whole lake may get completely covered by ice during one clear frosty night.

A further increase of the thickness of the ice goes on especially in dependence on the decrease of air temperatures (Table 8).

The retreat of ice cover can be usually registered when the temperature rises above 0 °C, and that usually going from the banks of the lake. It depends however, as well as the freezing, on climatic and topographic conditions, on the character of individual years and on the climatic course of the winter. An example may be the comparison of the two last winter periods. At the end of the rather mild winter 1997 – 1998, the first significant melting occurred as soon as on 4 April 1998 and when I visited the lake five days later, it was already without ice. A year later, a completely different situation occurred. From January to March, a great quantity of snow had fallen on the frozen lake surface and it alternatively melted and froze. Still as late as in the middle of April, there was a nearly

80 cm thick snowdrift at the lake margins. On the contrary, the central part of the lake was at that time practically without snow. The thickness of the compact ice layer could not be measured, because a 40 cm layer of melted snow covered it. The situation was quite different at the dam, where the ice was approximately 3 cm thick. In the ensuing period, the accumulated snow was progressively melting away in the direction from the central part that, together with the area at the dam, was that year the first to be melted. The total retreat of ice cover was registered as late as at the beginning of May 1999.

Due to the oscillations of temperatures during the winter, the ice structure is usually stratified and its thickness often differs in different parts of the lake.

Table 8: Development of ice cover of the Plešné Lake in the years 1997 – 1999 in the location of the water gauge

	6 Dec. 1997	19 Jan. 1998	3 Feb. 1998	19 Feb. 1998	25 Feb. 1998	15 March 1998
thickness of ice (cm)	3	20	20	16	10	22
	4 April 1998	14 Nov. 1998	23 Nov. 1998	1 Dec. 1998	16 Dec.1998	31 Dec.1998
thickness of ice (cm)	2	2	5	10	20	30
		7 Jan. 1999	12 Jan.1999	24 Jan.1999	23 Feb.1999	28 March 1999
17 April 1999		thickness				
of ice (cm)	33	27	25	70	73	40

6.2. Transparency and colouring of the water

To determine the transparency of water, the Secchi desk is usually used. It a white circular disc of a diameter of 30 cm with a weight suspended on its lower part and in its middle hung at a calibrated rope with the help of which it gets immersed under the water. The transparency is established by immersing the desk up to the limit of its visibility. It is good during the observation to eliminate the reflection of sunbeams. The Secchi desk can be also used to establish the colour of water that is determined according to the colouring of the disc in the half depth of the transparency by comparing with the Ule-Richter scale comprising in total 21 colour shades going from dark blue to dark brown.

The transparency of water in the Plešné Lake was measured for the first time in 1896 by Wagner who found only slightly lesser values than Švambera did several years later. The second one registered in October 1903 the transparency even down to the depth of 3.3 m. A greater transparency has not been established since (Kuchař, K., 1939). After a long interval, the transparency was measured in 1960 by Procházková: 24 August 1960 (2 m), 28 June 1961 (1.7 m), 30 August 1961 (1.5 m) and later by Novák: 11 August 1961 (2.4 m), 4 April 1962 (3.2 m) (Hejzlar et al., 1998). These values show a significant decrease of transparency that is interesting especially when comparing the values of the Černé and Čertovo Lakes where an increased acidification was on the contrary accompanied by a greater transparency (Černé Lake even 14 m). As indicated by Veselý J., (1988), the Plešné Lake also belongs to strongly acidified lakes characterized by a relatively high transparency of water. Veselý (1988) explains this phenomenon by a visible browning of lake water (especially at the dam) that was caused mainly by mineral clouding.

