UPDATED FINNISH LAKE ASSESSMENT METHOD AND THE CLASSIFICATION RESULTS OF NGIG DATABASE

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Finnish fish-based assessment method, EQR4

… is based on lake types and reference lakes

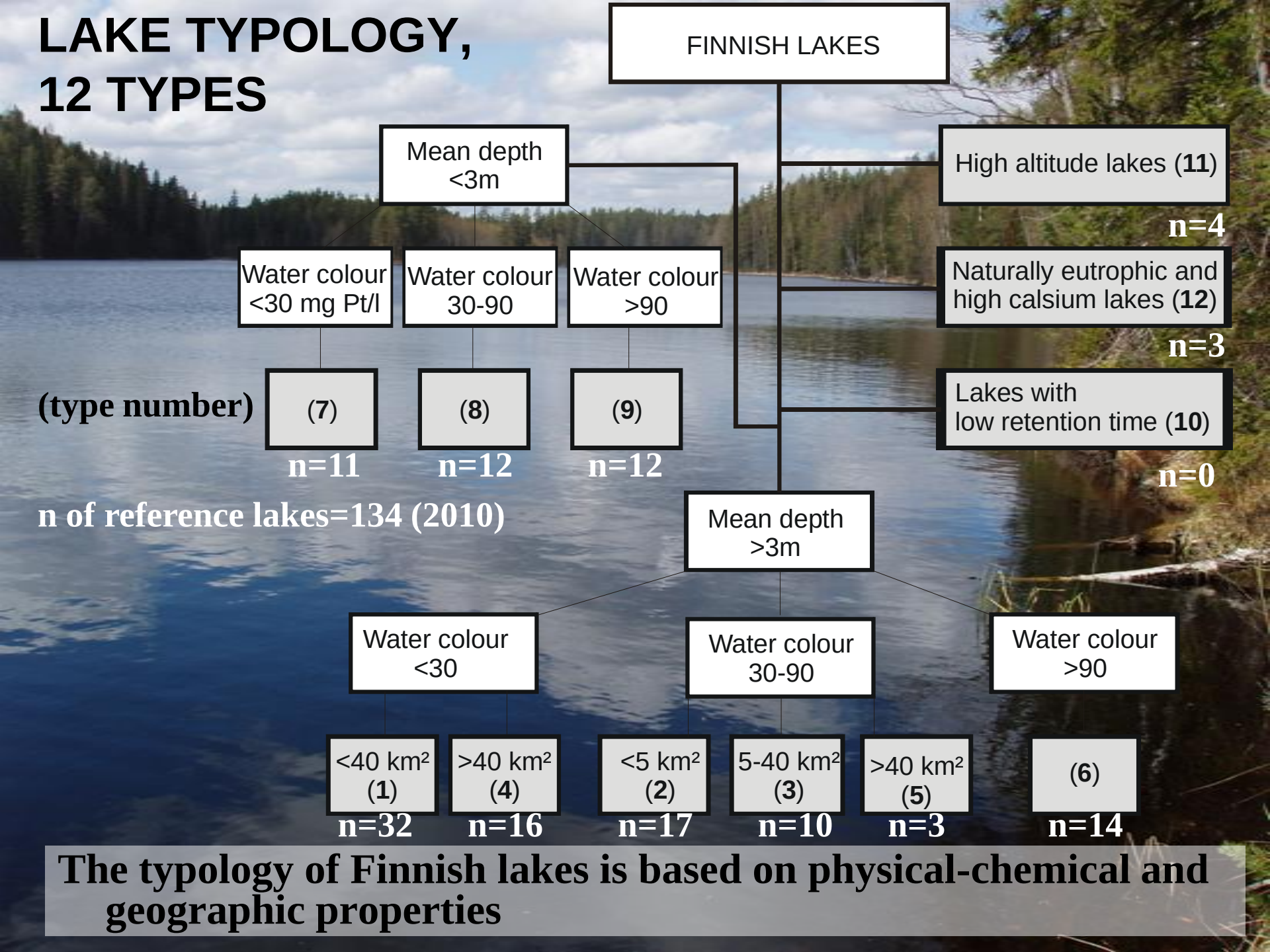
… is average of four variables (BPUE, NPUE, Cyprinid% and indicator species)

… has reference values and class boundaries calculated from type-specific reference lakes (except indicator species)

…has data from standard gillnetting

… is targeted at eutrophication pressure

LAKE TYPOLOGY, 12 TYPES

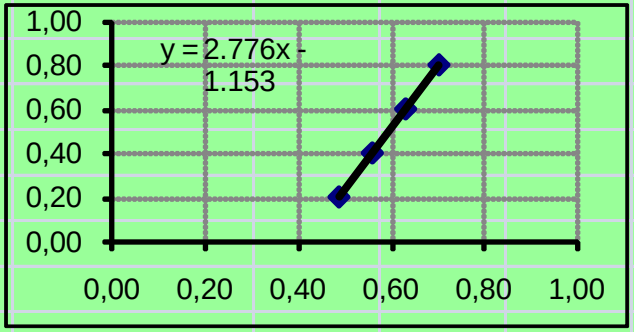


The typology of Finnish lakes is based on physical-chemical and geographic properties

