

Changes in the fish community over 40 years in Lake Tåkern, Sweden

The Aim of this study was to detect changes in the fish community in the shallow Lake Tåkern. Special interest was directed towards the possible establishment of bream (*Abramis brama*) and carp (*Cyprinus carpio*), since one single individual of each had been caught recently. A decline of the low oxygen tolerant species crucian carp (*Carassius carassius*) and tench (*Tinca tinca*) was expected, due to the warmer climate, resulting in fewer events of winter hypoxia.

The methods used for sampling were test-fishing with multi mesh gill nets and Environmental-DNA (eDNA) sampling. Test-fishing was performed in June 2019 ($N = 16$), to compare with the results from test-fishing 40 years earlier. The same locations, dates and type of nets were used. Standardized test-fishing was performed in August 2019 ($N = 24$), to compare the ecological status of the fish community with a national reference system and more specifically with six similar shallow lakes in southern Sweden. eDNA-samples were collected in September 2019 ($N = 6$) for detection of species.



Photo: Anders Hargeby



Photo: Lasse Skog

The Results showed that all the cyprinid species had decreased significantly. The low oxygen tolerant crucian carp decreased with 94 % in number of individuals, compared to the average of 1978 and 1979 together (Fig 1). One bream was caught from test-fishing, and the species was also detected through eDNA-analysis (Fig 2).

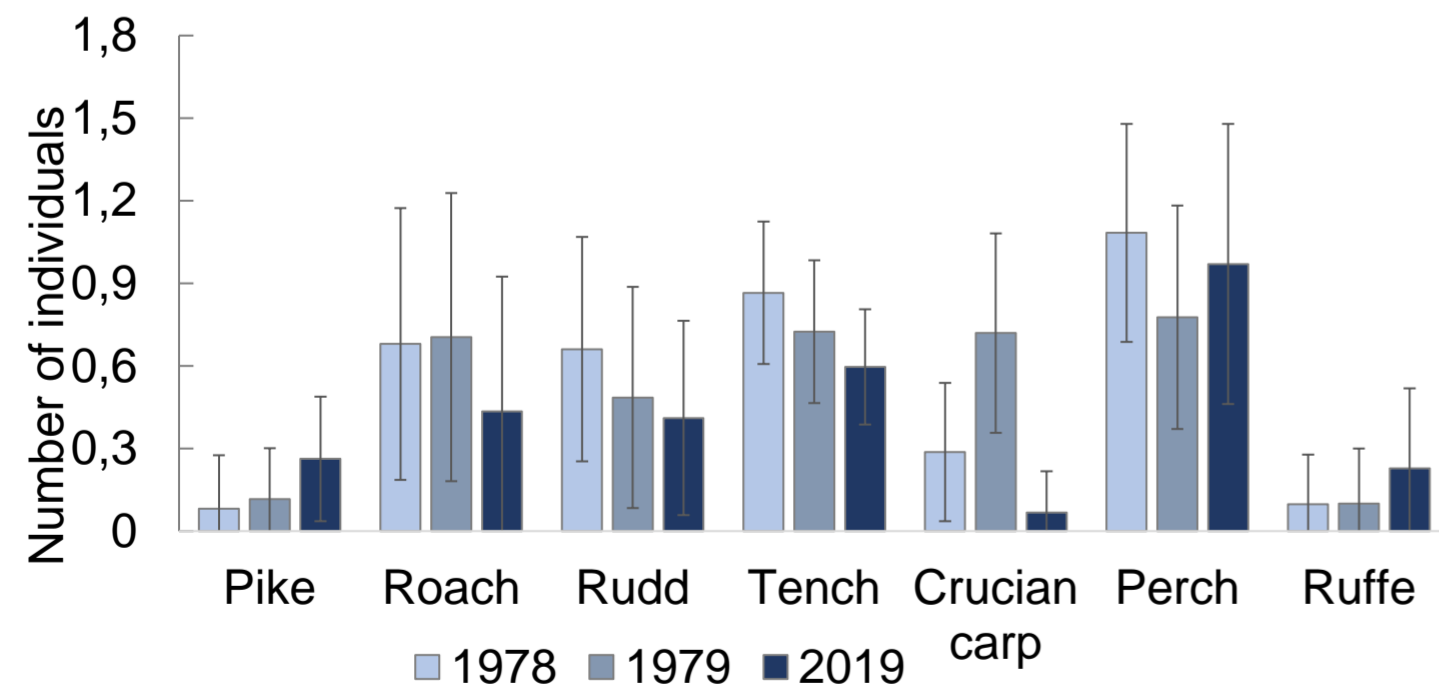


Figure 1. Log number of individuals caught per species and net from test-fishing in June 1978, 1979 and 2019 ($N = 16$). Means + s.d.

