Reduction of cyprinid fish populations at Lake Nimmern by seine fishing, autumn 2025

1. General

Internal nutrient loading and unbalanced food webs may explain specially summertime water quality problems in many lakes. One of the common sources for the situation are high biomasses of cyprinid fishes that are dominating fish populations. Reduction fishing of cyprinids may therefore decrease algae problems and increase water clarity. The method suits best to the lakes where the highest nutrient contents and murkiest water are observed during warmest summer months, July-August, when the feeding activity of fishes is most intense. In addition, the fishing removes nutrients from the lake directly along the catches.

A Finnish (autumn) seining method for fishing of cyprinids has been developed since early 1990s. In small and shallow lakes, the method can be used throughout a year. In large lakes the technique is most cost-effective in autumn and cooling water when cyprinid fishes tend to shoal to dark refuges like deep areas of a lake during daytime. In cooling water cyprinid fishes can meet their needs for daily feeding during twilight and night and thus being exposed for visual predators like pike and fish-eating birds during the daytime is an unnecessary risk. The biggest cyprinids like adult bream and tench may still stay in open and illuminated water layer because their risk for predation is low. If dark refuge is not available, the fish may also hide to rivers, brooks, even ditches, or to littoral vegetation.

The reduction fishing of cyprinids at Lake Nimmern aims to improve the lake's water quality. Fishing in autumns 2017-2020 produced a catch of 83000 kg (212 kg/ha) which was over the level of calculatory minimum target catch 180 kg/ha [1)]. The fishing produced, for example, improvement in late autumn secchi depth from 0,45 (2017) to 2,6 m (2020) and a very strong population of big predative perch [2)]. A negative consequence of the better water clarity was a significant increase in the growth of the invasive water plant Elodea canadensis in 2021-22. During 2023-2024 Elodea canadensis retracted to its "normal" areas and strength. At the same time the water quality worsened again and reduction fishing of cyprinids was re-initiated. In autumn 2023 four days fishing produced a catch of 11500 kg (29 kg/ha) and in autumn 2024 catch with the same effort was 8300 kg (21 kg/ha). Both fishing took place in late September / early October when Secchi depth was 60-65 cm and water temperature 12 - 17 ℃.

To improve the fishing efficiency, it was now decided to time seining to late Autumn when Sechhi depth should be higher and water temperature lower. These both should intensify the daytime shoaling of cyprinids to deep water.

1) Target catch (kg) = 16.9 x (TP ug/l) $^{0.52}$. (TP=total phosphorus during vegetation period 15th June – 15th September).Jeppesen, E. & Sammalkorpi, I. 2002. Lakes. In: Davy, A.J. & Perrow, M.R.(ed.). Handbook of ecological restoration. Vol. II. Restoration in practice. Cambridge University Press: 297-324

2. The seining and catches 2025

Seining took place 4th- 10th November (7 days) and included 13 seine hauls (Table 1). The conditions during the fishing were good and all hauls were technically successful. During the period surface water temperature was 8-9 ℃. Secchi depth rose from 105 cm to 140 cm during the days.

The biomanipulation catch was 32800 kg (83 kg/ha) and consisted mostly of roach (mört, 44 %), bream (braxen, 43 %) and bleak (benlöja, 9 %). The average catches per seine haul and per fishing day were 2492 and 4629 kg. (Figure 1).

About 4430 kg predatory fishes were released back to the lake in good condition. They consisted of pike pike (gädda, 1243 ind., 2194 kg), pikeperch (gös 455 ind., 212 kg) and perch (abborre 127 ind., 25 kg). About 40 pikeperch were 3-5 kg individuals and the rest were 2-*3* summer old 13…25 cm individuals. Pikes were mostly 1...3 kg. Perch were 0,15….0,3 kg. The prey-predator ratio (kg/kg) in the catch was 13. (Table 1)

3. Summary and some observations from years 2017-2025.

Seven seine fishing operations in 2017-2025 have produced total catch of 135 tons (346 kg/ha) (Table 2). With the catch, 1082 kg phosphorus and 3381 kg nitrogen has been removed from the lake. Cost for the removed phosphorus has been 600 kr/kg. The lake suits well for seining which shows in the low 4,8 kr/kg fishing cost of removed cyprinid biomass. After our 35 years' experience we consider costs under 12 kr/kg cost-effective and 13-23 kr/kg reasonable. Prices over 23 kr/kg are costly and with these figures one should consider adjusting or changing the methods.

