

## Klassificering av sjöar och vattendrag

- nordisk jämförelse utifrån svenska bedömningsgrunder



Klassificering av ekologisk status i vattendrag  
enligt EU:s ramdirektiv för vatten  
-en jämförelse av svenska och danska metoder  
A comparison between Swedish and Danish methods  
for classifying ecological status in streams

Examensarbete i miljövetenskap, 15 hp

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LÄNSSTYRELSEN  
UPPSALA LÄN

## **Classification of lakes and running waters –**

### **A nordic comparision on the basis of the swedish classification system**

The aim was to analyze if lakes and running waters with low and relatively high nutrient levels respectively, are classified equivalent in Denmark, Finland and Sweden. If the classification did not agree, the reasons will be clarified.



## Quality elements

LAKES			RUNNING WATERS		
DK	FI	SE	DK	FI	SE
Chl a	Phytoplankton	Phytoplankton	Bentic invertebrates	Diatoms	Diatoms
	Bentic invertebrates	Bentic invertebrates		Bentic invertebrates	Bentic invertebrates
	Chemical elements	Chemical elements		Chemical elements	Chemical elements



## Finland running waters

	Lestijoki	Malisjoki	Sonnanjoki	Yläneenjoki
ARO area (km <sup>2</sup> )	499	377	11	197
Agriculture	3%	20%	1%	29%
Soil	silty clay	silty clay	silty clay	silty clay
P-tot (ug/l)	14	121	4	111
P-ref (ug/l)	10	19	8	18
P-agri (ug/l)	78	78	81	81
P-ref korr (ug/l)	11	23	8	25
Status SE, P-tot	High	Bad	High	Poor
P-ref FI	<20	<20	<15	<40
Status FI	Moderate* (P-tot, N-tot, pH)	Bad (P-tot, N-tot, pH)	High (P-tot, N-tot)	Moderate (P-tot)
IPS Sweden	19,3	15,8	18,5	15,8
IPS Finland	18,8	15,9	18,5	14,8
Diatoms Sweden	High	Good**	High	Good
Diatoms Finland	High	Good**	High	Moderate

\* The classification included both P, N and pH

\*\* P bounded to humic substances and not available as nutrient



## Denmark running waters

P-sampling only during spring – probably higher concentrations in summer

Gomphonema parvulum (nutritious) should probably be Gompgonema olicaceum (low P)

	Karstoft å	Lindenberg å	Sunds å	Kastbjerg å	Fjederholt å	Skibsted å
ARO area (km <sup>2</sup> )	175	50	64	87	100	60
Agriculture	69%	45%	81%	75%	61%	68%
Soil	Sand	Sandy clay loam	Sand	Sandy clay loam	Sand	Sandy loam
P-tot (ug/l)	32	53	19	70	21	22
P-ref (ug/l)	13-20	16-24	14-21	17-27	12-19	15-23
P-agri (ug/l)	23	90	23	90	23	32
P-ref korr (ug/l)	12-14	29-34	12-13	38-40	12-14	16-18
Status P Min	<b>Moderate</b>	<b>Good</b>	<b>Good</b>	<b>Good</b>	<b>Good</b>	<b>Good</b>
Status P Max	<b>Moderate</b>	<b>Good</b>	<b>Good</b>	<b>Good</b>	<b>Good</b>	<b>Good</b>
Diatoms Sweden	<b>Good</b>	<b>Good</b>	<b>Moderate</b>	<b>Poor</b>	-	<b>Moderate</b>



## Lakes Finland

	Kajoonjärvi	Hattujärvi	Viitaanjärvi	Kannusjärvi
Lake area (ha)	552	604	265	165
Max depth (M)	50	9	14	nd
Forest	49%	66%	53%	52%
Water colour (mg Pt/l)	75	156	197	77
P-tot (ug/l)	10	23	64	47
Transparency (mg Pt/l)	2,8	1,5	1	1,1
P-ref (ug/l)	8	14	13	11
Status Sweden, P-tot	High	Good	Bad	Poor
Transparency-ref (m)	3,9	3,5	3,4	3,8
Status Sweden, Transparency	High	Moderate	Poor	Poor
Status Finland (P-tot, N-tot)	High	High	Good	Moderate
Chl a Sweden	High	Good	<Moderate	<Moderate
Status Sweden phytoplankton	Good	High	Moderate	nd
Status Finland phytoplankton	>Good	>Good	<Moderate	<Moderate



