Ice observations at Lake Stechlin 1998-2020

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Authors and data management Silke R. Schmidt, Gabriele Mohr

Contact person Sabine Wollrab (wollrab@igb-berlin.de)

Data responsibility Sabine Wollrab

Former data responsibility Neubert (for data from Deutscher Wetterdienst, the German Federal Meteorological Service), Rainer Koschel, Peter Casper

Data origin Observations from 1998-2002 were made and marked in maps by Deutscher Wetterdienst (DWD) (Neubert) and later evaluated by the Leibniz Institute of Freshwater Ecology and Inland Fisheries (IGB) (Gabriele Mohr). Data from 2008 until 2020 were collected and evaluated by IGB (Gabriele Mohr).

Data

Sampling site Lake Stechlin is a deep, dimictic, formerly oligotrophic clear-water lake that has been undergoing eutrophication since at least the early 2000s and especially since 2010. The lake is located in a nature reserve approximately 80 km north of Berlin, Germany (53°9‘5.6“N, 13°1‘34.2“E) at 59 m altitude. The lake has a maximum depth of 69.5 m, a mean depth of 23.3 m, a surface area of 4.3 km^2 and a volume of 96.9 x 10^6 m^3. The lake basin was formed during the last continental glaciation ca. 12,000 years ago and is today situated at the transition between temperate maritime and temperate continental climate (Fraedrich et al. 2001). The catchment has a size of 12.6 km^2 and is almost completely covered by managed forest (95%). The main species is Scots pine (*Pinus sylvestris*), although beech (*Fagus sylvatica*) is the dominant tree species along the shoreline. Non-forested areas are the site of a former nuclear power plant and a small village (Neuglobsow with about 300 residents but more during the summer tourist season), whose wastewater is diverted to a different catchment. The shoreline is largely undeveloped with no notable infrastructure except on the properties of a fisherman, the Federal German Environment Agency and the Leibniz Institute of Freshwater Ecology and Inland Fisheries. The seepage lake is mainly fed by precipitation and groundwater, resulting in a theoretical water retention time of more than 40 years (Koschel 1995, Holzbecher et al. 1999). There are no river inflows except for

occasional discharge from a small stream channel that is dry in most years. The water level of Lake Stechlin is regulated. From 1966 to 1990, the lake received a total of about 300,000 m^3 d^{-1} of cooling water from the nearby nuclear power plant. The cooling water was withdrawn from neighbouring Upper Lake Nehmitz and discharged into Lake Stechlin at an average temperature of approximately 10 °C above the ambient surface water temperature. This resulted in an average increase in water temperature by 1-2 °C during the power plant operation (1966-1990). For more information, see Casper (1985), Koschel and Casper (1986), Casper and Koschel (1995), Koschel and Adams (2003) and Kirillin et al. (2013).

Time span 1998-2020

Sampling method

During periods of ice formation on the lake, the extent of ice cover was determined at about weekly intervals. An observer walks around the lake along the shoreline to assess from several perspectives the areas and location of ice and snow cover. These areas are marked in a paper copy of a schematic map of the lake (Figure 1). Ice thickness and, if present, snow thickness on top of the ice layer are measured at the dock of the Leibniz Institute of Freshwater Ecology and Inland Fisheries (IGB). A hole is cut in the ice to measure the thickness of the ice and snow layers with a meter stick. The maps are evaluated using a stencil (Figure 2) placed over the paper map of the lake. The points over the marked areas are counted. The sum of points yields the percentage of ice and snow cover of the whole lake area according to the table in Figure 3. For the data from 1998 until 2002, the percentage of snow and ice cover of the whole lake area was reconstructed from schematic lake maps on ice and snow cover at Lake Stechlin collected by the Deutsche Wetterdienst, DWD (Neubert), the Federal German Meteorological Service. From 2008 onwards information on ice and snow cover has been collected by the IGB (Gabriele Mohr) using the same procedure as the DWD, as described above. The maps are available as scans. Some contain additional information such as further observations and comments. No measurements were taken between 2002 and 2008. For this time span, occasional qualitative observations by a citizen are available upon request.