Master student: Manfred Skog
Supervisor: Anders Hargeby

The analysis from the eDNA-samples detected 13 species, of which bream, sunbleak (*Leucaspis delineatus*), asp (*Aspius aspius*) and common dace (*Leuciscus leuciscus*)/ide (*Leuciscus idus*), has not been found in the lake during the last 150 years. No carp was detected.

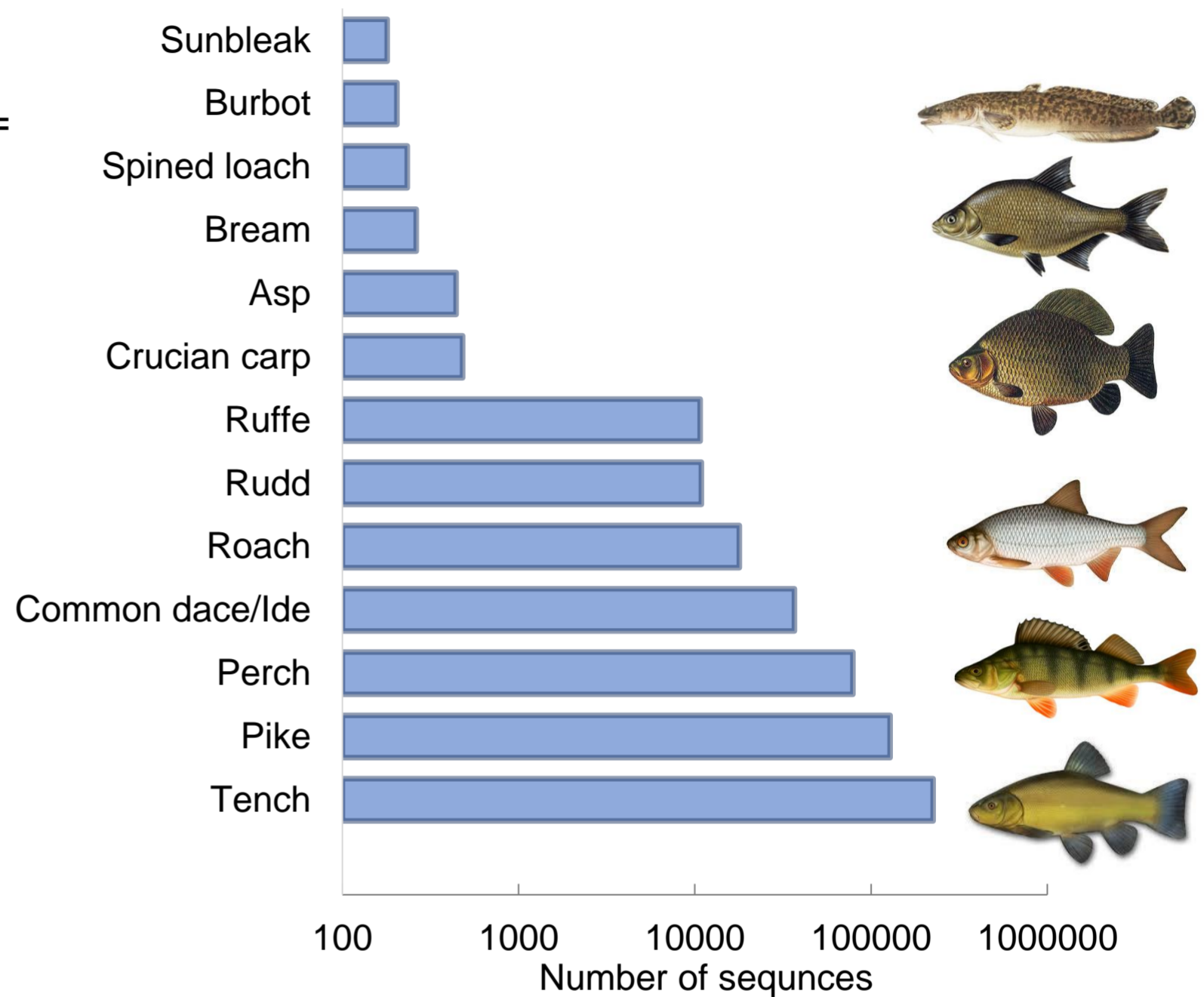


Figure 2. Species detected from eDNA-analysis. Number of sequences displays abundance of each species.

