FRESHWATER CENTRE

Biomonitoring: sampling procedures collection , processing, analysis interpretation

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UNDP/GEF Kura Aras project &
SYKE/NEA Georgia water project joint
Scientific training
Tbilisi 27-30.3.2012

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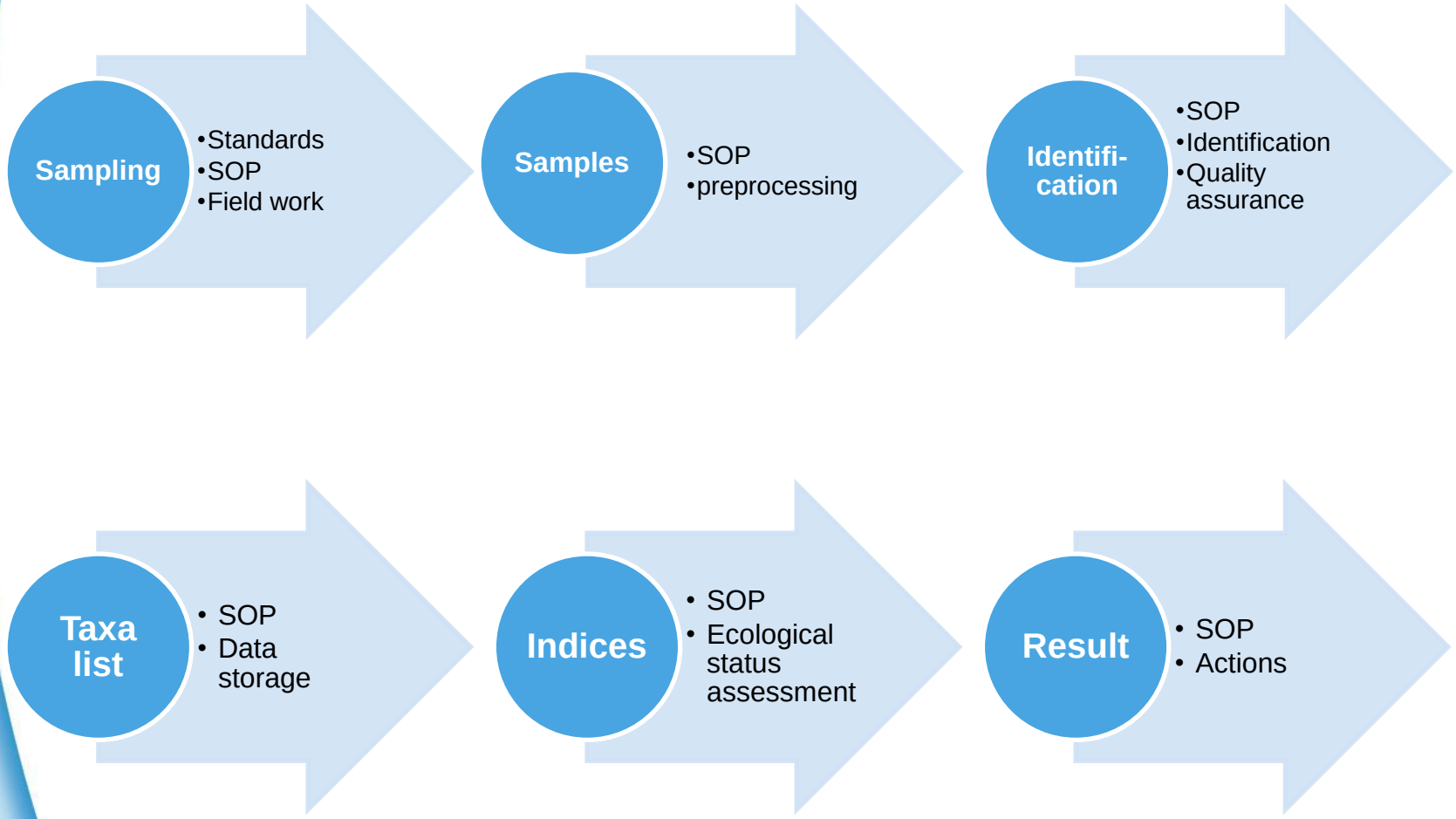
Workflow in biomonitoring



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Macroinvertebrate sampling in freshwaters

Methods and results vary with approach taken

- Qualitative methods
  - not related to volume or area
    - Kicknet without time or area, collections, biodiversity inventories
- Semiquantitative
  - Area or volume more or less loosely specified
    - **Kicknetting according to SOP (1m , 20/ 30sec)**
- Quantitative
  - Exactly specified sample area or volume
    - Surber sampling (0,3 x 0,3 m)
    - **Ekman**