Parameters

- `date` – date of measurement [`YYYY-MM-DD`]
- `winter` – years of respective winter season [`YYYY/YYYY`]
- `ice cover` – percentage of the lake area covered with ice [%]
- `snow cover` – percentage of the lake area covered with snow on ice [%]
- `ice thickness` – thickness of the ice layer [cm]
- `snow thickness` – thickness of the snow layer [cm]
- `comment` – comments and observations

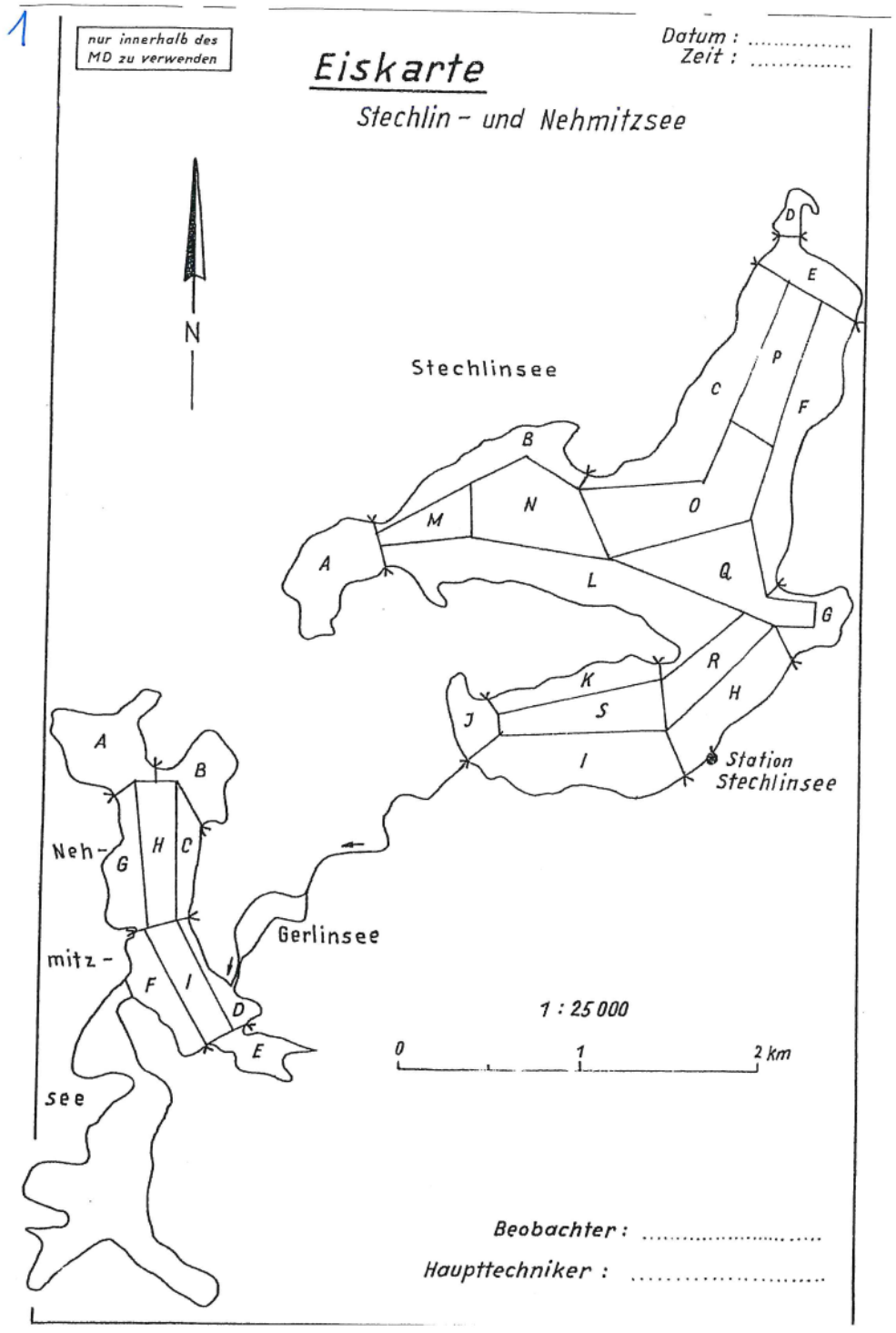


Figure 1: Schematic map of Lakes Stechlin and Nehmitz that served as template to mark areas of ice and snow cover