The ecological status of the fish community was classified as intermediate through multimeric indexes but showed a high proportion of piscivore percids contra cyprinids, compared to data from six other shallow lakes in Sweden with similar characteristics (Fig 3).

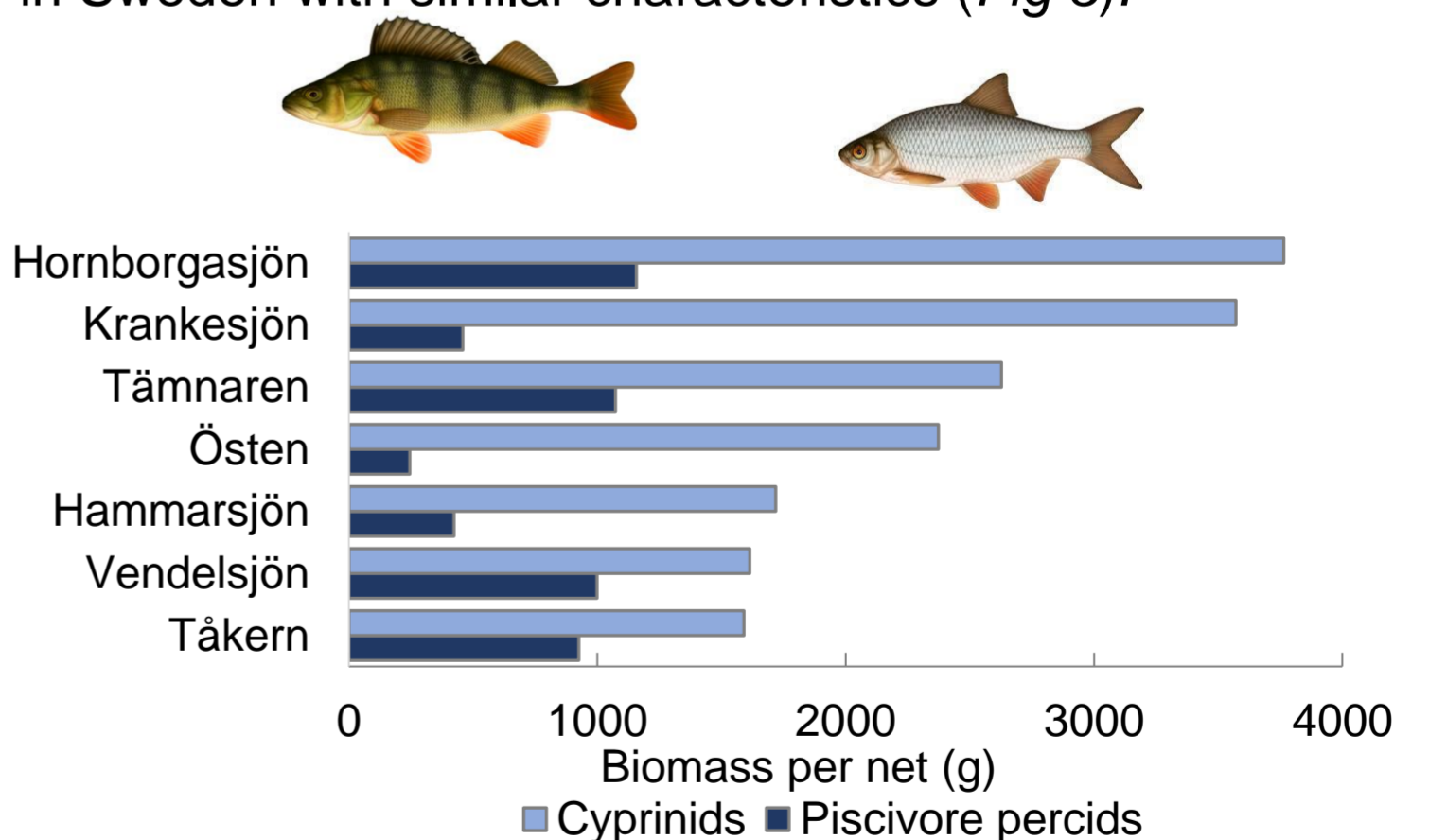


Figure 3. Average biomass per net of piscivore percids and cyprinids in seven shallow lakes in southern Sweden.

The Conclusions were that all cyprinid species had decreased significantly 40 years later. The 94 % decrease in number of crucian carp was most likely an effect from the warmer climate with fewer events of winter hypoxia. The catch and detection of bream confirmed the establishment of a new species in the lake, a species known to increase turbidity and eutrophication in lakes. The fish community in the lake reflected a clear-water state with no obvious indications of shifting towards a turbid state.