During the years, seining has been executed in different water temperatures and Secchi depths (Table 2).

In big or mid-sized and relatively deep lakes the seine catches usually improve markedly when water temperature drops under 12 degrees in autumn. This is also the case at Nimmern. Especially big catches become more likely as the sizes of cyprinid shoals grow in cooling water. (Figure 2).

Secchi depth tends to increase along the decreasing autumnal water temperature. The optimal Secchi depth for the seine fishing at Nimmern seems to be somewhere at 0,9…1,3 m (Figure 3). Low water clarity keeps fishes scattered to littoral areas where as increasing visibility forces them to move to open deep water during daytime (Figure 4). However, if Secchi depth grows even more, dark refuge disappears and fish seek alternative refuges from places where seining is not possible. This was the case in 2020 when Secchi depth was 2,6 m during the few days seining (Table 2).

4. Conclusions and suggestions

Autumnal seine fishing is a very suitable and a natural method for managing eutrophication problems at Lake Nimmern. The fishing cost for removed cyprinid biomass kr/kg has been exceptionally low so far. The fishing produces good raw material, for example, for fertilizers and biogas.

At Nimmern, the optimal time for seine fishing is when Secchi depth is 90…130 cm and water temperature is under 12 degrees. This is normally scheduled for late October … early November.

Thanks!

Thanks again for all the help during the fishing for Nimmerns Fiskevårdsområdesförening.

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Table 1. *The hauls and catches in Lake Nimmern in autumn 2025. An excel file with a more complete fishing diary has been sent separately for the client.*

DRAG				FÅNGST kg							Biomanipulering	ROVFISKAR			gädda		abborre >15 cm		Rovfiskar
nummer	dag	lengd m	yta ha	braxen	mört	gers	abborre <15 cm	benlöja	ruda	sutare	fångst kg	e	st.	gös kg [2]	st.	kg [3]	st.	kg [4]	tillsammans kg
1	4.11.2025	220	4,4	3375	1500	56	5	60	3	1	5000		20	5	155	310	7	2	317
2	5.11.2025	240	4,8	2090	855	30	0	825	0	0	3800		35	7	151	302	1	0	309
3	5.11.2025	230	4,6	980	314	100	0	0	5	1	1400		84	34	80	160	22	4	198
4	6.11.2025	230	4,6	1455	600	34	10	600	0	1	2700		26	10	81	162	2	0	173
5	6.11.2025	240	4,8	650	518	80	50	0	0	2	1300		109	44	55	110	29	7	161
6	7.11.2025	230	4,6	1100	2264	30	0	500	4	2	3900		19	3,8	120	240	5	1	245
7	7.11.2025	250	5	700	224	30	40	0	4	2	1000		102	87	57	114	23	5	205
8	8.11.2025	240	4,8	1050	700	150	100	200	0	0	2200		6	6	56	112	3	1	119
9	8.11.2025	220	4,4	700	2250	100	50	300	0	0	3400		14	3	156	312	5	1	316
10	9.11.2025	230	4,6	450	900	43	30	75	2	0	1500		11	9	94	188	4	1	198
11	9.11.2025	210	4,2	690	1380	66	46	115	2	1	2300		19	4	92	184	14	3	191
12	10.11.2025	240	4,8	250	2000	60	39	150	1	0	2500		6	1	94	188	8	2	191
13	10.11.2025	200	4	570	700	30	19	80	1	0	1400		4	1	52	104	4	1	106
			59,6	14060	14205	809	389	2905	22	10	32400		455	212	1243	2194	127	25	2431
				43 %	44 %	2 %	1 %	9 %	0 %	0 %	100 %								
[1]Predators were counted as follows:											83 kg/ha						Removed in catch		
	All pikeperch										4629 kg/day						P kg	N kg	
	Perch about >15 cm TL										2492 kg/haul						259	810	
	All pikes																		
[2] mean weight was estimated as 0,2-1 kg according to catch											13 prey-predator ratio (kg/kg)								
[3] mean weight was estimated as 2 kg according to catch																			
[4] mean weight was estimated as 0,2 kg according to catch																			