CYPRINIDS %, type-spesific RVs and boundaries

TYPE 6: HIGHLY HUMIC REFERENCE LAKES (n=14)

Reference lakes	Cyprinids (biom.%)	Ref. value (median)	EQR (ref./obs.)	25th percentile	ref./max. obs.	Class boundaries H/G	G/M	M/P	P/B
Ekojärvi	53.028	33.795	0.637	0.704	0.415	**0.704**	**0.632**	**0.559**	**0.487**
Haarajärvi	48.971	33.795	0.690						
Harkkojärvi	35.555	33.795	0.950			Given as biom.%:	48.0	53.5	60.4	69.3
Iso Hanhijärvi	21.469	33.795	1.574						
Iso Ruuhijärvi	57.808	33.795	0.585			Normalising EQR into scale *0-1.0* :			
Itäjärvi	17.168	33.795	1.968						
Lapinjärvi	12.034	33.795	2.808			$EQR_{normalised}$=	2.776	*EQR	-1.153
Majalampi	38.072	33.795	0.888						
Niettaanselkä	26.328	33.795	1.284						
Pakkaselanjärvi	65.251	33.795	0.518						
Pitkäniemenjärvi	17.498	33.795	1.931						
Savijärvi	32.034	33.795	1.055						
Ähtärinjärvi	45.426	33.795	0.744						
Älänne	22.709	33.795	1.488						



- similarly: BPUE and NPUE (2-tailed: EQR=ref./obs. or obs./ref.)

INDICATOR SPECIES, expert judgement

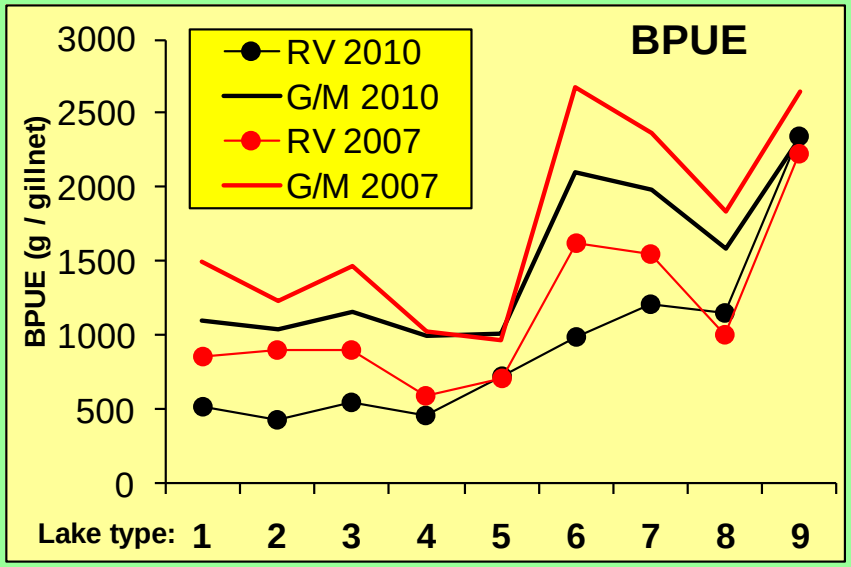
EQR	Criteria, >200 ha lakes	Criteria, <200 ha lakes
0.8	Natural population: *S. alpinus, C. lavaretus, P. phoxinus, B. barbatula, T. quadricornis* >1 species -> 0.05 extra points for each	As in >200 ha lakes
0.6	Natural population: *L. lota, S. trutta, C. albula, T. thymallus, C. gobio, C. poecilopus, P. pungitius* >1 species -> 0.05 extra points for each	Normal population structure of *P. fluviatilis, E. lucius* and/or *R. rutilus*
0.4	Normal population structure of *P. fluviatilis, E. lucius* and/or *R. rutilus*	Abnormal population structure of *P. fluviatilis, E. lucius* and/or *R. rutilus*
0.1	Abnormal population structure of *P. fluviatilis, E. lucius* and/or *R. rutilus*	Very abnormal population structure of *P. fluviatilis, E. lucius* and/or *R. rutilus*