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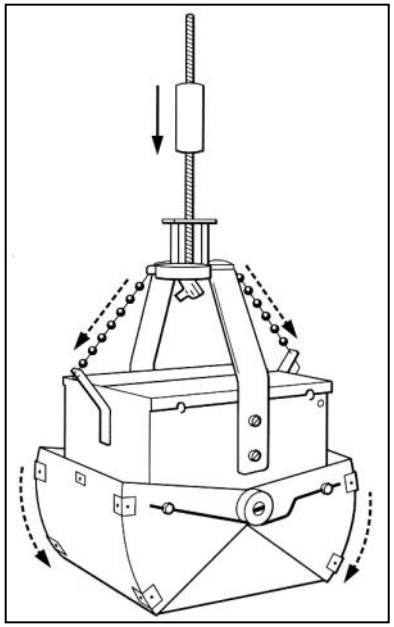
Sampling the lake profundal

- Requires deep lakes (>10m max.depth)
- For shallower lakes results are not reliable
  - littoral and sublittoral species
- Replicate samples are needed (6 samples)
  - In boreal oligotrophic lakes up to 10 samples



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Before going to the field

If depth maps of lakes are available

- determine the coordinates of the deepest point in the lake
- Fill in the field sheet as far as possible
- Make sure you have all equipment
- Inform colleagues where you are going
- Work in pairs

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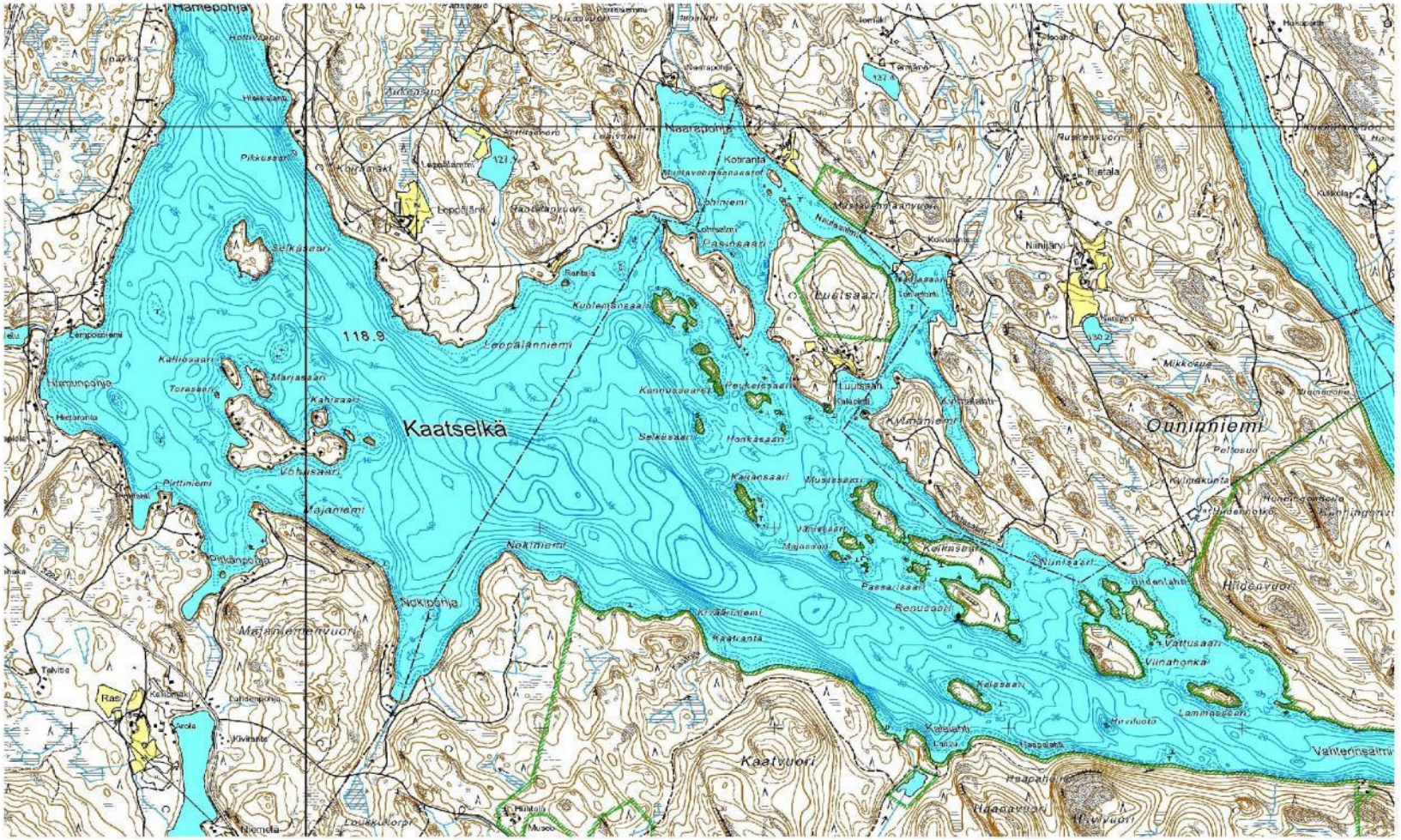