## Lakes Denmark

	Damhus sø	Hinge sø	Nors sø	Søby sø	Lading sø	Schousbye sø	Sunds sø
Lake area (ha)	50	90	350	70	45	3,3	124
Max depth (M)	2,4	2,6	19,5	6,5	1,6	2,3	3,3
Agriculture	9%	80%	49%	24%	61%	0%	82%
P-tot (ug/l)	50	138	25	24	155	8	14
Transparency (mg Pt/l)	1,7	0,8	3,8	3,2	0,7	>2	>2,5
P-ref (ug/l)	10-17	10-18	8-14	9-15	11-18	11-18	10-17
Status Min	Poor	Bad	Moderate	Moderate	Bad	High	Good
Status Max	Moderate	Bad	Good	Good	Bad	High	Good
Transparency-ref (m)	3,7-4,4	3,7-4,4	3,7-4,4	3,7-4,4	3,7-4,4	3,7-4,4	3,7-4,4
Status Transparency max	Moderate	Poor	High	High	Bad	Good	Good
Status Transparency max	Moderate	Bad	High	High	Bad	Moderate	Good
Status phytoplankton Sweden	Good*	Bad	Good	High			
Chl a Sweden	High*	Bad	Good	High			
Chl a Denmark	<Moderate	<Moderate	>Good	>Good			

\* Very high variation in biomass, probably due to restauration measures in the lake.



# Bentic invertebrates in lakes

Finland

	Kajoonjärvi	Hattujärvi	Viitaanjärvi	Kannusjärvi
Status Sweden, P-tot	High	Good	Bad	Poor
Status Sweden, Transparency	High	Moderate	Poor	Poor
Status Finland (P-tot, N-tot)	High	High	Good	Moderate
Chl a Sweden	High	Good	<Moderate	<Moderate
Status Sweden phyto	Good	High	Moderate	nd
Status Finland phyto	>Good	>Good	<Moderate	<Moderate
BQI Sweden	High	High	Poor	Poor
EK Finland	High	Good	Moderate	Bad

Denmark

	Damhus sø	Hinge sø	Nors sø	Søby sø	Lading sø	Schousbye sø	Sunds sø
Status P Min	Poor	Bad	Moderate	Moderate	Bad	High	Good
Status P Max	Moderate	Bad	Good	Good	Bad	High	Good
Status Transparency max	Moderate	Poor	High	High	Bad	Good	Good
Status Transparency max	Moderate	Bad	High	High	Bad	Moderate	Good
Status phyto Sweden	Good	Bad	Good	High			
Chl a Sweden	High	Bad	Good	High			
Chl a Denmark	<Moderate	<Moderate	>Good	>Good			
ASPT Sweden		Moderate			Good	High	Good





## Benthic invertebrates in running waters

### Finland

	Lestijoki	Malisjoki	Sonnanjoki	Yläneenjoki
Status, P-tot	High	Bad	High	Poor
Status Finland	Moderate* (P-tot, N-tot, pH)	Bad (P-tot, N-tot, pH)	High (P-tot, N-tot)	Moderate (P-tot)
Diatoms Sweden	High	Good**	High	Good
Diatoms Finland	High	Good**	High	Moderate
ASPT	High	High	High	High
DJ	High	Good	Good	Good
Status FI	High	High	High	nd

### Denmark

	Karstoft å	Lindenberg å	Sunds å	Kastbjerg å	Fjederholt å	Skibsted å
Status P Min	Moderate	Good	Good	Good	Good	Good
Status P Max	Moderate	Good	Good	Good	Good	Good
Diatoms Sweden	Good	Good	Moderate	Poor	-	Moderate
ASPT	High	High	High	High	High	High
DJ	High	High	High	High	High	High
DSFI DK	High	High	High	Moderate	Good	Good



# Summary lakes

lake	phytoplankton Chl a		bentic invertebrates		water chemistry		transparency	one out all out expert judgement expert judgement		
	SE	SE	SE	SE	SE	SE		SE	SE	DK
	Dammhus	GOOD	HIGH	nd	<MODERATE	MODERATE			MODERATE	MODERATE
Hinge	BAD	<MODERATE	MODERATE	BAD	POOR		BAD	BAD	<MODERATE	
Nors	GOOD	GOOD	nd	>GOOD	HIGH		GOOD	GOOD	>GOOD	
Söby	HIGH	HIGH	nd	>GOOD	HIGH		GOOD	GOOD	>GOOD	
Lading	nd	nd	GOOD	BAD	BA )		BAD	BAD	<MODERATE	
Schousbye	nd	nd	HIGH	HIGH	>GOOD		GOOD	GOOD	>GOOD	
Sunds	nd	nd	GOOD	GOOD	GOOD		GOOD	GOOD	>GOOD	