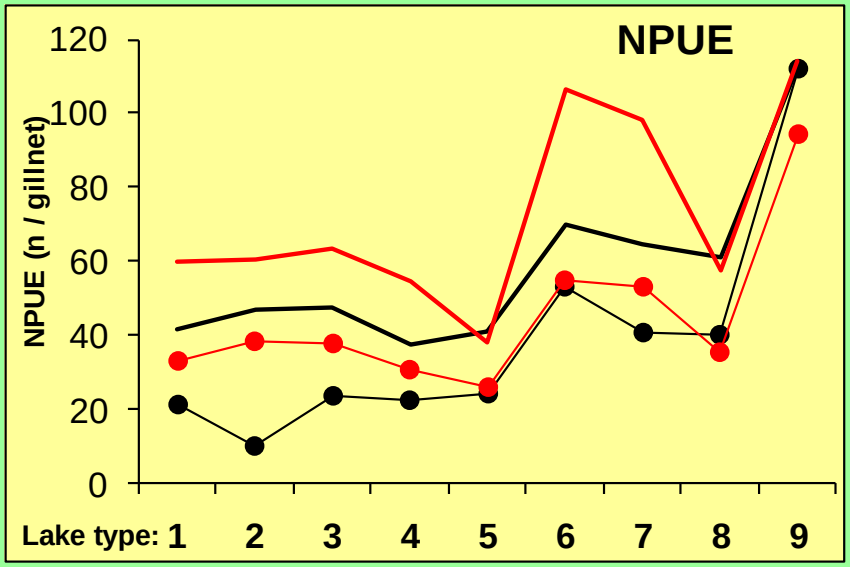
- documented extinction of indicator species reduce EQR.
- stocking does not increase EQR

The updating of Finnish assessment method

- Updating before intercalibration, autumn 2010
- More reference data 97->127 (11-32 / type, types 1-9)
- Tighter reference criteria (some earlier R-lakes were excluded: <10 ha, prev. acid., uncertain)
- Lake type nat. eutr. -> G/M -boundary according to phosphorus classification (benchmarking)
- Only cyprinid species that benefit from eutrophication were included in Cyprinid%

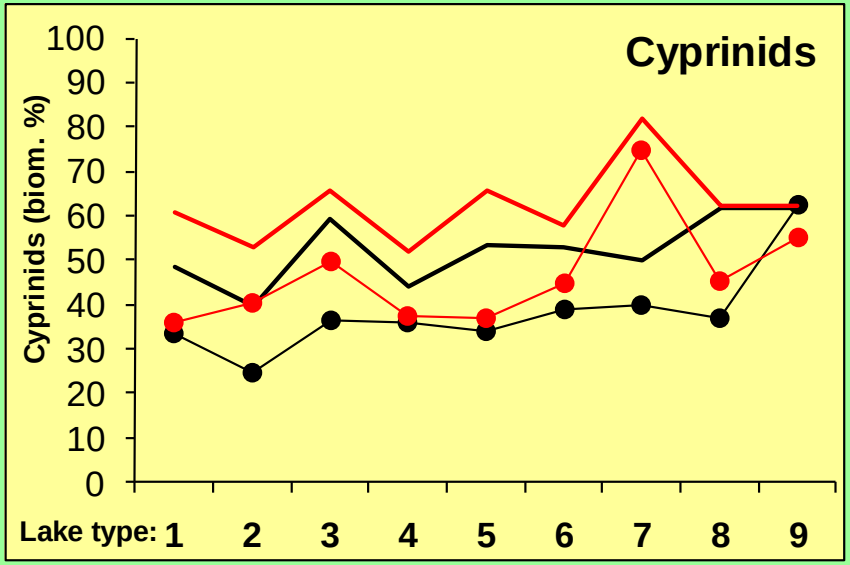
The updating of Finnish assessment method





New G/M class boundary (for high catches) is tighter:

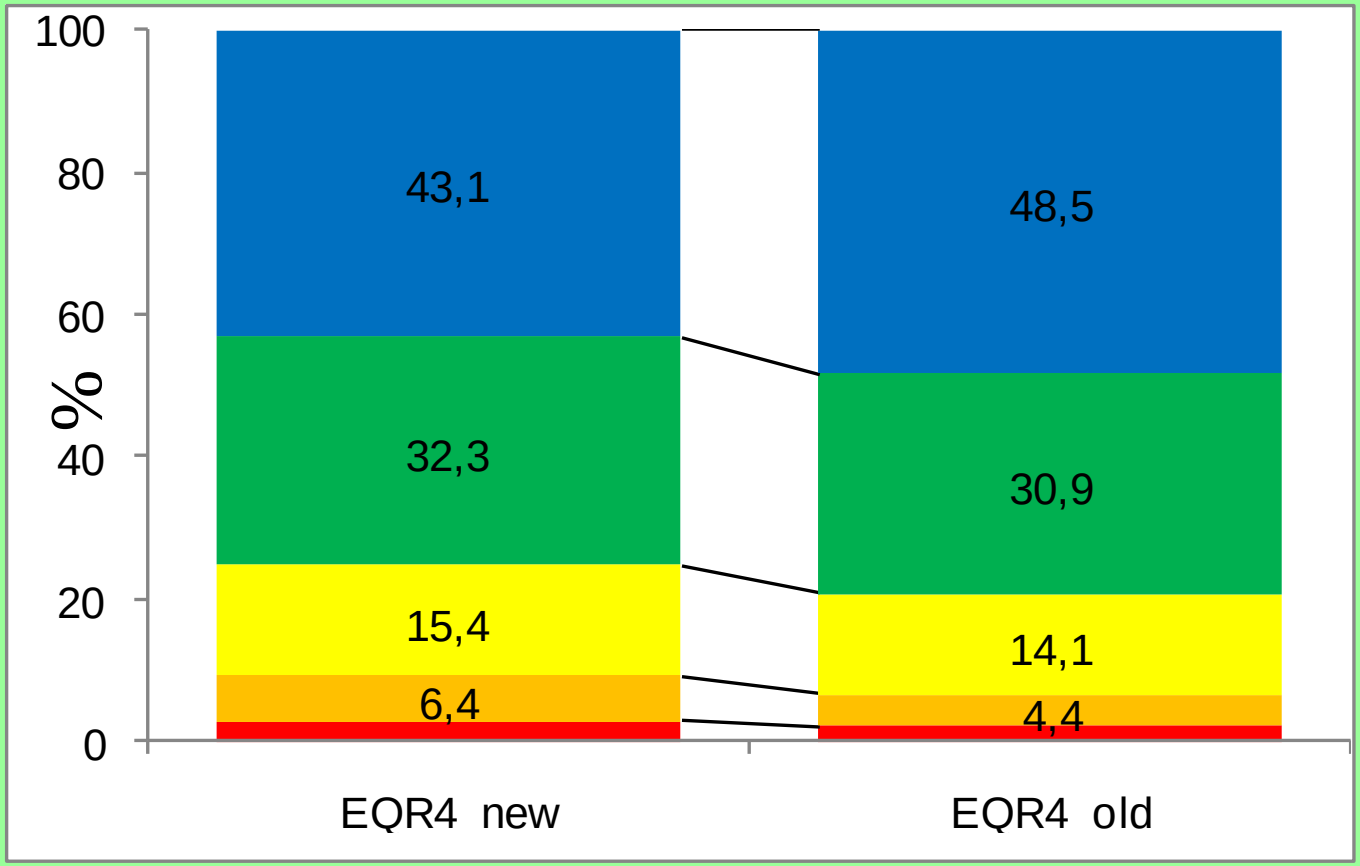
- BPUE: 13.9% (-4 - 27%)
- NPUE: 18.2% (-8 - 34%)
- Cyprinids: 15.4% (0 - 39%)