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At the lake (profundal)

1. Use personal floating devices
2. Locate the coordinates of the deepest part (GPS or map)
3. Check accuracy with depth probe
4. Move upwind to about 90% maximum depth and anchor
5. Take a water sample
6. Take your first Ekman sample at the anchoring site from the rear of the boat
    1. Arm the Ekman
    2. Using the 1m interval marks on your Ekman cable, lower the grab to depth-1m
    3. Stop the grab and wait for 30sec
    4. Fully release the cable
    5. Let the grab sink and drop the weight
    6. Slowly lift the sample
    7. Make sure the grab shut tightly and sample is ok

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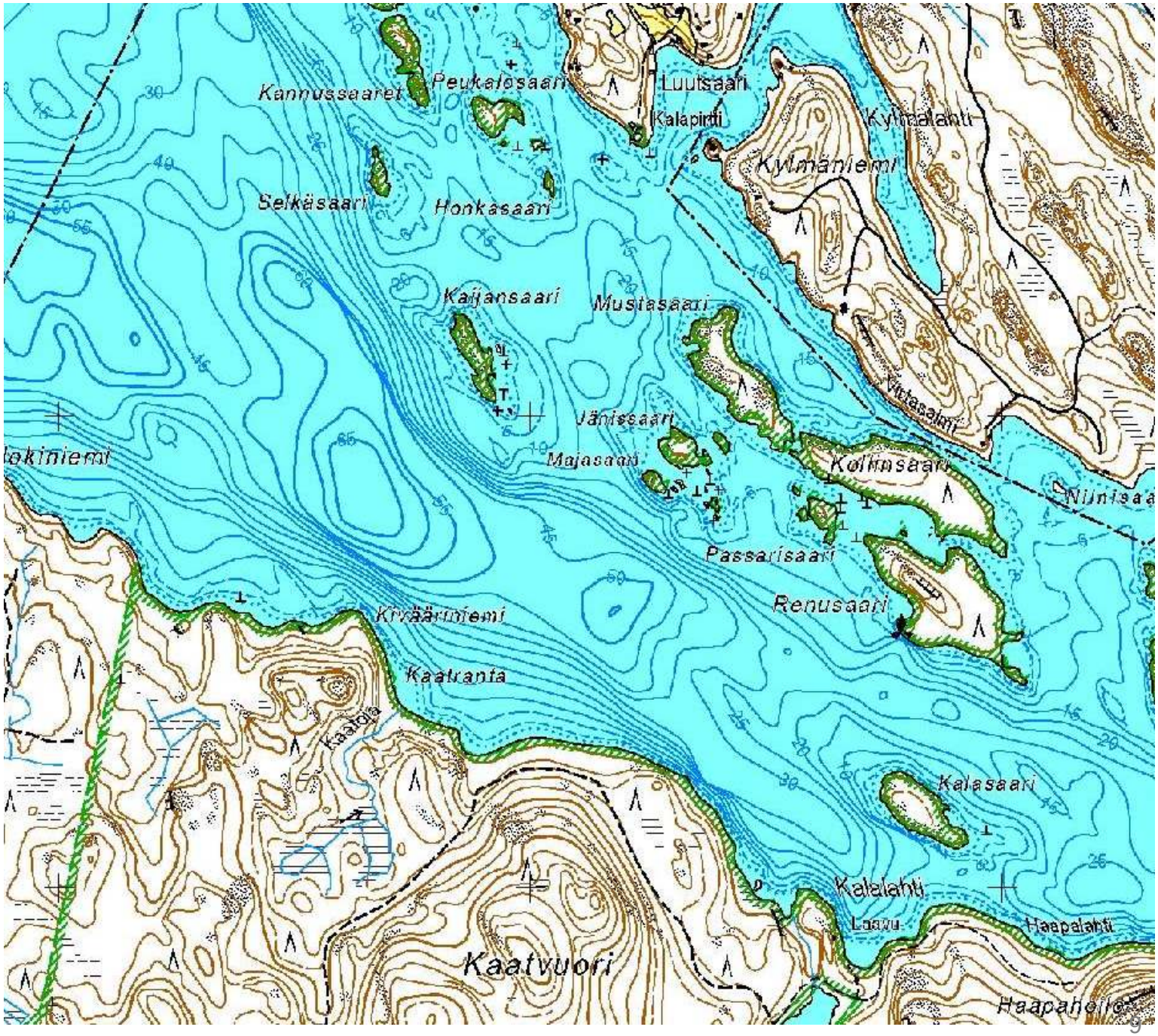
