

Reduction of cyprinid fish populations at Lake Nimmern by seine fishing, autumn 2024

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 the 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 directly from the lake along the catches.

The reduction fishing of cyprinids at Lake Nimmern aims to improve the lake's water quality. Earlier 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 marked improvement in late autumn secchi depth from 0,45 (2017) to 2,6 m (2020) and a very strong population of big predatory perch ²⁾. A negative consequence of the improved water clarity was a significant increase in the growth of the invasive water plant *Elodea canadensis* in 2021-22. During 2023-2024 *Elodea canadensis* seems to have "vanished" from the lake as fast as it first invaded it. At the same time the water quality has worsened again and reduction fishing of cyprinids has been re-initiated but with less effort. The aim of the fishing is to:

1. survey the present situation in lake's fish community
2. decrease cyprinid fish populations

In autumn 2023 four days fishing produced a catch of 11500 kg which constituted mainly of small 7-10 cm roach. The fishing was continued now with the same effort.

The fishing method

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. If dark refuge is not available, the fish may also hide to rivers, brooks, even ditches, or to littoral vegetation. 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.

The seining and catches 2024

The four day's seining took place 4th- 7th October and included 8 seine hauls (Fig. 1). The conditions during the fishing were good and all hauls were technically successful. During the period surface water temperature decreased from 13,5 to 11,7 °C. Secchi depth was 0,65 m and water colour slightly green.

The biomanipulation catch in the four days was 8300 kg and consisted mostly of small roach (about 10...13 cm, mört, 62 %), mainly small (< 20 cm) and some big (4-5 kg) bream (braxen 30 %), tench (sutare 4%) and bleak (benlöja 3 %). The average catches per seine haul and per fishing day were 1038 and 2075 kg.

About 1190 kg predatory fishes were released back to the lake in good condition. They consisted mostly of pikeperch (gös 949 ind., 234 kg), perch (abborre 946 ind., 251 kg) and pike (gädda, 390 ind., 736 kg). About

ten pikeperch were 2-4 kg individuals and the rest were 1-3 summer old 6...25 cm individuals. Pikes were mostly 0,5...4 kg. Perch were 0,15...0,5 kg. The prey-predator ratio in the catch was 6,8.

Observations on fish community

Because the water temperature was still high and secchi depth low, fish were seen sparsely in all parts of echo sounded areas. In the deep (>4 m) areas and beside steep littoral cliffs there was commonly seen mid-water shoals of very small one summer old bleak. The species is relatively short-lived and the fishing was focused on other cyprinids. Most of the fish biomass was found at the bottom in 2-4 m deep areas. These areas were the ones that were seined and from where the catch came. All in all, the situation in the lake seemed very similar to autumn 2023:

1. The biomass of cyprinid fishes, and especially big bream and big roach, is markedly less than in the beginning in 2017. The average CPUE (kg/seine haul) has decreased from 2500 to 1000 kg. The catches from autumn shoals tend to be good even though populations of cyprinids would have decreased much more relatively.
2. The prey-predator ratio in the catch is under 10 which is not a best figure (which is about 3-5) but at a satisfactory level. On first two seining years the ratio was 30.
3. The population of big bream is greatly reduced and the survivors are now fat and weigh 4-5 kg. The lack of big bream seems to have given opportunities for tench that has now spread from the shallow vegetation areas to deeper areas of the lake which shows well in seine catches.
4. The year class of roach that was born in the spring 2022 (or 2023, depends on growth speed) is very strong and it has now produced the major part of the 2023 and 2024 seine catches.
5. Also, the bleak year class 2024 is numerous and there has been a lot of zooplankton feeders in the lake during recent summers.
6. The reproduction of bream has not been efficient at all when compared to roach.