Classification by updated Finnish assessment method (NGIG database)

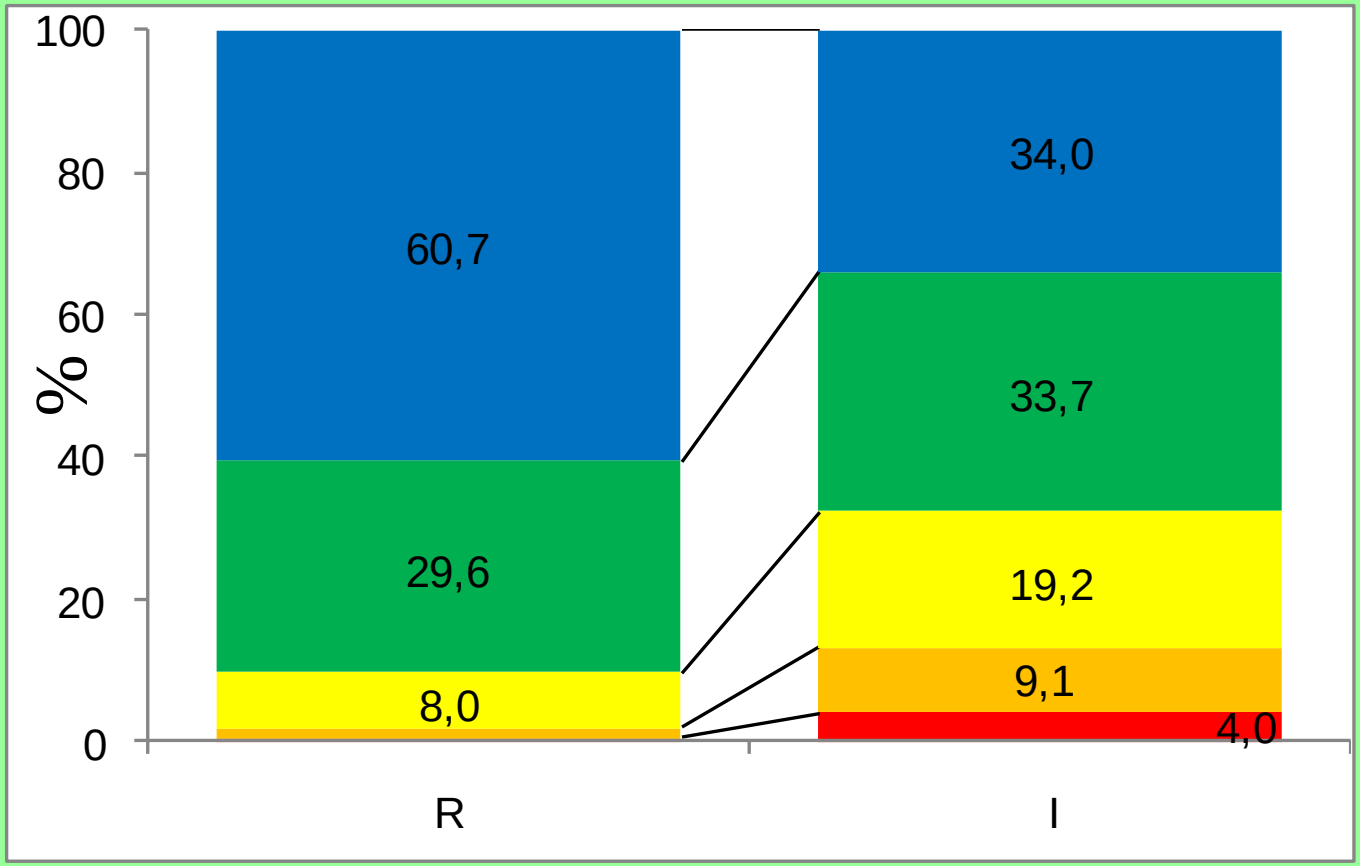
- 1508 out of 2476 cases (lake campaigns) were classified
- 968 non-classified cases were Swedish lakes without water colour information
- 221 cases were typified as high altitude lakes. The type has no class boundaries -> were classified according to nearest lake type (unreliable results)