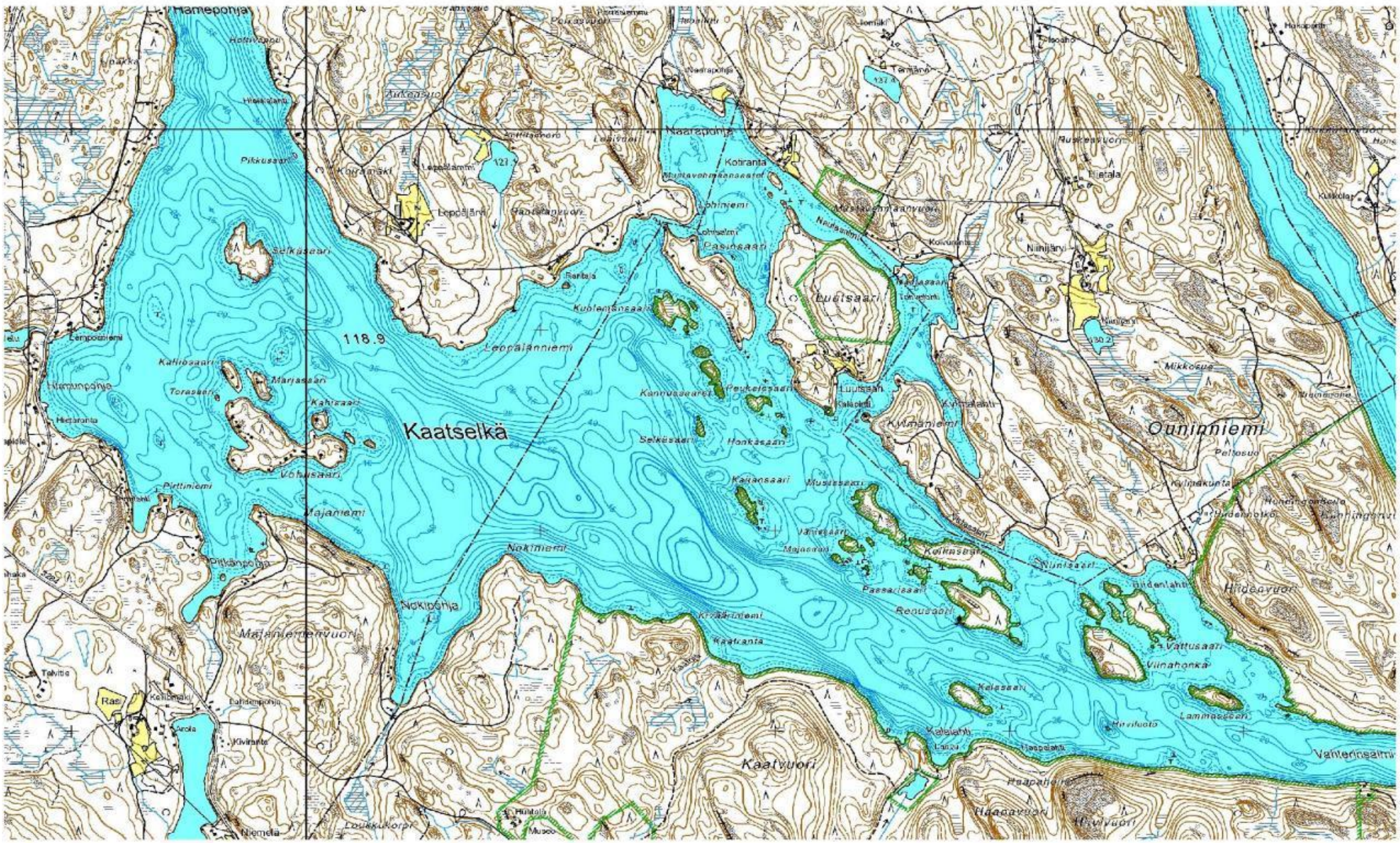
Preserving the sample

1. Preserve the sample separately on board or put in a separate bucket for on shore preservation
    1. Wash grab well and arm before next sample
2. Release anchor line for 2-3m wait for the wind to ”relocate you”
3. Repeat this procedure for 5 times
4. Return to shore
    1. Preserve samples individually if you have not done it in the boat


Kannussaaret
Peukalosaari
Luutsaari
Kalapirtti
Kylmälahti
Kylmäniemi
Selkäsaari
Honkasaari
Kaijansaari
Mustasaari
Jänissaari
Majasaari
Kolmisaari
Niinisaa
Passarisaari
Renusaari
Kryäärniemi
Kaaranta
Kaatoja
Kalasaari
Kalalahti
Loavu
Haapalahti
Kaatvuori
Haapaholm