To these values correspond also the results of our measurements above the area of maximal depths:

maximal depths:	10 April 1998	(clear, 3. p.m.)	– 2.15 m
	2 June 1998	(clear, 11 a.m.)	– 1.55 m
	16 October 1998	(cloudy, 9 a.m.)	– 1.75 m
	12 May 1999	(overcast, 10 a.m.)	– 1.97 m
	17 July 1999	(clear, 9 a.m.)	– 1.50 m

The problem of water colouring is one of the oldest the research on the Plešné Lake was concerned with. It was mentioned at first by many poets, including A. Hejduk who called the lake "magnificent brown topaz" or the already mentioned A. Stifter explaining the dark colour of the lake by the environment it is situated in (Švambera, J., 1939). Frejlach used the Ule-Forel colour scale for the first time in August 1894 for measuring the water colouring. But Frejlach established a so dark colour that he could not introduce it into the then still incomplete scale (Frejlach, J., 1895). His observation differed thus from the report by Frič from the year 1872 who described for the first time the yellow-brown colouring of the lake water. In 1897, Wagner established the colour of the lake, according to the Ule-Forel scale, as being No. 14 (yellow green) and pointed out the former overestimating of the dark water surface that seems to be darker as it really is. Švambera confirmed by repeated measurements in 1903 and 1906 the approximate correctness of Wagner's findings. He stated the nearly complete absorption of blue colour and the resulting yellow-brown colouring of water (Nos 14 – 15 of the colour scale). In his notes, he characterized this colour as tea like and explained it by the neighbourhood of the lake where there is a great quantity of rotting substances (Kuchař, K., 1939). Chábera in 1955 determined colouring as dark brown, although on the background of surrounding forests it appears as metallic black. Veselý J., (1988) describes its expressive browning in the second half of 1980's. This is confirmed also by our observations, according to which the lake water is green-yellow to brown yellow (see Table 9). Quite different from the precedent observations is the blue-green colour observed by Novák in 1961 (Hejzlar et al.,1998).

Table 9: Colouring of the water of the Plešné Lake

Date	Time	Weather	Forel – Ule scale	Colour
10 April	3 p.m.	clear	16	brown-yellow
2 June	11 a.m.	clear	15	green-yellow
12 May	10 a.m.	overcast	15	green-yellow
17 July	10 a.m.	clear	17	brown-yellow

7. Conclusion

This article is based on the diploma thesis of the co-author (Vránek, T., 1999) which is a part of the project of the resumed research on the Šumava lakes carried on with the backing of the Grant Agency, Charles University, Prague. The paper links to the tradition of the geographic research on the lakes at the Faculty of Science, Charles University, Prague. The extent of field measurements done in the years 1997-1999 has not been realized before in the Plešné Lake, also because the access to that region was sensibly limited after the Second World War.

Although the lake was relatively often mentioned by historical literature, for the first time as soon as in 1567, more serious scientific research was done there only at the end of the 19^{th} century (Frič, A., 1871, Bayberg, F., 1885, Frejlach, J., 1894, 1896, Wagner, P., 1897). The majority of basic geographic data on the Plešné Lake have been up to now taken from the papers by Švambera, V. (1912, 1939), in which he presented the results of his field research from the years 1903 and 1906.

The Plešné Lake is situated in the cirque deepened into the hill-side of the north-east slope of the Plechý massif, the highest mountain of the Czech part of the Šumava Mountains. On the basis of our own levelling order set up in October 1998, the altitude of the lake surface was established as being 1087.2 m a.s.l.. This altitude is reached when the water gauge shows 68 cm. The area of the lake is 7.642 ha, the catchment area of the lake 7.643 km^2 at the mean altitude of 1213.5 m and the mean inclination of the catchment area is 27°47'.

On the basis of 1477 measurements of depth at 48 profiles, the bathymetric map of the lake was constructed at a scale 1:1000. The maximal depth of the lake is 18.7 m and the mean depth 8.04 m. When the lake surface reaches the above-mentioned altitude, some 614 320 m^3 of water are accumulated in the lake basin. The area of greatest depths is situated in the frontal central part of the lake basin. Differently from the up to now used map by Švambera, our map is much more detailed.