Classification by updated and ”old” Finnish assessment methods



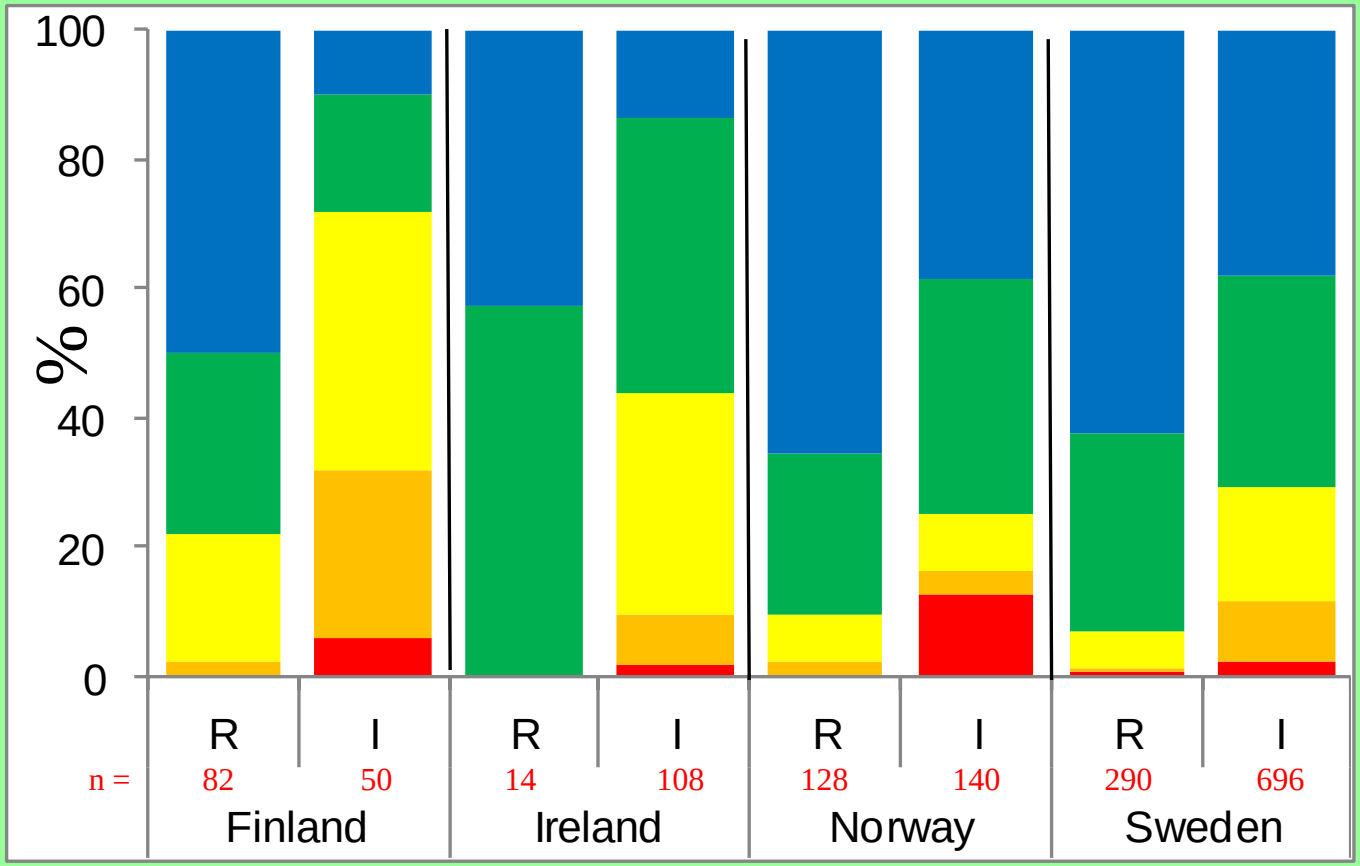
Updated classification result is slightly tighter