Littoral macroinvertebrate sampling

- Determine coordinates of 3-4 possible shore sites based on maps and accessibility
- Fill in the name and coordinates into the field sheet
- Go to the site
- Inspect the site from shore for suitability
- **Start sampling from the downwind area**
- Go to a depth of about 25-40cm
- Mark the site
- Trample the substratum while moving backwards ,upwind parallel to shore with the kicknet
- Move for exactly 1m in about 20sec
- Remove any large objects from the net (stones & sticks)
- Preserve the sample


Kaatselkä
118.9
Hämepohja
Selkäsaari
Luotsaari
Ouninniemi
Nokipohja
Kaatvuori
Majaniemenvuori
Vattusaari
Lammassaari
Vahterneami

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Stream macroinvertebrates

- Using maps locate suitable sites
- Avoid sampling directly at bridges
- Prefer riffle sections over runs
- Start from the bank you operate from in the upstream direction
- Randomly chose the site (20-75cm/s)
- Mark the downstream end of the site with the floater
- Stand in front or sideways to the net
- 1m /30 sec
- Move the net from time to time upstream
- Bring the net to the shore and preserve the sample
- The next sample should be spaced at least 2-3m from the previous
- Take 4-6 samples/ site (6 in Finland)

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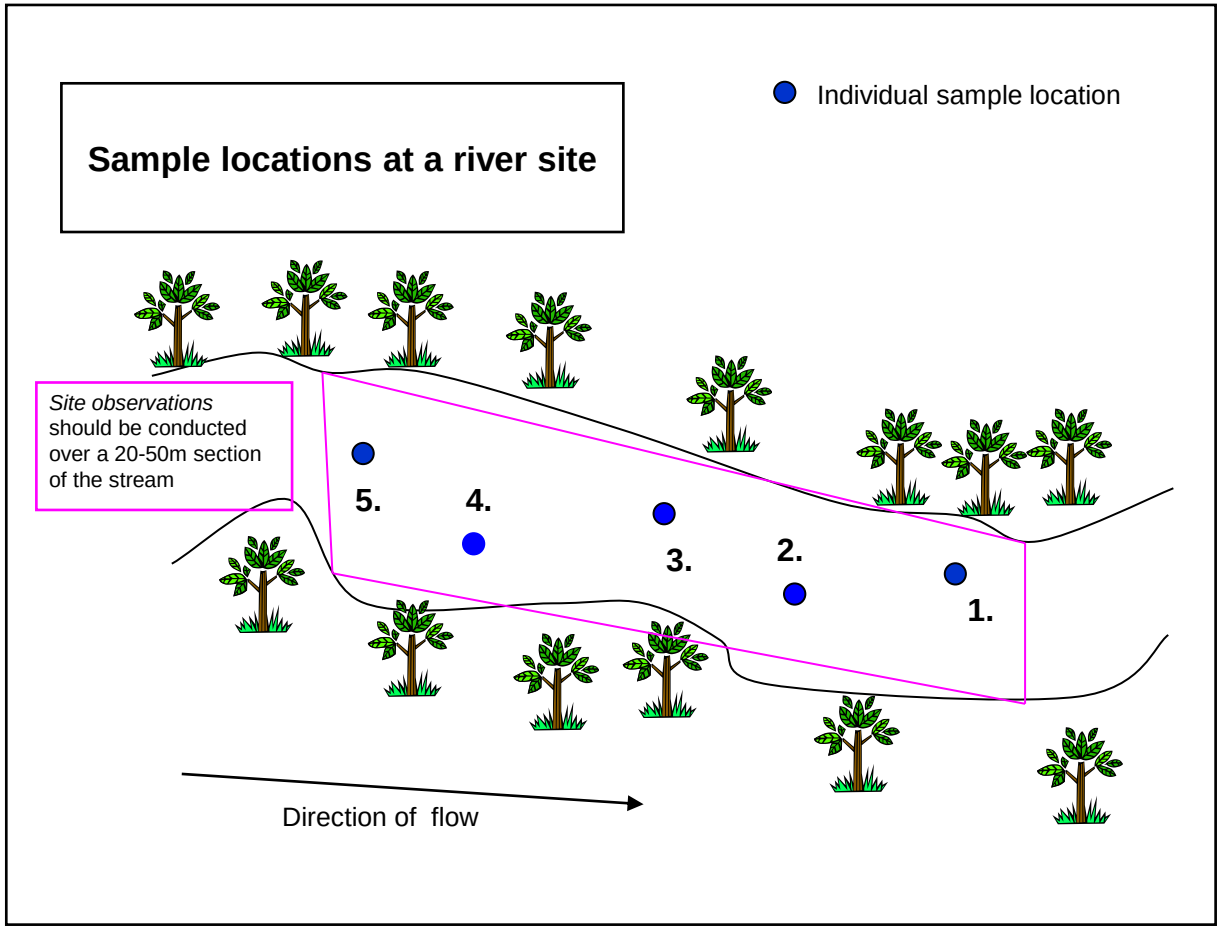
Sample locations at a river site
Individual sample location
Site observations should be conducted over a 20-50m section of the stream
5.
4.
3.
2.
1.
Direction of flow