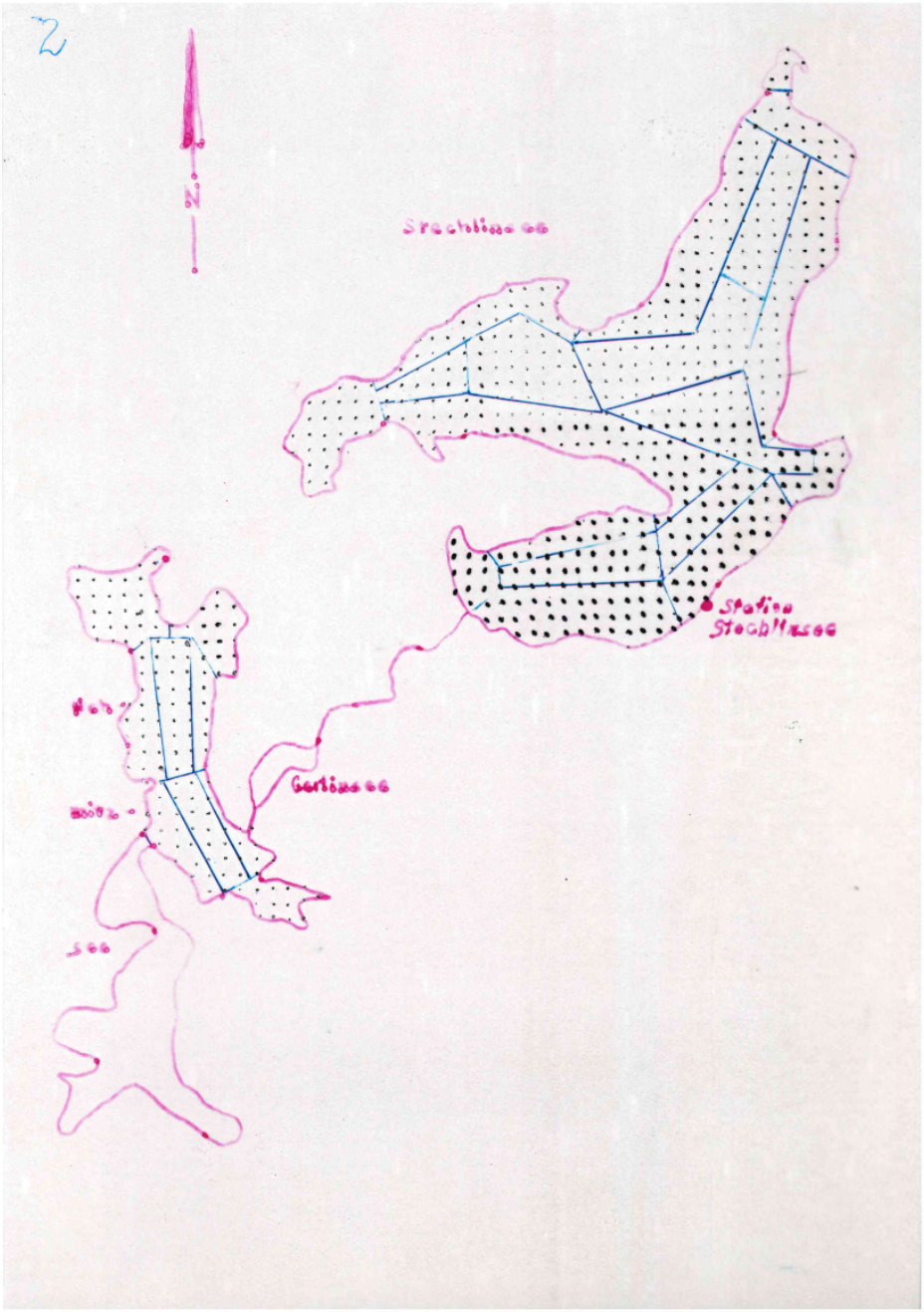
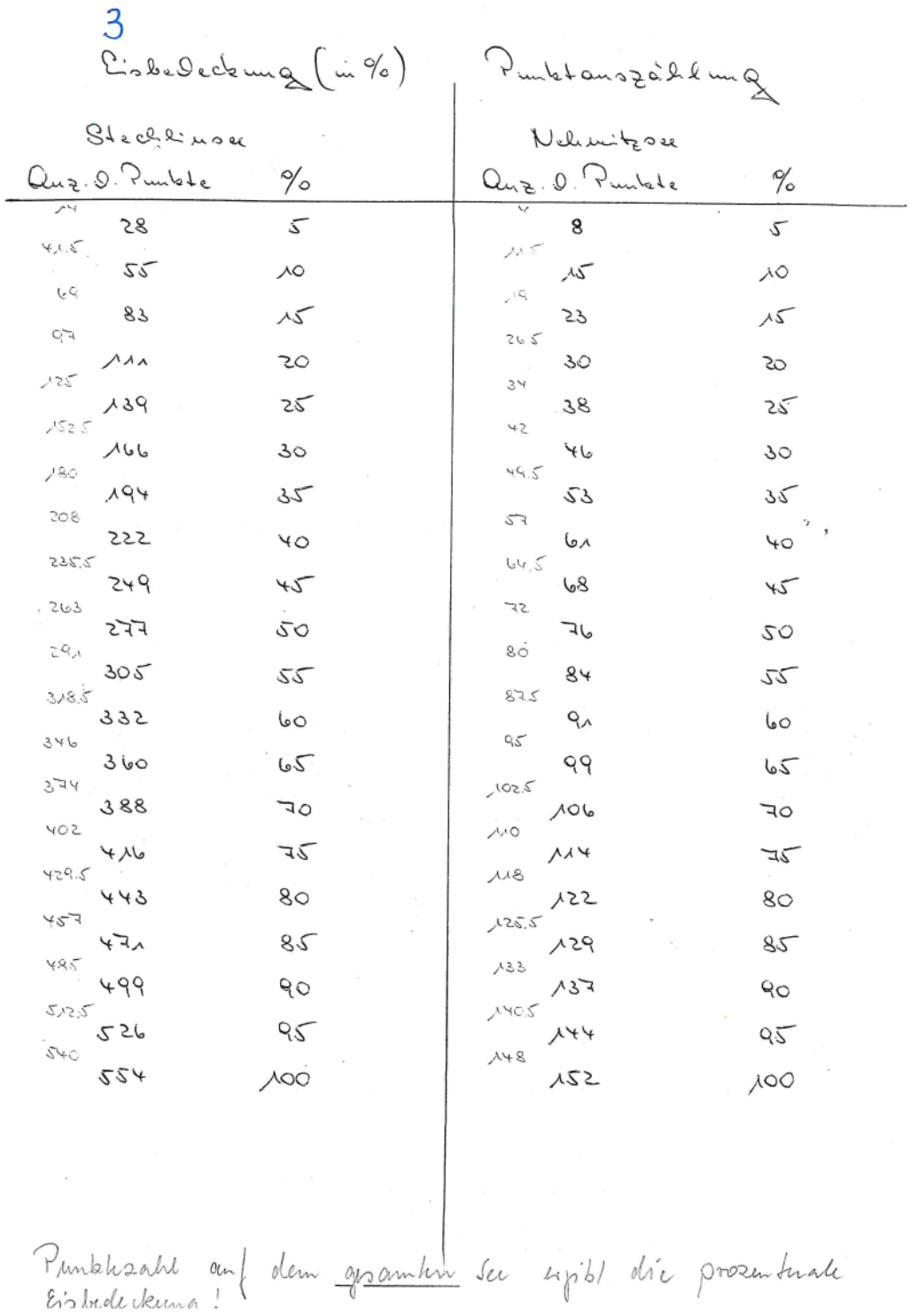


Figure 2: Stencil used to evaluate the number of points of ice-covered and snow-covered areas on Upper Lake Nehmitz and Lake Stechlin



3

Eisbedeckung (in %) — Punktauszählung

Stechlinsee		Nehmitzsee	
Anz. d. Punkte	%	Anz. d. Punkte	%
28	5	8	5
55	10	15	10
83	15	23	15
111	20	30	20
139	25	38	25
166	30	46	30
194	35	53	35
222	40	61	40
249	45	68	45
277	50	76	50
305	55	84	55
332	60	91	60
360	65	99	65
388	70	106	70
416	75	114	75
443	80	122	80
471	85	129	85
499	90	137	90
526	95	144	95
554	100	152	100

Punktzahl auf dem gesamten See ergibt die prozentuale Eisbedeckung!

Figure 3: Original table to evaluate the percentage of ice and snow cover corresponding to the number of points counted on marked areas in the map. Left: Lake Stechlin, right: Upper Lake Nehmitz

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Change log

- 2020/2021 Silke R. Schmidt: For records with comments “eisfrei” or “Beginn Eisbildung”, values of ice cover, snow cover, ice thickness and snow thickness were changed from `NA` to `0`.