The elements of hydrological balance of the lake were regularly monitored. The flows at the outflow of the lake were very variable during the monitored period. Maximal values occurred during the spring snow melting and after intensive rainfall, the minimal ones at the end of autumn and in winter. The maximal outflow exceeded 46 l/s (28 March 1999), the minimal one was only 1.8 l/s (6 December 1997). During the two winter periods (97/98 and 98/99), water equivalent of snow cover was measured in the catchment area of the lake. The volumes of water in snow oscillated in individual months in a large span of 48.79 to 327.49 mil. m^3. To evaluate the impact of snow cover on the hydrological balance of the lake, it would be useful to go on with measuring during a longer time period of several years.

The lake manifests a typical thermal regime during the whole year, which is usual in lakes of the temperate region. In summer, the period of direct thermal stratification occurs, in winter, on the contrary, the period of inverse thermal stratification. Twice a year, in spring and in autumn, water exchange occur in the vertical column during a short several-day period of thermal homothermy. The lake is regularly frozen from the beginning of December to the end of March. In dependence on the course of temperatures, the period of freezing may be sensibly longer. The maximal observed thickness of snow cover was 73 cm.

According to our own measurements of the transparency of water, relatively low values (1.5 to 1.97m) were established which does not correspond to a high degree of acidification of the lake. During our field research we established the water colour to be between the degrees 15 and 17 of the Ule-Forel scale, that is from green-yellow to brown-yellow.

References

BALATKA, B., CZUDEK, T., DEMEK, J., SLÁDEK, J. (1973): Regionální členění reliéfu ČSR. Sborník ČSZ, 78, pp. 81–96, Praha.

BAYBERGER, F. (1886): Geographisch-geologische Studien aus dem Böhmerwalde. Peterm. Geogr. Mitteil. Ergänzungsheft, Heft 81, pp. 36-37, Gotha.

ČEŘOVSKÝ, J. (1983): Kolik je na Šumavě jezer? ABC, 27, 15, p. 3, Praha.

DEMEK, J. (1987): Zeměpisný lexikon ČSR. Hory a nížiny. NČSAV, 584 p., Praha.

FREJLACH, J. (1895): Geofyzikální pozorování v jezeře Plöckensteinském. Věstník Československé Akademie nauk 6, 4, pp. 295–298, Praha.

FREJLACH, J. (1898): Bathymetrická mapa jezera Plöckensteinského. Věstník Československé akademie nauk 4, 7, pp. 267–270, Praha.

HEJZLAR, J., KOPÁČEK, J., VRBA, J., ČÍŽKOVÁ, R., KOMÁRKOVÁ, J., ŠIMEK, K. (1998): Limnological Study of Plešné Lake in 1994–1995. Silva Gabreta, 2, pp. 155–174, Vimperk.

HRUŠKA, V. (1979): Šumavská jezera a některé kapitoly z jejich výzkumu. Živa, 27, XXVII, pp. 124–126, Praha.

CHÁBERA, S. (1968): Formy zvětrávání a odnosu žuly v okolí Jelení na Šumavě. Sborník Provozně-ekonomické fakulty VŠZ v Českých Budějovicích, 16, pp. 1–7, Č. Budějovice.

JAGR, S. (1997): Historie rychty Želnava, 191 p., Černá v Pošumaví.

JANSKÝ, B. (1975): Mladotické hrazené jezero. Rigorosní práce, PřF UK, 96 p., Praha.

JANSKÝ, B. (1996): Tradice geografických výzkumů jezer na Karlově univerzitě. Geografie – Sborník ČGS, 101, 1. Nakl. ČGS, pp. 59–63, Praha.

JOSEFÍNSKÝ KATASTR (1786): Dominium Stubenbach. Položka č. 162 a zvláštní protokol. Wien.