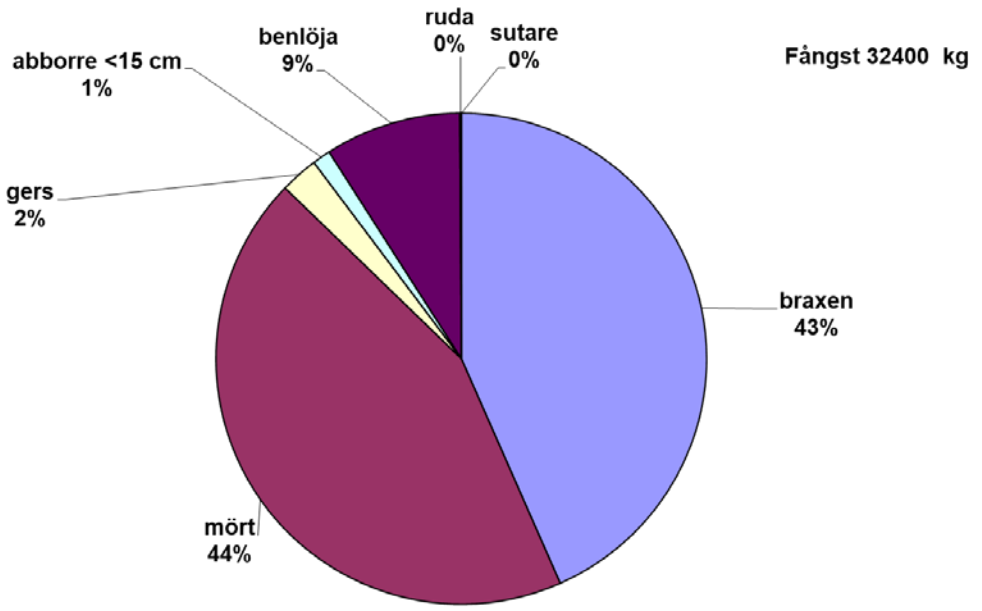


Figure 1. *The composition of catch in the reduction fishing of cyprinids by seining in Lake Nimmern in autumn 2025*

Table 2. A summary of autumn seine fishing at Lake Nimmern in 2017-2025.

Autumn	Date	Water temp C	Secchi depth m	Fishing days numb.	Hauls	Catch kg	Catch/day	Prey-predator ratio
2017	9.-14.10	10→ 9	0,45	6	12	28600	4767	30
2018	23.-31.10	10 → 5	0,95	9	16	43000	4778	14
2019	24.-29.10	10→8	1,2	6	11	7420	1237	8
2020	31.10-1.11	9	2,6	2	3	4000	2000	1
2023	24.-27.9	17→16	0,6	4	8	11500	2875	10
2024	4.-7.10	14→12	0,65	4	8	8300	2075	7
2025	4.-10.11	8-9	1,2	7	13	32400	4629	13
				38	71	135220		
				Alltogether:				
				Catch per area		346	kg/ha	
				Catch per day		3558	kg	
				Catch per haul		1905	kg	
				Fishing cost		0,44	€/kg	
						4,8	kr/kg	
				Removed nutrients from the lake				
				P	1082	kg	(0,8 % of fish fresh weight)	
				N	3381	kg	(2,5 % of fish fresh weight)	