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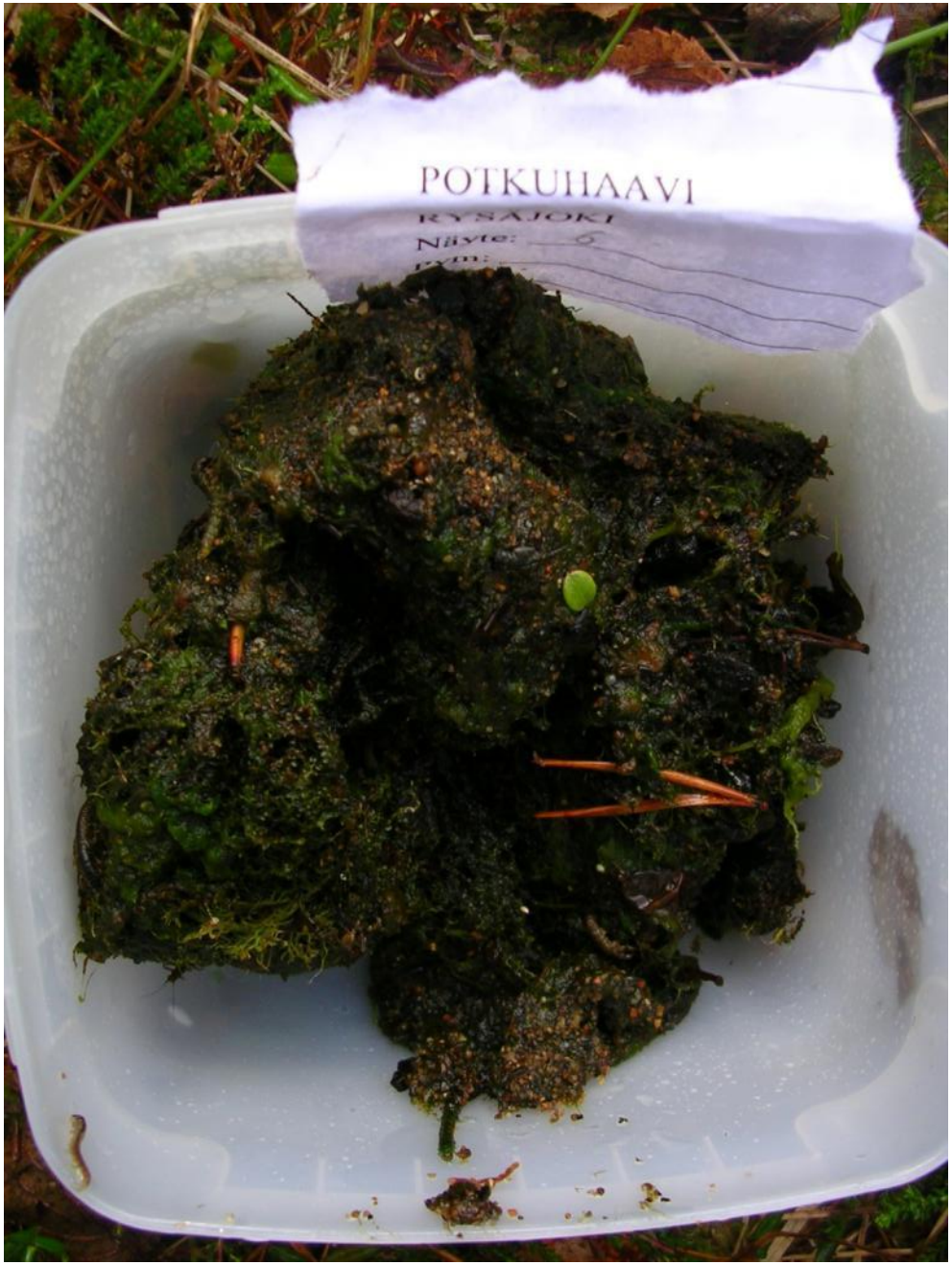
POTKUHAAVI
RYSÄJOKI
Näyte: 6


SÄHKÖTYS
RYSÄJOKI
Näyte: 5
Pvm:
Tekijät:

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Preprocessing

DO NOT POOL SAMPLES !