KOLEKTIV (1991): Trojmezská hornatina. Nakl. Olympus, 30 p., České Budějovice.

KOLEKTIV (1995): Geologická mapa ČR 1 : 50 000, list 32–14 Nová Pec, ČGÚ, Praha.

KUBÍKOVÁ, A. (1979): Pobyt manželů Mařákových u Plešného jezera. Jihočeský sborník historický, 48, pp. 78–79, Č. Budějovice.

KUCHAŘ, K. (1939): Příspěvky k výzkumu šumavských jezer. Sborník ČSZ, 45, pp. 87–90, 120–122, Praha.

KUCHAŘ, K. (1947): Mapy šumavských jezer podle měření prof. V. Švambery. Kartografický přehled, II, 3 – 4, pp. 41–44, 120–122, Praha.

KUNSKÝ, J. (1933): Zalednění Šumavy a šumavská jezera. Sborník ČSZ, 39, pp. 1–6, 33–40, Praha.

MANDÁK, F. (1981): Šumavská jezera. Šumava, 15, pp. 5–8, Plzeň.

MAREK, J. (1936): Hydrografická měření na Plöckensteinském jezeře. Tradice, duben–červen, pp. 49 (289) –52 (292), Č. Budějovice.

POLÁK, V. (1965): Trojmezná a Plešné jezero. KSSPPOP, 10 p., Č. Budějovice.

STABILNÍ KATASTR (1837): Stubenbach 1 : 2880. I. Teil B 1, VIII, Wien.

ŠIMEK, T. (1963): K historii Plešného jezera. Lidé a země, 10, XII, pp. 390–391, Praha.

ŠVAMBERA, V. (1912): Výzkum šumavských jezer. Sborník ČSZ, 18, pp. 250–257, Praha.

ŠVAMBERA, V. (1939): Jezera na české straně Šumavy. Sborník ČSZ, . 45, pp. 15–23, Praha.

VESELÝ, J. (1987): Okyselení šumavských jezer. Vesmír, 12, 66, pp. 676–678, Praha.

VESELÝ, J. (1988): Acidifikace šumavských jezer. Ústřední ústav geologický; 36 p., Praha.

VOTÝPKA, J. (1981): Geneze a klasifikace granitového reliéfu masívu Plechého, 67 p. České Budějovice.

VRÁNEK, T. (1999): Plešné jezero. Diplomová práce, PřF UK, 96 p., Praha.

WAGNER, P. (1897): Die Seen des Böhmerwaldes, 50 p., Leipzig.

WENZIG, J., KREJČÍ, J. (1860): Der Böhmerwald. C. Bellmann, Prag, 354 p.

ZÁLOHA, J. (1980): Krajem Lipna. JČN, 76 p., Č. Budějovice.

ZBOŘIL, A. (1994): Prášilské jezero. Diplomová práce, PřF UK, 94 p., Praha.

PLEŠNÉ JEZERO

Résumé

Tento článek je založen na výzkumu provedeném v rámci diplomové práce T. Vránka (Vránek 1999) v období let 1997-1999. Tematicky se jedná o součást dlouhodobého výzkumu všech jezer české části Šumavy, který je prováděn Katedrou fyzické geografie a geoekologie Karlovy univerzity.

Prášilské jezero bylo prvnímu seriöznímu výzkumu podrobeno koncem 19. století (Frič 1871, Bayberg 1885, Frejlach 1894, Wagner 1897). Nejvýznamnější geografické informace pocházejí ze článků V. Švambery (1912, 1939), ve kterých prezentoval výsledky svých výzkumů z let 1903 a 1906. Po druhé světové válce byl výzkum jezera prakticky znemožněn omezenou dostupností regionu.