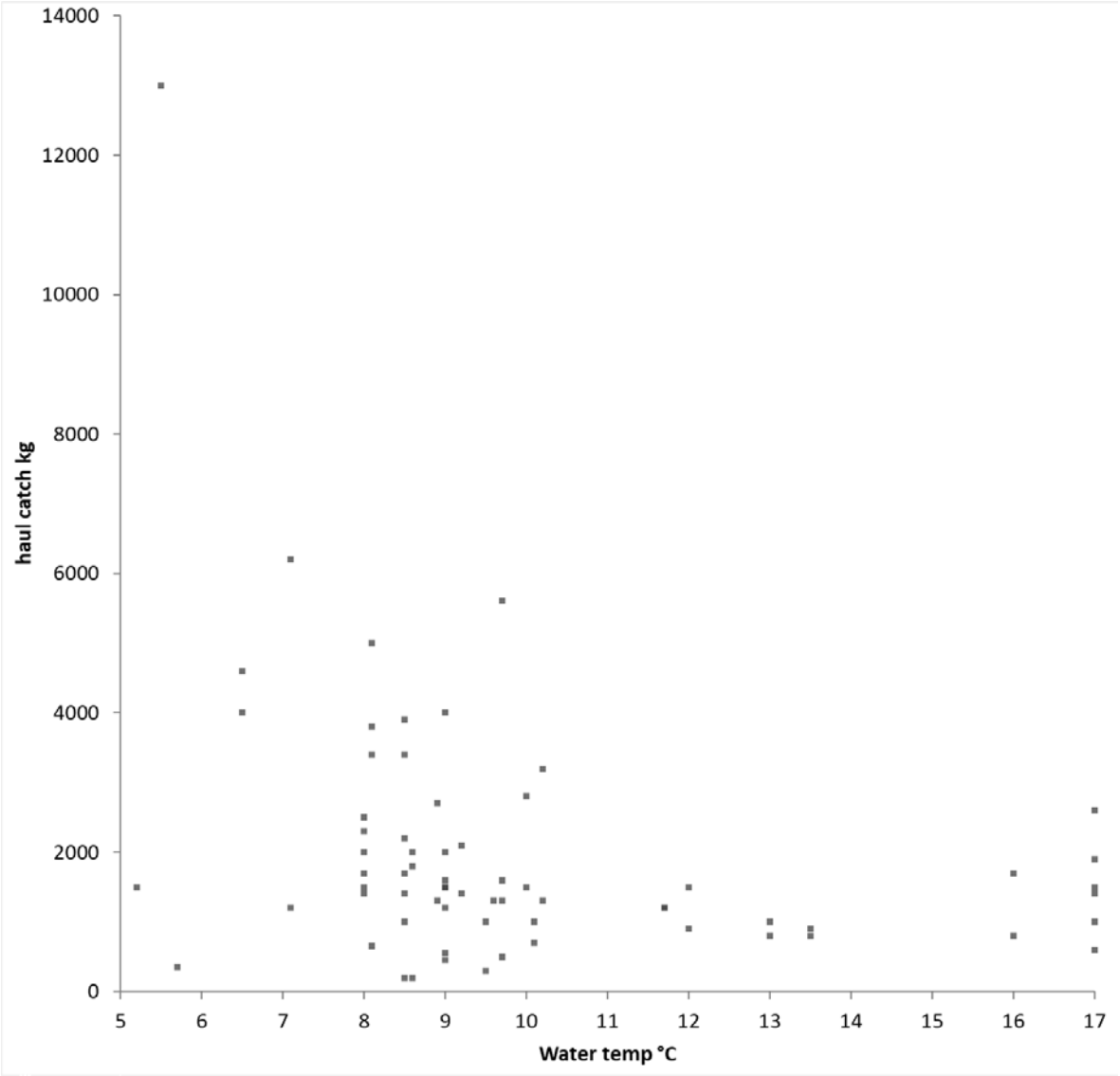


Figure 2. *Seine seine haul catches in different surface water temperatures at Lake Nimmern in autumns 2017-2025..*