Classification by updated Finnish assessment method, R and I lakes



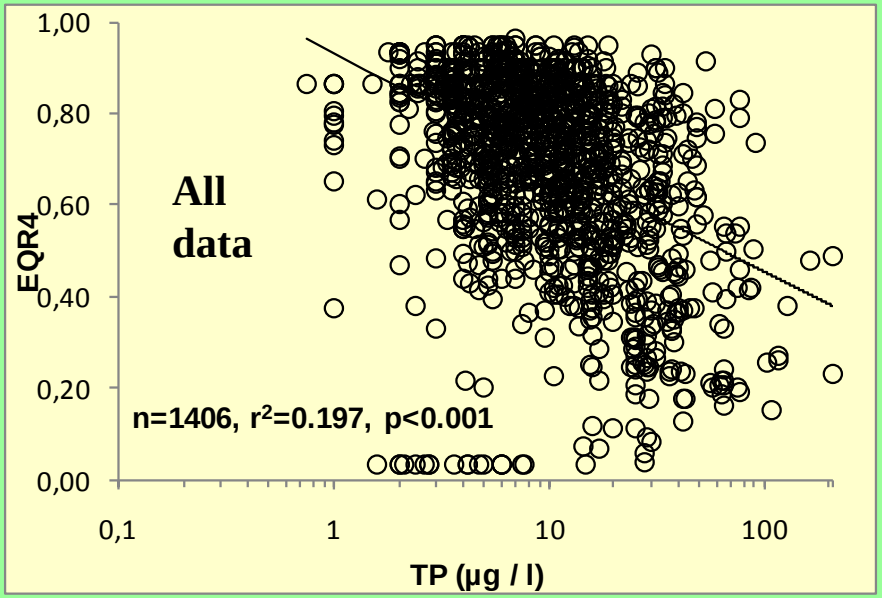
<10 % of R cases and >30% of I cases in <G class

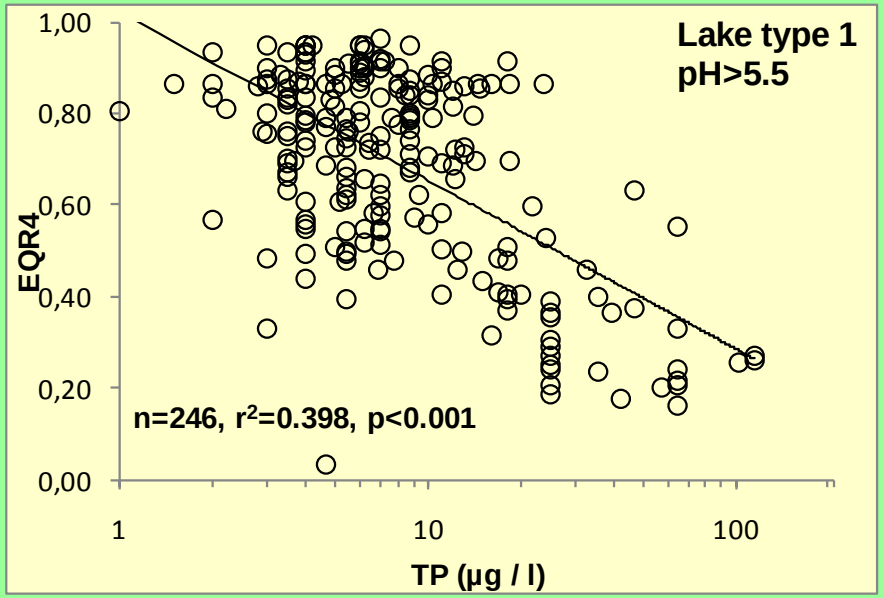
Classification by updated Finnish assessment method, R and I lakes of MSs