Treat samples separately all the way!

- Allows estimation of intersample error
  - Species accumulation curves
- Crucial for quality assurance

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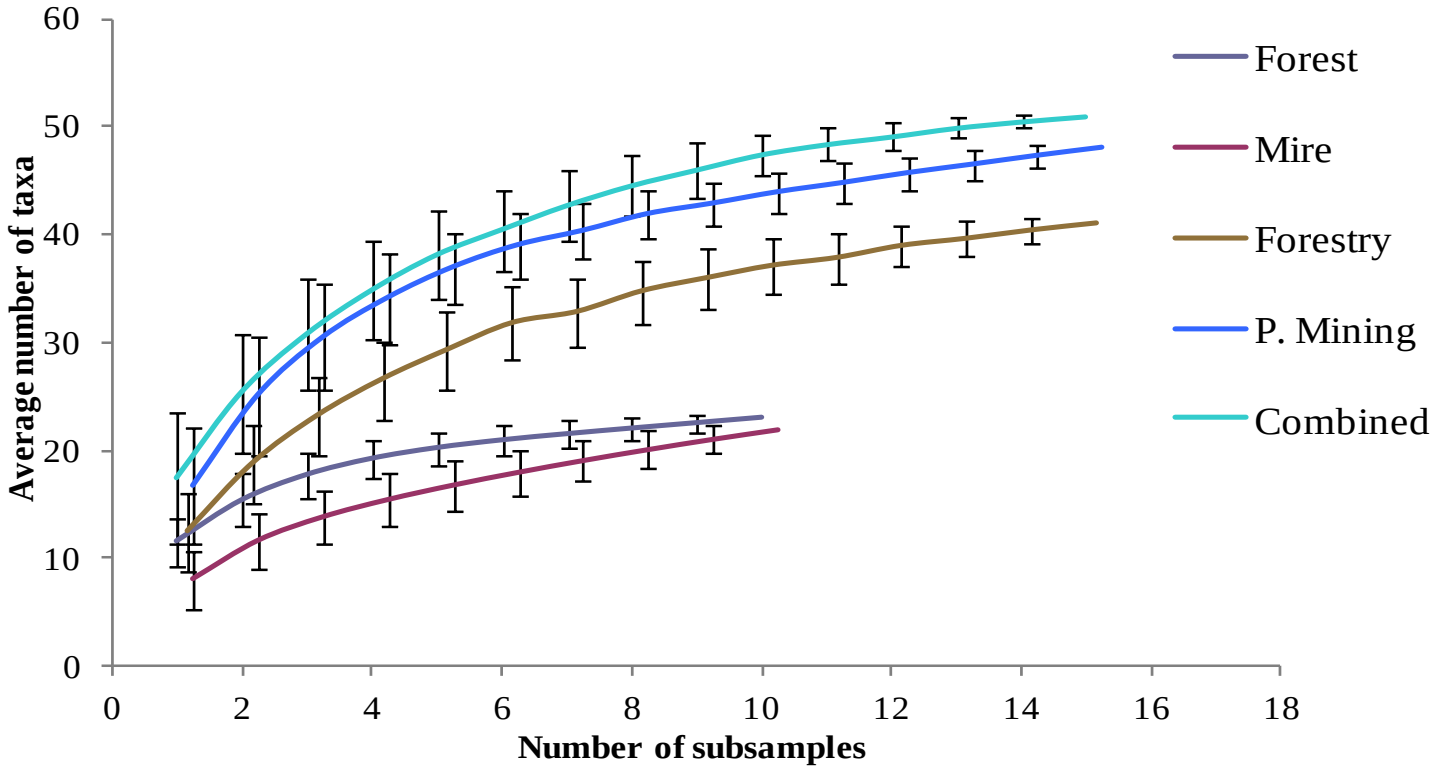
How much sampling is needed?



Daza-Secco, Nieminen & Meissner, unpublished

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In rivers, 5 samples is often enough for common species monitoring, how about rare ones? A littoral example:

Diversity and Distributions, (Diversity Distrib.) (2012) 1–11

Species turnover in lake littorals: spatial and temporal variation of benthic macroinvertebrate diversity and community composition

Heli Suurkuukka[1]*, Kristian K. Meissner[2] and Timo Muotka[1,3]

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Preprocessing

- Picking should mainly be done without magnifying glasses
- Pick organisms from white trays
- Use high powered lighting (halogen)
- Transfer all sample information into the sample vial
- Be sure to not any sub sampling on the paperslip going into the vial
- Use 80% alcohol and seal vials well
- Train all technical personnel until they repeatedly pick at least 90% of all organisms