	phytoplankton		Chl a		benthic invertebrates		water chemistry		transparency	one out all out expert judgement		
	SE	FI	SE	SE	FI	SE	FI	SE		SE	FI	
	Kajoonjärvi	GOOD	>GOOD	HIGH	HIGH	HIGH	HIGH	HIGH		HIGH	GOOD	HIGH
Hattujärvi	HIGH	>GOOD	GOOD	HIGH	GOOD	GOOD	HIGH	MODERATE	MODERATE	GOOD	GOOD	
Viitaanjärvi	MODERATE	<MODERATE	<MODERATE	POOR	MODERATE	BAD	GOOD	POOR	BAD	POOR	MODERATE	
Kannusjärvi	nd	nd	<MODERATE	POOR	BAD	POOR	MODERATE	POOR	POOR	POOR	MODERATE	



## Summary running waters

stream	diatoms		bentic invertebrates		water chemistry		one out all out	expert judgement	
	SE		SE		SE	DK		SE	SE
Karstoft å	GOOD		HIGH		MODERATE	HIGH	MODERATE	GOOD	HIGH
Lindenberg å	GOOD		HIGH		GOOD	HIGH	GOOD	GOOD	HIGH
Sunds å	MODERATE		HIGH		GOOD	HIGH	MODERATE	GOOD	HIGH
Kastbjerg å	POOR		HIGH		GOOD	MODERATE	POOR	MODERATE	MODERATE
Fjederholt å	nd		HIGH		GOOD	GOOD	GOOD	GOOD	GOOD
Skibsted å	MODERATE		HIGH		GOOD	GOOD	MODERATE	GOOD	GOOD

stream	diatoms		bentic invertebrates		water chemistry		one out all out	expert judgement	
	SE	FI	SE	FI	SE	FI		SE	SE
Lestijoki	HIGH	HIGH	HIGH	HIGH	GOOD	MODERATE	GOOD	GOOD	GOOD
Malisjoki	GOOD	GOOD	HIGH	HIGH	BAD	BAD	BAD	BAD	BAD
Sonnanjoki	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH
Yläneenjoki	GOOD	MODERATE	HIGH	nd	POOR	MODERATE	POOR	MODERATE	MODERATE



## Summary

Data does not meet the requirements in the methods – sampling frequency, date of sampling etc

Different biological quality elements give different status classification which probably is an effect of different response to different environmental pressure

Benthic invertebrates almost always give highest ecological status

The Swedish, the Finnish and the Danish classification systems always give similar status (in this investigation!) regarding the critical limit good – moderate, which also is the limit for measures and program for measures

Expert judgement is important as complement even if you have data and methods!

Thanks to DMU and SYKE!



# A comparison between Swedish and Danish methods for classifying ecological status in streams

Gro Runeman

Methods for classification of ecological status in streams according to the EU Water Framework Directive. The systems used in Sweden and Denmark was compared to determine whether they result in the same levels of classification.

Sweden: Fish, diatoms, benthic invertebrates

Denmark: Benthic invertebrates



## Comparison between fish, diatoms and benthic invertebrates in running waters in southern Sweden.

Swedish and danish classification system for benthic invertebrates.

	fish	diatoms	ecostat one out out	DJ bentic SE	DVFI bentic DK	
Julebodaån	GOOD	nd	GOOD	HIGH	HIGH	HIGH
Verkaån	GOOD	GOOD	GOOD	HIGH	HIGH	HIGH
Ybbarpsån	POOR	nd	POOR	HIGH	GOOD	MODERATE
Råån	MODERATE	nd	MODERATE	HIGH	MODERATE	GOOD
Saxån	POOR	MODERATE	POOR	HIGH	GOOD	GOOD
Braån	POOR	MODERATE	POOR	HIGH	GOOD	GOOD
Sege å	BAD	nd	BAD	HIGH	GOOD	MODERATE

Her conclusion is that

The Danish classifications were generally higher than the overall Swedish ones.

There were considerable variations between the different factors used for the Swedish assessments, and the Swedish classifications of macroinvertebrates were always higher than the Danish.

The assessments of macroinvertebrates according to both Swedish and Danish methods generally resulted in high status classifications, while the classifications of fish and diatoms showed higher variability between streams.

A main problem when using and comparing the classification systems today is that there is a considerable lack of data from many streams.



**Thank you for your attention**