After this said, we must emphasize that the autumn seining of cyprinids should not be considered as a flawless sampling method to evaluate lake fish communities in general. The focus in the fishing is on the aggregation areas and shoals of cyprinid fishes. Depending on the time of the year this fishing neglects many species and/or their size-classes. During the early autumn many species and size classes spend their time inside or very near the shallow vegetation zones of the lakes, or in bottom holes, and are therefore most likely underrepresented in the seine catch (e.g. big pike and big perch, tench, rudd, crucian carp, burbot, eel...). In late autumn pikes and specially big pikes move to deeper areas, large herds of mergansers and cormorants may arrive, and vulnerable fish species try to avoid them by any means. This means larger daytime shoals in dark or, if water is clear, moving to other refuges than deep water. For example, in the very special autumn 2020 the seining was done in very clear and cold water and all that was found from seinable areas were large shoals of predatory perch combined with some big roach. Vulnerable cyprinids had most likely searched shelter from littoral vegetation and even predatory perch made large shoals to keep safer from visual predators. Therefore it is problematic to compare seining results that are from different times of autumn and from different circumstances considering Secchi depth and water temperature. The reduction fishing at Nimmern has so far executed in 2017-2020 (four years, all in late autumn and cold water) and in 2023-2024 (two years, early autumn, warmer water). The first four years are somewhat comparable to each other but not with the two last two years.

Conclusions and suggestions

We assume that in the present situation the main problem is not so much the biomass but the numbers of cyprinids. The young bleak age class will vanish naturally in few years but the roach population needs

reduction. Fortunately roach does shoal very intensely when circumstances are right and then its seining is very productive and cost-effective. An optimal time for the next fishing period would then be later in autumn when secchi depth increases to about 1,5 meter. Because the autumns seem to be getting warmer and warmer the right time might now be in late October or even in November.

Thanks!

Thanks again for all the help during the fishing and for the excellent organization and handling of the catch at the shore for Nimmerns Fiskevårdsområdesförening.

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Arto Hautala

Eemeli Koivisto

Fish biologist

Fisheries technician

WWW.VÅRDFISKE.FI

- 1) Target catch (kg) = $16.9 \times (\text{TP ug/l})^{0.52}$. (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) Hautala A and Kiiskilä A 2020: Reduction of cyprinid fish populations at Lake Nimmern by seine fishing, autumn 2023. -Report, 6 pages.

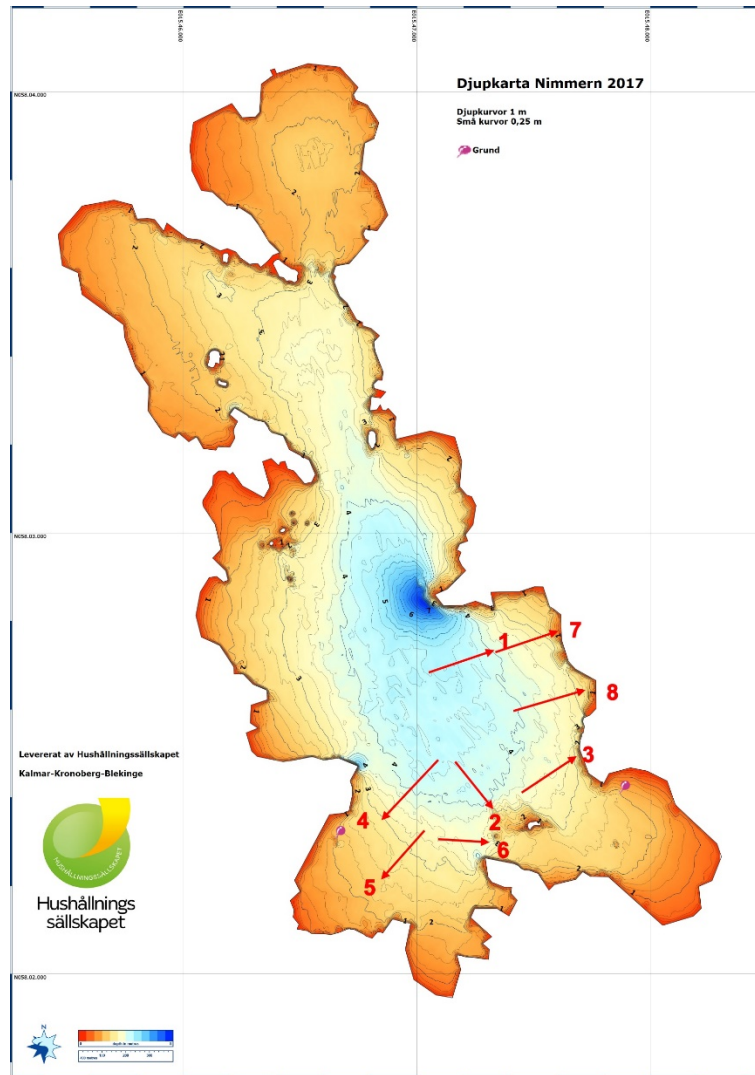


Figure 1. The locations of 8 seine hauls made in the reduction fishing in Lake Nimmern in autumn 2024. The haul locations are very similar to autumn 2023 when fishing was done at about same Secchi depth and water temperature.