Plešné jezero leží v cirku severovýchodního svahu masivu Plechý, který je nejvyšší horou české části Šumavy. Podle našeho měření dosahuje hladina nadmořské výšky 1087,2 m.n.m., rozloha jezera je 7,642 ha, sběrná oblast zaujímá plochu 7,643 km^2 se střední nadmořskou výškou 1213,5 m.n.m. Na základě 1477 měření ve 48 profilech byla konstruována bathymetrická mapa v měřítku 1 : 1000. Maximální hloubka jezera je 18,7 m a střední hloubka 8.04 m. Při výše uvedené úrovni hladiny jezera dosahuje objem zadržené vody 614 320 m^3.

Hydrologický režim jezera byl po dobu pozorování velmi variabilní. Maximálních hodnot dosahuje přítok a odtok při jarním tání sněhu a při intenzivních dešťových srážkách. Maximální odtok představoval 46 l/s (28. března 1999), minimální pouze 1,8 l/s (6. prosince 1997). Teplotní režim jezera odpovídá charakteristikám ostatních jezer v tomto regionu. V létě zde existuje přímé teplotní rozvrstvení, v zimě pak inverzní. Jezero pravidelně zamrzá od počátku prosince do konce března. Maximální výška sněhové pokrývky dosahovala v době pozorování 73 cm.

Photo 1: The Plešné Lake in summer

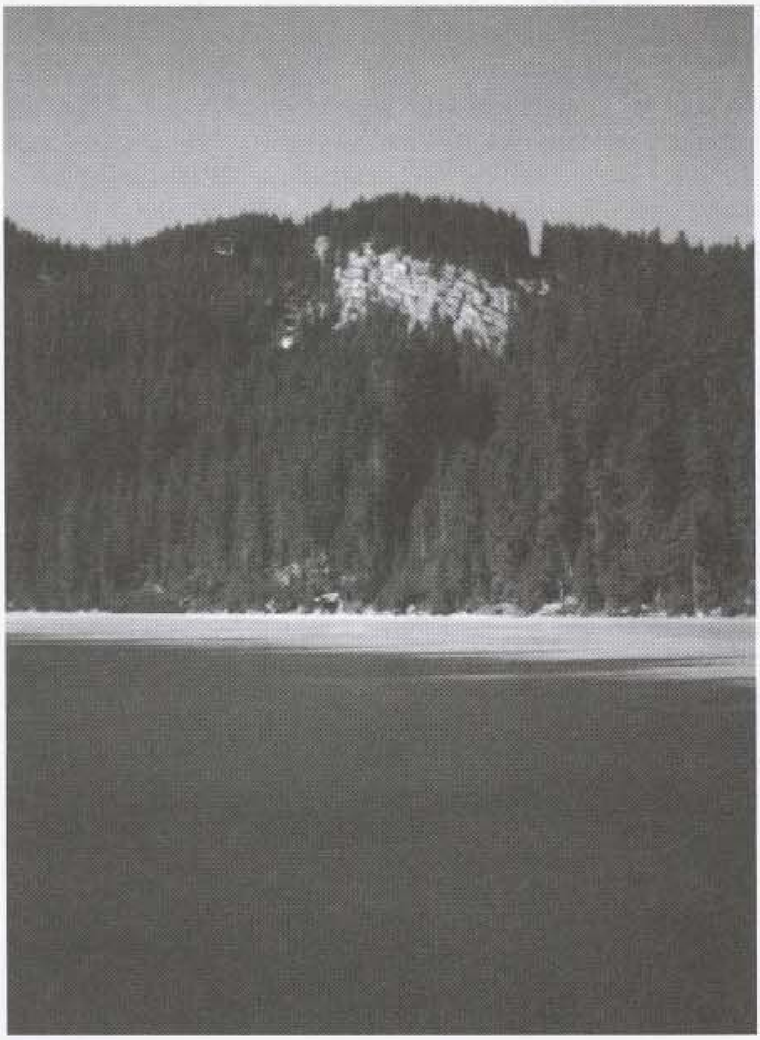

Photo 2: The Plešné Lake in winter