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Data storage

Samples must be stored individually in a data base

- Samples can later be separately pooled for index calculations
- Environmental data related to samples must be stored as well, either in a separate data base or in the same
- All data must be georeferenced and dated to enable joint analysis of environmental and biological data also for other than ecological status assessment purposes
- Data should be regularly backed up and preferably be hosted at a server to enable easy exchange and remote access
- Open data policy is advised

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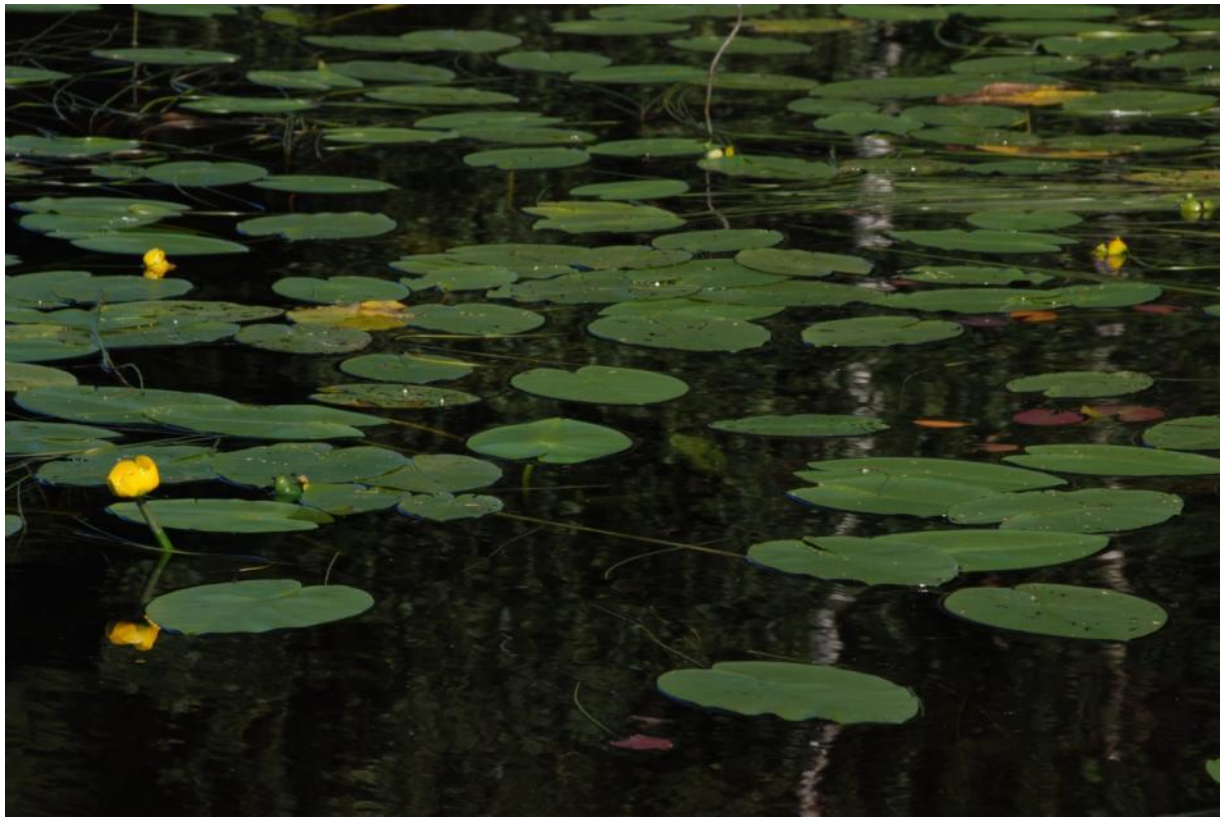
The importance of SOP at all stages of the monitoring process

- SOPs will reduce errors (sampling, processing, identification, and storage related)
- Improve national and international comparisons



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Other quality assurance related measures

- Personnel needs continuous training and auditing
- Cross auditing between organizations is strongly advised
- Taking part in, and, or organizing taxonomic proficiency tests

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Example: Results from Finnish macroinvertebrate proficiency tests

	2003 stream and profundal	2008 stream	2008 lake profundal	2011 lake littoral	2011 Baltic coastal
Keyed correctly (% individuals)	87	91	92	97	96
Standard deviation (%)	10	10	10	3,1	3,8
Worst result (%)	65	68	70	82	70
Best result (%)	98	100	100	100	100
Mean number of misidentified species	8,6	3,6	1,8	2,1	2,8
Standard deviation	6,1	4,6	1,9	0,8	0,6
Worst result	19	14	4	9	8
Best result	1	0	0	0	0

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Thank you for your attention!

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