

Monitering af marin naturgenopretning – Fra maveførmelse til data

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Monitoring guideline:

Ecosystem services provided by restored biogenic reefs, boulder reefs or eelgrass meadows



Hvad skal vi med en monitoringsmanual?

Fra "aktivitets-baseret" til "effekt-baseret" dokumentation

Hvor mange sten lagde vi ud? til hvilke økosystemfunktioner fik vi og hvordan måler vi det?



Harmonisering af data på tværs af projekter og over tid
for at sikre sammenlignelighed/udvikling.



Principperne bag monitoringsvejledningen

Udvalgte økosystemtjenester og dertil knyttede økosystemfunktioner for de tre habitater inddelt i:

-økosystemfunktioner & Mindre økosystemfunktioner

Ecosystem Services (ES)		X = Key ecosystem function	Biogenic Reefs	Eelgrass Meadows	Boulder Reefs
		o = Minor ecosystem function			
Provisioning					
Goods/products provided or produced by ecosystems	Harvest/fishing production/enhancement				
Supporting					
Services necessary for production of all other ES	Biodiversity enhancement				
	Habitat/species/population enhancement		X	X	X
	Genetic diversity				
	Ecosystem stability and improved function - food web				
Regulating/Maintaining					
Benefits from regulation of ecosystem processes	Water clarity		X	o	
	Carbon burial/immobilisation		o	o	o
	Nutrient burial/immobilisation		X	X	o
	Erosion prevention			o	X
	Sediment/substrate stability		o	o	X
Cultural					
Non-material benefits from ecosystems	Recreational visitors/citizen science etc.				
	Tourism activities and employment				
	Health and well-being				

Principperne bag monitoringsvejledningen

- Hjælp til at definere formål og målsætninger i naturgenopretningsprojekter.
- Sikre, at monitoringsindsatser er i overensstemmelse med formål og budget.

Vi skal **ikke** måle alt hver gang!

- Outline af grundlæggende monitoringsprincipper:
 - Ingen genopretning uden baseline – Vi skal kunne dokumentere succes/fiasco.
 - Hvad er kontrolområder, referenceområder og BACI-design?
 - Hvad skal måles hvornår? Tidsperspektivet i den naturlige udvikling.
- Hjælp til udvælgelse af metoder til monitorering af de enkelte økosystemfunktioner.
 - Anbefalede metoder
 - Supplerende metoder
 - Niveau-inddelt

Eksempel – biodiversitet, biogene rev

Supporting ES Ecosystem Function	Indicator	Product	Method	Scientific (S) Non-scientific (N)	Expertise level: Specialist (S) Volunteer (V)	Recommended (R) Complementary (C)	Scale	Strength	Weakness	Processing Level Units	Timeframe Frequency	Performance Criteria
Biodiversity enhancement	Species abundance, competition, richness diversity/ evenness	INFAUNA Species identification and quantification of density and biomass	Sediment cores Recommended sampling time: Spring.	S/N	V/S	R	m	Reliable, common and fast. Flexibility in assessment e.g. volunteers can just do number of species or groups	Small sampling area, multiple samples, expensive equipment by boat. Expertise for fine taxonomic levels, time-consuming.	Number of species per sediment volume. List of species/groups identified. Biomass/species/groups per area sampled individuals/m ² , wet weight or dry weight g/m ²	Before restoration. 1-2 months after reef establishment Follow-up ~1 yr after reef establishment (same season).	Short term (1-3 yrs): Indication of higher biodiversity and abundance on restored sites compared to control sites. Long term (>5 yrs.): Statistically higher biodiversity and abundance
			Grab	S	S	C	m	Reliable, common and fast. Larger sampling volume compared to cores.	Unsuitable in areas with stones/dense mussel beds. Require larger boats and experts, expensive equipment, limited area, non-target sampling. Time-consuming post processing of samples.			
			eDNA	S	S	C	m-100m	Fast sampling, cover large areas, good snapshot of the community.	Expert, expensive analysis, quantification uncertain			
		EPIFAUNA & MACROFLORA Species identification and quantification of density and biomass	Diver quadrat	N	V	R	m	Direct sampling, detailed, common	Limited area, require divers/snorkelers	Biomass/species/groups per area sampled ind/m ² wet weight g/m ² or or dry weight g/m ²	Before restoration. 1-2 months after reef establishment Follow-up ~1 yr after reef establishment (same season). Annual thereafter.	
			Grab	S	S	C	m	Reliable, common and fast.	Unsuitable in areas with stone/dense mussel beds. Require larger boats+experts, expensive equipment, limited area, non-target sampling. Time-consuming post processing of samples.	Number of species/m ² . List of species/groups identified. Biomass/species/groups per area sampled ind/m ² , wet weight g/m ² or or dry weight g/m ²		
			Video transects (ROV, sledge or diver)	N	V/S	C	m-100m	Direct visual assessments, easy to use, cost effective, large area coverage	Expert quantitative analysis, no physical sampling, limited by visibility and what is observed on surface, small coverage on occasions	Number of species/m ² . List of species/groups identified. Biomass/species/groups per area surveyed ind/m ²		
	Drop down camera		N	V/S	C	m-100m						
	eDNA		S	S	C	m-100m	Fast, cover larger areas, snapshot of the community,	Expert, expensive analysis, quantification uncertain	Presence/absence			

Anbefalinger - monitoringen skal tilpasses projektet

Monitoring methods to assess habitat performance

Assess mussel bed performance: page 13



Assess boulder reef coverage page 24



Monitoring shoot density, biomass and area coverage page 30



Methodes to monitor KEY ecosystem functions

Monitoring Methods: Enhanced Biodiversity page 37



Monitoring Methods: Nutrient Immobilisation page 48



Monitoring Methods: Erosion/Sediment Stability page 55



Monitoring Methods: Water Clarity page 58

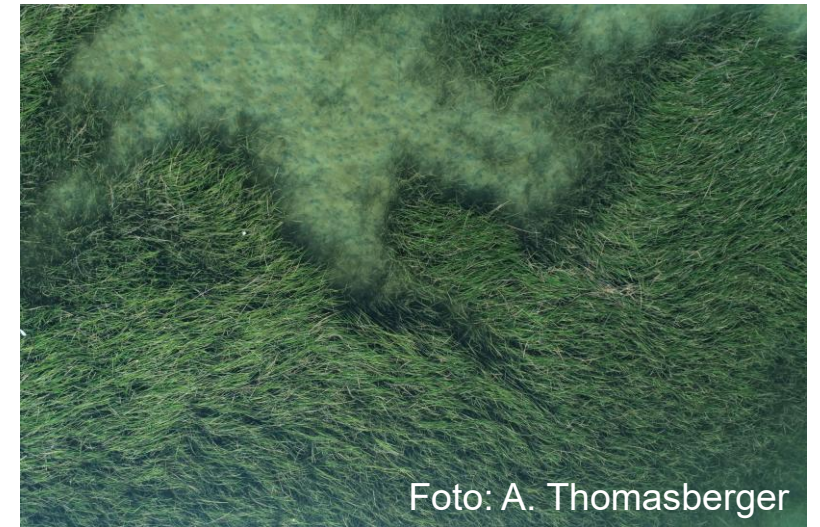


Foto: A. Thomasberger

Spørgsmål?

Vejledningen findes på marinnatur.dk

Hvornår kommer den på dansk?

Spørg Mogens

Foto: T.L: Banke



Foto: T. Lange



Tak til alle de andre forfattere:

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