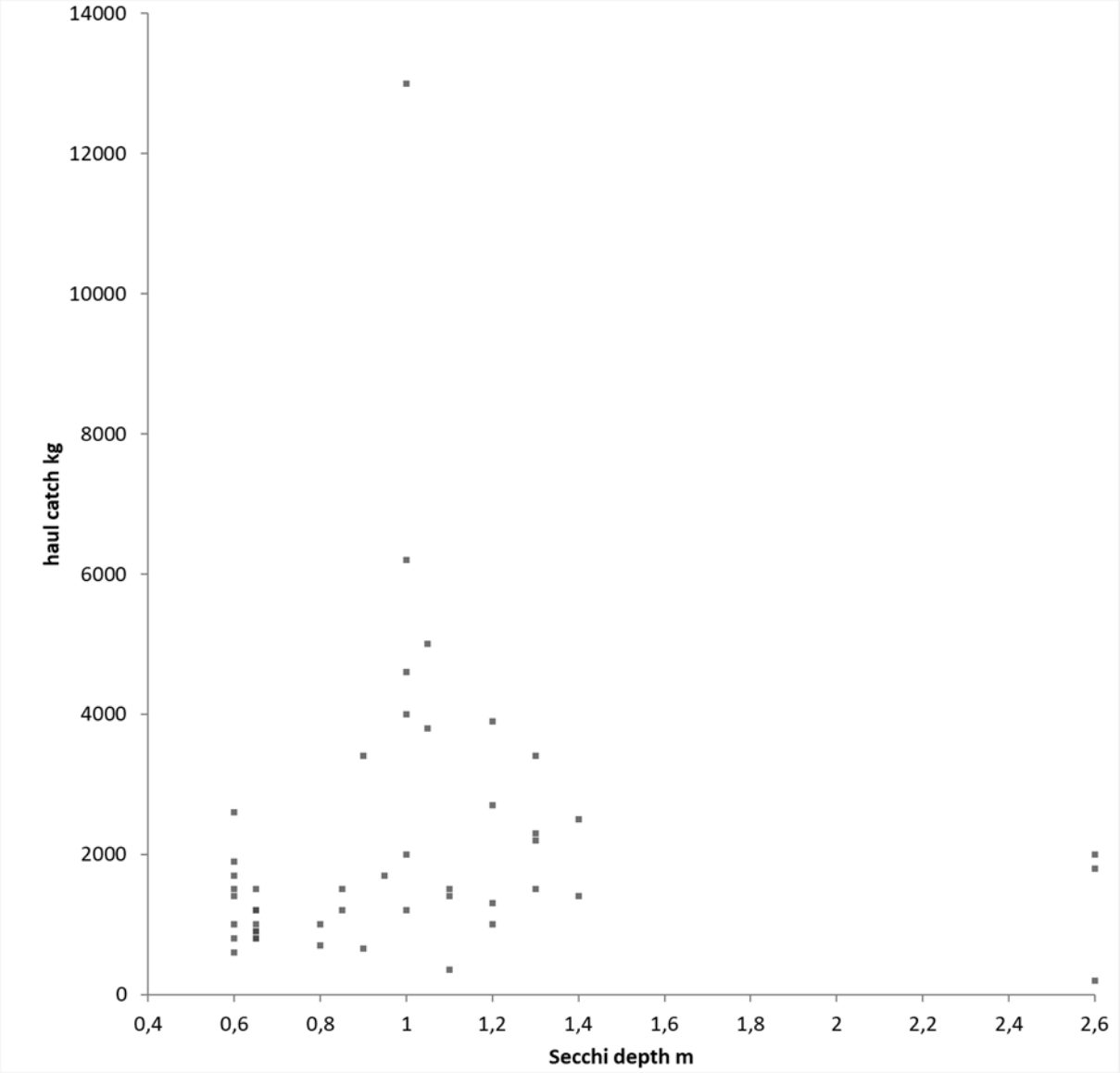


Figure 3. *Seine haul catches in different Secchi depths at Lake Nimmern in autumns 2017-2025.*

