FRESHWATER BIOMONITORING – OPPORTUNITIES FOR OMICS MINATURISATION

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Current regulatory monitoring - WFD

- WFD - established a framework for Community action in the field of water policy in October 2000
- Commits EU member states to achieve **good qualitative** and **quantitative** status of all water bodies by 2015

1. Biological quality
2. Physical-chemical quality
3. Hydromorphological quality
4. Chemical quality
Current regulatory monitoring - WFD

**Macrophytes**
- Macrophyte Prediction & Classification System (LEAFPACS)
- Canonical Correlation Analysis Based Assessment System (CBAS)

**Phytoplankton**
- Diatoms for Assessing River Ecological Status (DARES)

**Benthic Invertebrates**
- River Invertebrate Classification Tool (RCIT)
- RIVPACS

**EU Water Framework Directive**

**Fish**
- Fisheries Classification Scheme (FCS)

**Phytobenthos**
- Diatoms for Assessing River Ecological Status (DARES)
- Trophic Diatom Index (TDI)
Can omics replace current ‘traditional’ methods?

Need to be
1. Faster
2. Cheaper
3. Higher resolution
4. More reliable

Trophic Diatom Index (TDI)

- Changes in the species composition and abundance of the benthic diatom flora
- Includes measures of diversity, biomass and presence/absence/abundance of key taxa
Other freshwater applications for omics

Cyanobacteria/cyanotoxin genes

Pathogens

Antibiotic resistance

Microbial ecology
River Wolf molecular monitoring

- 20 sites
- 3 above Roadford lake, 17 below
- Triplicate samples (stone scrapes) at each site
- Bacterial (16S) and Eukaryotic (18S) pyrosequencing
Environmental DNA (eDNA)

Factors influencing detection of eDNA from a stream-dwelling amphibian

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Environmental monitoring using next generation sequencing: rapid identification of macroinvertebrate bioindicator species

Melissa E. Carew1, Vincent J. Pettigrove1, Leon Metzeling2 and Amy A. Hoffmann1,2

Analytical and methodological development for improved surveillance of the Great Crested Newt
Example of current technologies

Monterey Bay Aquarium Research Institute

Environmental Sampling Processor (ESP)

Remote, subsurface detection of the algal toxin domoic acid onboard the Environmental Sample Processor: Assay development and field trials

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- 125 ml whole water sample
- 0.45 μm filter
- 2 ml homogenate
Example of current technologies

Flow-through PCR module

http://www.mbari.org/ESP/
THANK YOU

Any Questions?...