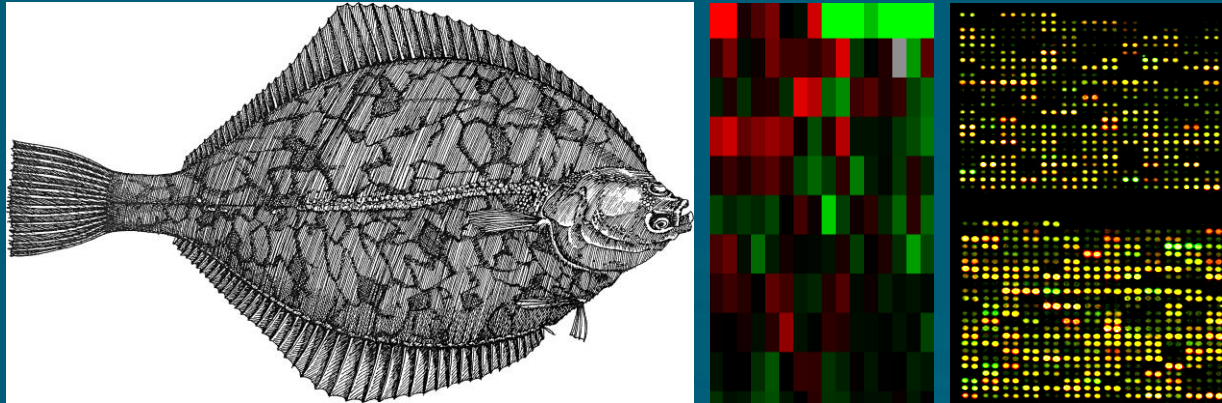


# Genomics and the marine strategy framework directive



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What is the potential of genomics to provide accurate, rapid, and cost efficient observations of the marine environment?

Are these approaches likely to be useful in next generation marine monitoring programs?



Bourlat et al. (2013) Genomics in marine monitoring: New opportunities for assessing marine health status. Marine Pollution Bulletin

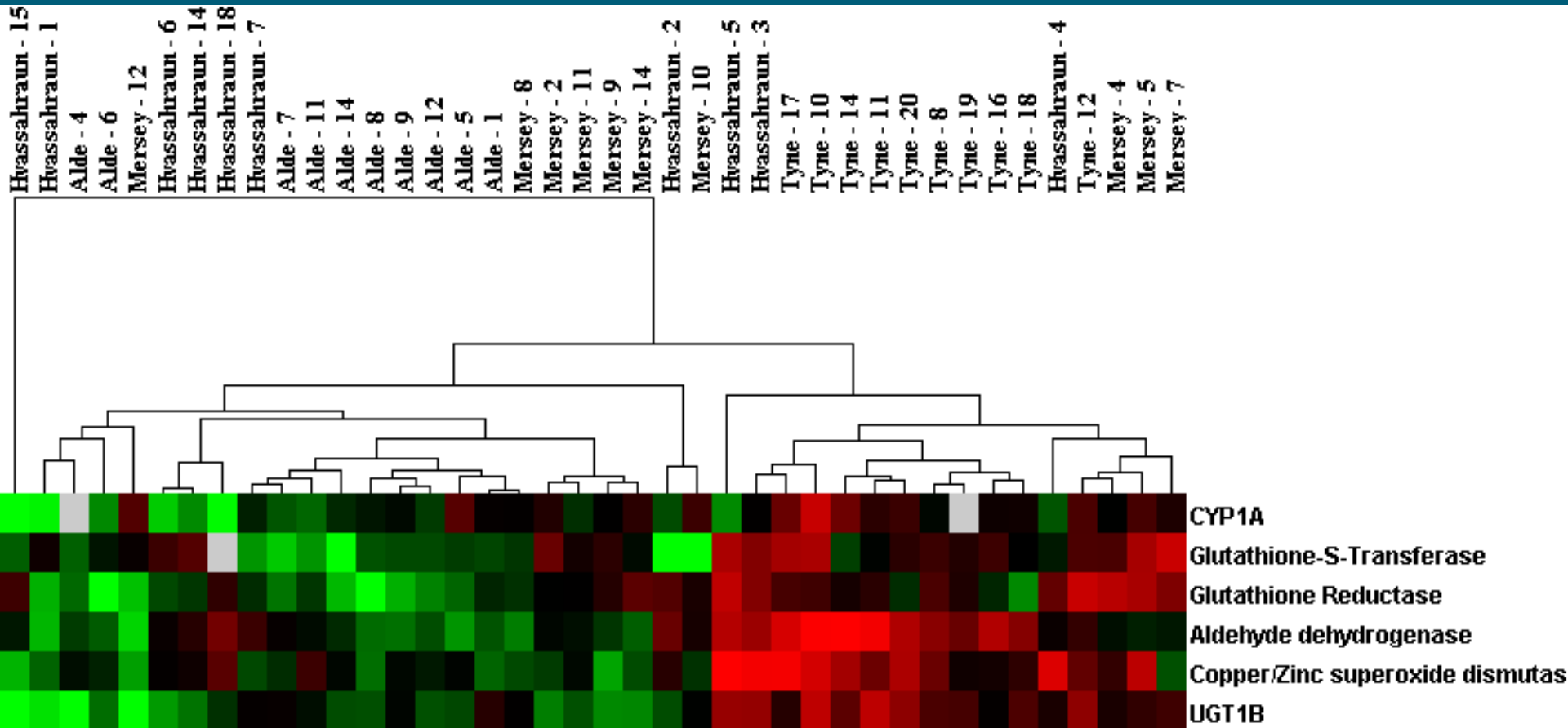
## **MSFD Descriptors that could be assessed with genomic techniques.**

1. Biodiversity (ID inc larval stages, Distribution, associated communities)
2. Non-indigenous species
3. Exploited Fish or shellfish (Fishing mortality/ tracing)
4. Food Webs (Abundance/Trend of functionally important species)
5. Eutrophication (Abundance of opportunistic macroalgae)  
HABS (species abundance)
6. Assessment of microorganism communities (shotgun sequencing)  
Seafloor integrity (presence absence of sensitive/ tolerant species)
8. Contaminant effects (Transcriptomic responses/ population changes)

1. DNA barcoding and metabarcoding
2. Metagenomics
3. Quantitative PCR or equivalents (lamp etc)
4. Short nucleotide polymorphisms (SNP's)



# Genes relating to PAH exposure



## What needs to happen in order to make the most of these techniques useable...

1. Pilot studies and cost-benefit analyzes comparing molecular with traditional methods.
2. Standardized manuals and protocols for sampling and sample processing.
3. Analytical pipelines and technologies integrating genomic data with other data sources (remote sensing, mapping tools, taxonomy databases).
4. Molecular indicators and /or methods to translate the results from molecular analyzes into indicator metrics for use in policy and decision making (e.g. status assessment).
5. Dissemination to and facilitation of adoption by monitoring bodies.