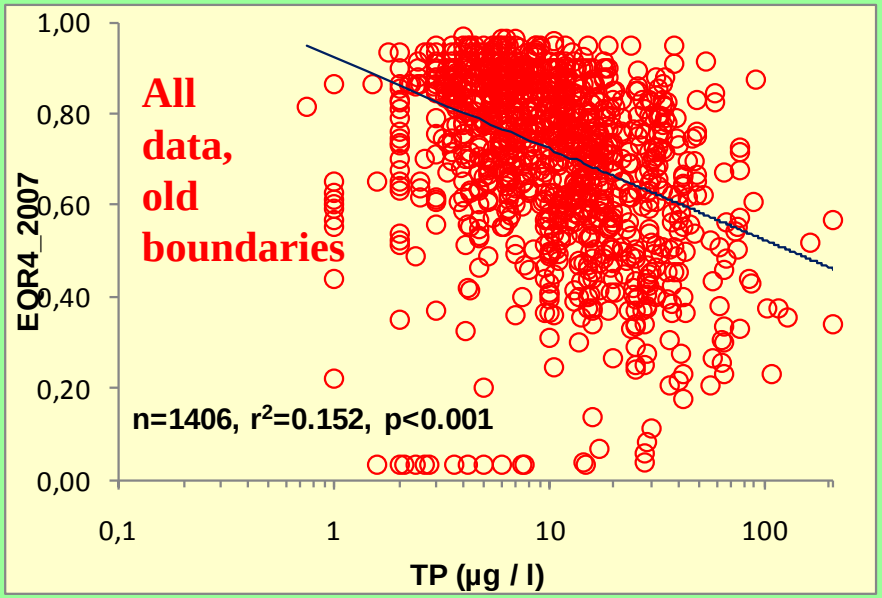


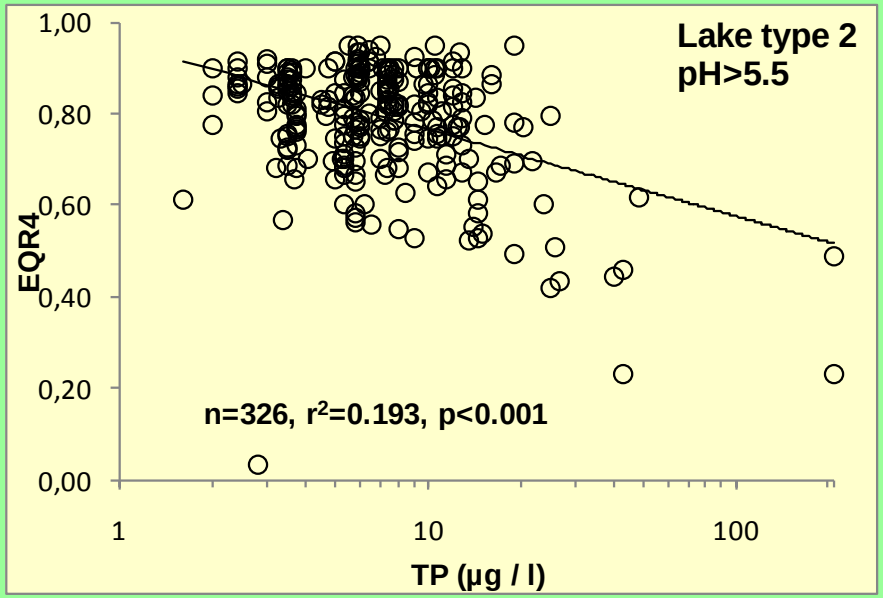
- I lakes had lowest classification in Finland
- Highest classification of R lakes in Ireland
- High classification of I lakes in Norway and Sweden