Table 1. The hauls and catches in reduction fishing of cyprinids by seining in Lake Nimmern in autumn 2024. An excel file with a more complete fishing diary has been sent separately for the client.

DRAG				FÅNGST kg								ROVFISKAR							
nummer	dag	lengd m	yta ha	braxen	mört	gers	abborre				Biomaniplering	gös		gädda		abborre >15 cm		Rovfiskar	
							<15 cm	benlöja	ruda	sutare		fångst kg	st.	kg ²	st.	kg ³	st.		kg ⁴
1	4.10.2024	250	5	465	270	10	0	25	1	30	800	#	66	66	15	30	14	4	100
2	4.10.2024	240	4,8	340	480	10	0	40	0	30	900	#	288	58	18	36	62	19	112
3	5.10.2024	250	5	250	660	30	0	10	0	50	1000	#	83	25	36	72	157	31	128
4	5.10.2024	290	5,8	600	140	50	0	0	1	9	800	#	140	56	69	138	168	34	228
5	6.10.2024	270	5,4	198	1200	40	1	0	1	60	1500	#	37	7,4	87	174	172	52	233
6	6.10.2024	200	4	130	700	40	0	0	0	30	900	#	34	6,8	76	152	170	51	210
7	7.10.2024	290	5,8	300	800	40	0	0	1	59	1200	#	207	10,4	50	75	109	33	118
8	7.10.2024	280	5,6	180	890	30	1	8	1	90	1200	#	94	4,7	39	59	94	28	91
			41,4	2463	5140	250	2	83	5	358	8300		949	234	390	736	946	251	1221
				30 %	62 %	3 %	0 %	1 %	0 %	4 %	21,2	kg/ha							

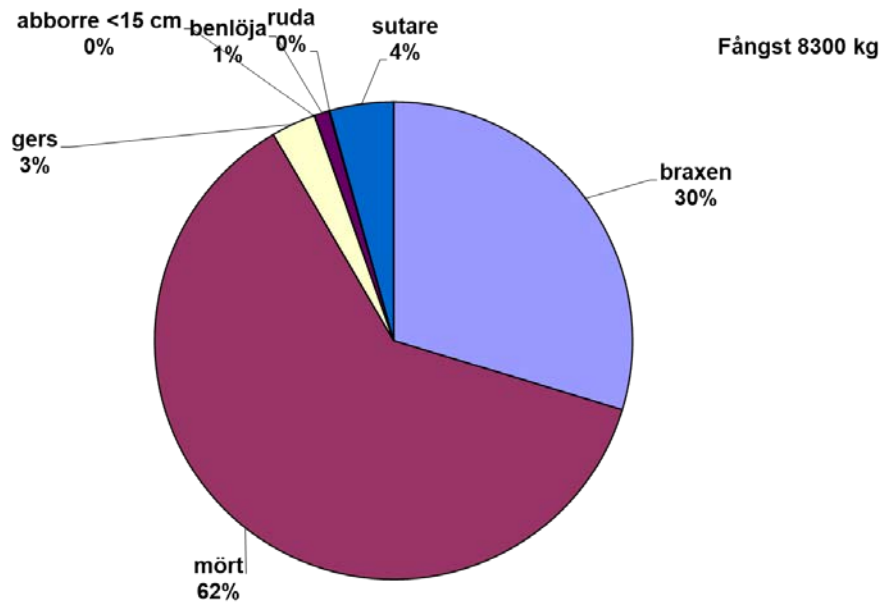


Figure 2. The composition of catch in the reduction fishing of cyprinids by seining in Lake Nimmern in autumn 2023