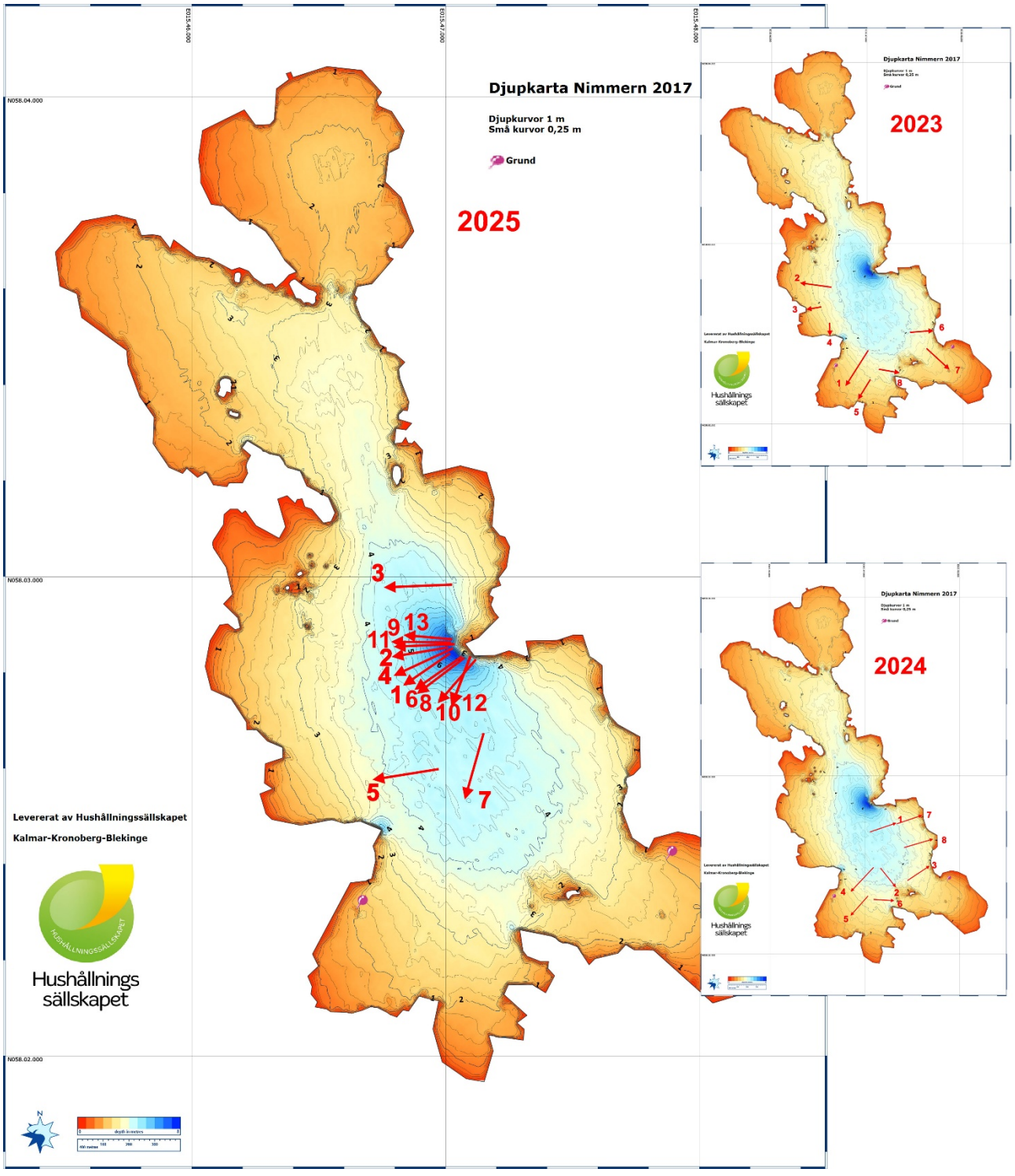


Figure 4. *The locations of seine hauls made in the reduction fishing in Lake Nimmern in autumns 2023, 2024 and 2025. In 2025 Secchi depth was 105…140 cm and water temperature 8…9 °C. The haul locations 2025 are very different to autumns 2023 and 2024 when Secchi depth was 60...65 cm and water temperature 13…17 °C.*