Pressure-impact (TP) in Finnish method

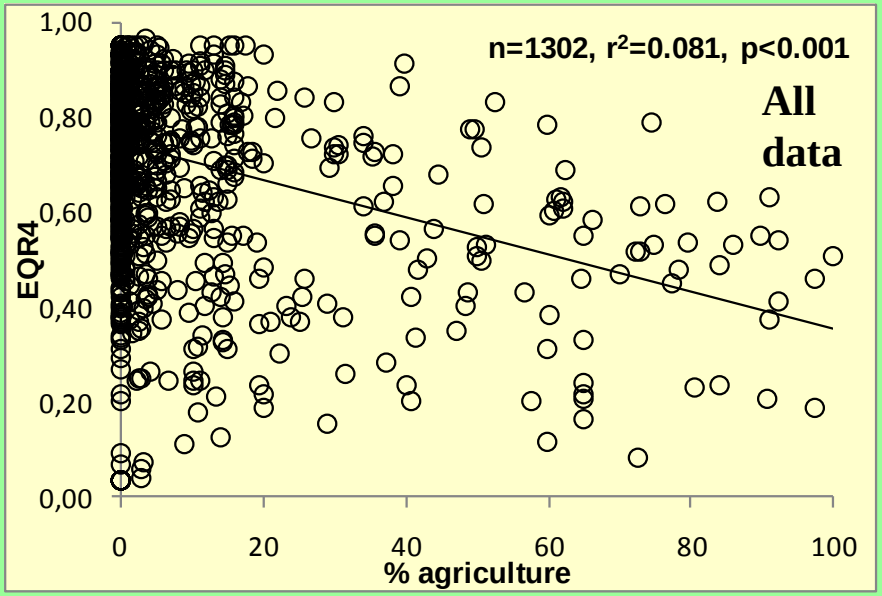


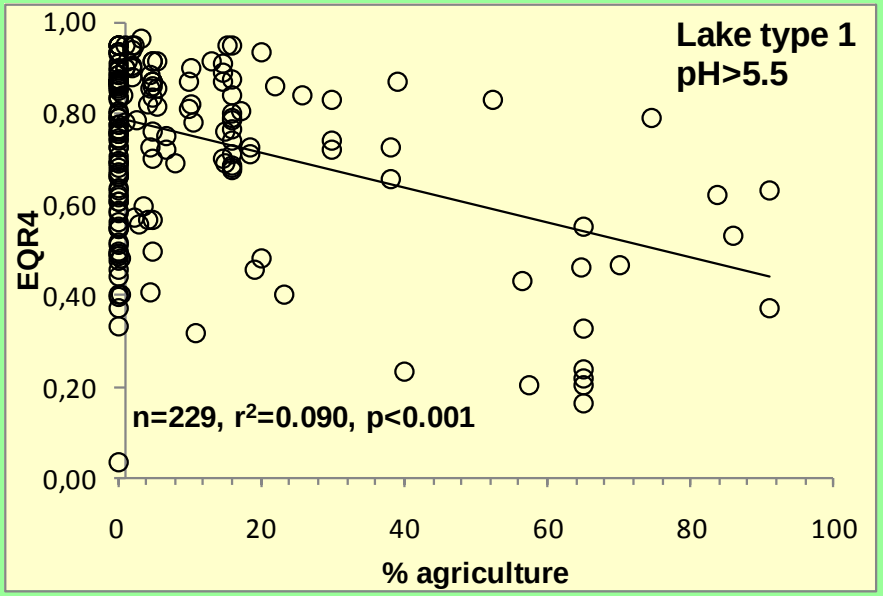


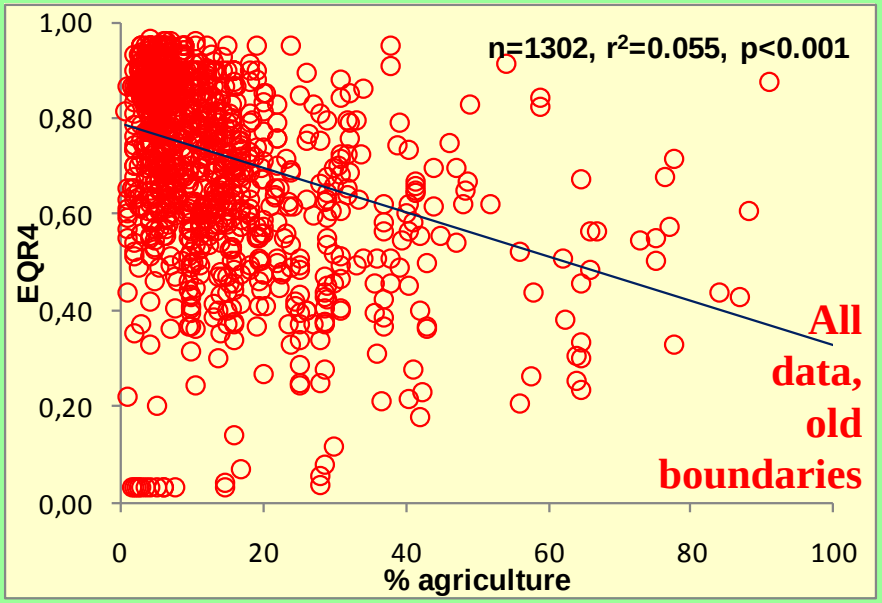


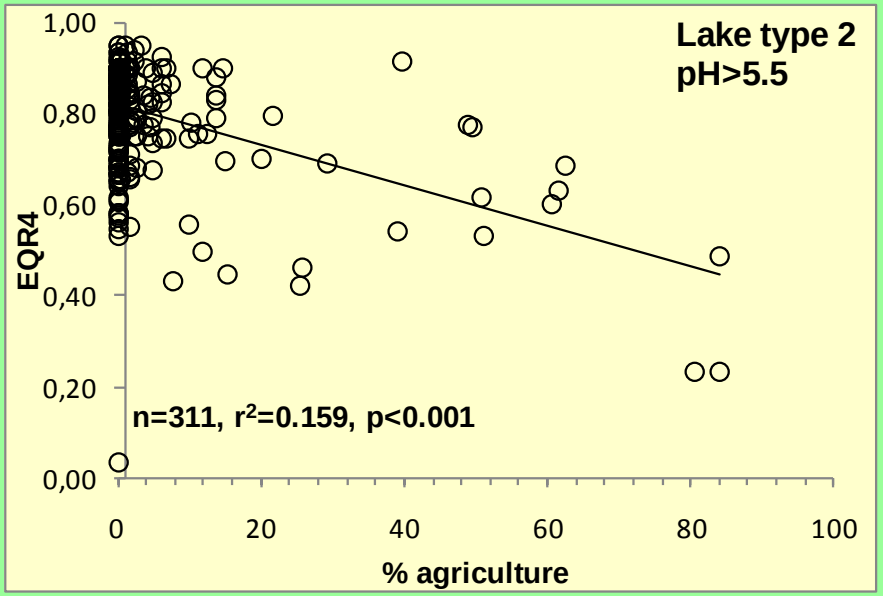


Pressure-impact (% agriculture) in Finnish method









Discussion

- Updated Finnish system has tighter class boundaries but only slight difference can be seen in NGIG-data
- Ireland and Finland included lakes with clearer eutrophication symptoms compared to Norway and Sweden (acidification, liming) Different pressures -> variation in classification
- Clear difference between R and I lakes, but >60% impacted lakes are classified as G or H -> acidified and limed lakes. Risk of errorneous classification of R lakes is low (<G, <10%)
- Significant and improved relation to eutrophication pressure measured as TP or % agriculture. But, high variation. Different lakes respond differently to eutrophication? Reliability of pressure (agri%) information? Variation was smaller in single lake types and low pH lake excluded
- We should not include the whole NGIG data set if we want to do IC with eutrophication pressure: only R lakes and eutrophicated lakes, IC lake types