MARELITT Baltic

2016 – 2019

Environmental Impact Assessment

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Environmental Impact Assessment

Aim: Evaluation of the impact of DFG retrieval operations on the diverse Baltic seafloor habitats.

- Assessment of **seafloor habitat types** characteristic for the Baltic Sea
- **Marine ecological assessment** of MARELITT **retrieval methodologies**
  - Creeper / "net fork" (Polish/German model)
  - Retrieval hooks (Estonian model)
  - Diving operations

- Comparison with **impact factors of other bottom-touching activities**

  (other net retrieval methods, fishing activities)
- Relation to the **zero alternative** (leaving DFG in place) –

  => can we expect improvement of ecosystem health?

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Environmental Consultancy
WSP, Stockholm
Authors: Jonas Sahlin, Ingrid Tjensvoll

Method 1: Selection of Habitats

Habitats selected following HELCOM HOLAS I

Characteric habitat groups:

- **Hard-sediment substrates** (photic/non-photic)
- **Soft-sediment substrates** (photic/non-photic)
  - Sand
  - Silt
- **Specialised Baltic Seafloor habitats**
  - Blue mussel beds
  - Eelgrass meadows
  - Bladder wrack meadows
- **Wrecks as a separate habitat class (artificial habitat)**

Table 1 HELCOM HOLAS I biological ecosystem components and habitats[1] used for impact assessment within this study (indicated in green), as well as additional habitats considered within study (indicated in orange).

Type of habitat	Habitat	Present EIA	Remarks
Species data	Harbor porpoise distribution	Not considered	
	Seal distribution	Not considered	
	Seabird wintering grounds	Not considered	
	Spawning and nursery areas of cod	Not considered	Spawning grounds not considered related to benthic environment
Water column	Photic water	Not considered	
	Non-photic water	Not considered	
Benthic biotopes	Blue mussel bed	Considered	Only areas with cover of >10 % of blue mussels
	Eelgrass meadows	Considered	Only areas with cover of >10 % of eelgrass
	Bladder wrack meadows	Considered	Only areas with cover of >10 % of bladder wrack
Benthic biotope complexes	Photic sand	Considered	
	Non photic sand	Considered	
	Photic mud and clay	Considered	
	Non-photic mud and clay	Considered	
	Photic hard bottom	Considered	
	Non photic hard bottom	Considered	
Artificial biotope	Wreck	Considered	

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Method 1: Selection of Habitats

Habitats selected following HELCOM HOLAS I

<u>Habitats that could not be individually considered & need specific evaluation:</u>

- **Complex coastal habitats**
  - Shallow areas (0-5m) with pronounced individual structure
  - Complexity of specific regional coastal and estuarine habitats is unsuited for a global Baltic EIA approach
- **Spawning and nursery grounds**
  - Cod spawning sites and nurseries
  - Nursery grounds in shallow and estuarine areas
  - The high level of diversity in nursery grounds cannot be generalised

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Results of methodology testing

WWF Germany measured creeper impact

- Indentation Depth of Creeper (Polish model)
- Immediately after dragging:
  - 2-4 cm in soft sediments
  - 0.5-2 cm on hard substrates (rocky ground)

No visible traces left after 3 months!

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Retrieval techniques

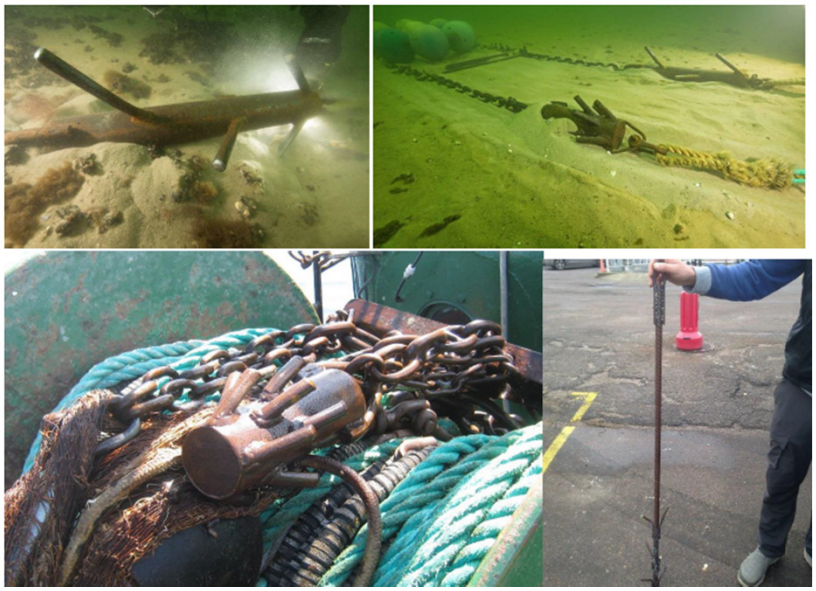
Search devices were classified into 2impact groups:

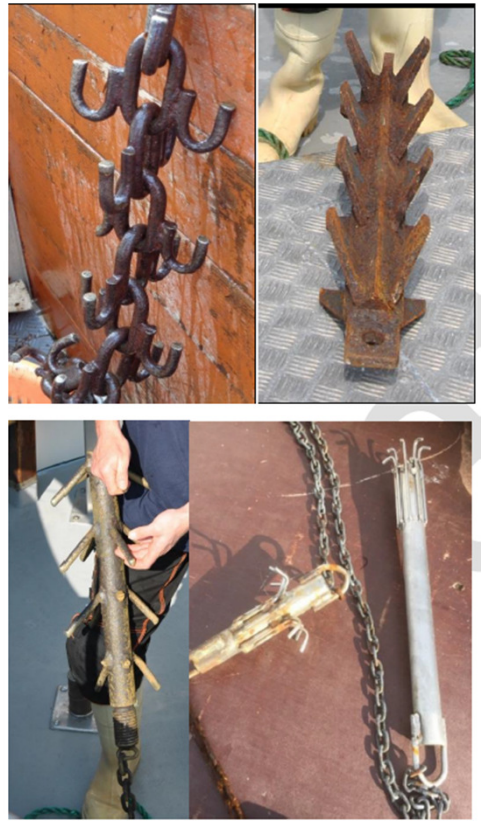
Rock hopper with hooks
Light chains with light hook
} **Low impact**

Otter boards, bars, metal frames
Heavy chains
} **High impact**

Because of their light to moderate weight and the expected effects on the seafloor, all MARELITT search devices were classified as

„Light creepers“





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Types of seafloor effects

4 (+2) effects were identified & considered:

1. Abrasion

- Disturbance through abrasive forces

2. Siltation

- Uplifting of silt and sediment (visibility, water quality)
- Sedimentation of uplifted silt

3. Introduction of marine litter into the environment

4. Species extraction

5. Structural damage of cultural heritage

6. Destruction of artificial reefs

} Wrecks only

Abrasion effects

Table 5 Estimated magnitude of abrasion for different activities

Activity		*Soft Bottom*	*Hard bottom*	*Blue mussel bed*	*Eelgrass meadow*	*Bladderwrack*	*Wrecks*
Search for DFG	Light creeper	1	1	1	2	1	1
	Heavy Creeper	2	2	1	2	2	2
	Low impact supporting device	1	1	1	1	1	1
	High impact supporting device	3	2	3	3	2	3
Retrieval of DFG	Manpower/winch						3
	Diver (or other controlled operation)						1
Zero alternative	Zero alternative Leaving DFG in place						
Trawling	Trawling device	3	3	3	3	3	3

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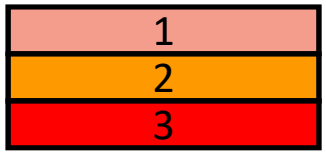
Method 2: Effect x Sensitivity = Impact

Effects

1. **Abrasion**
2. **Siltation**
3. **Marine litter**
4. **Species extraction**
5. **Structural damage of cultural heritage**
6. **Destruction of artificial reefs**



Sensitivity

1. **Resilience of each biotope & seafloor habitat**
   - Insensitivity towards disturbances

2. **Regeneration rate**
   - Timescale during which habitat is restored after disturbance

Scores Holas I	Sensitivity score
0-1,49	Low
1,5-2,9	Medium
3-4	High

Figure 1 Shows the interval the sensitivity scores from HOLAS I (HELCOM) were set as. We used the intervals to divide them into 3-graded sensitivity scale.

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Method 3: Determination of Impact

Effect factor x sensitivity index = Intensity of impact

Effect	Habitat sensitivity		
	Low	*Medium*	*High*
Low			
Medium			
High			

- **Multiplicating effects:**
  - **High effect of a certain device leads to severe impact**
  - **High sensitivity of a certain habitat leads to severe impact**
  - **Moderate effect plus moderate sensitivity leads to strong impact**

! Simplification into a 3-grade scale leads to information loss: Moderately severe and extreme impact factors cannot be distinguished.

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Sensitivity indices

HOLAS assessment plus expert research and evaluation

1. **Abrasion (HOLAS)**
2. **Siltation (HOLAS)**
3. **Introduction of marine litter into the environment**
4. **Destruction of artificial reef structures**
5. **Species extraction**
6. **Structural damage on cultural heritage**

Table 11 Sensitivity scores for the different habitats.

Habitat	*Abrasion*	*Siltation*	*Introd. Marine litter*	*Artificial reef dammage*	*Species extraction*	*Structural damage*
Photic sand	3	2	3	*na*	3	*na*
Photic mud and clay	2	2	3	*na*	3	*na*
Photic hard bottom	1	*na*	3	*na*	3	*na*
Non photic sand	3	2	3	*na*	3	*na*
Non-photic mud and clay	3	1	3	*na*	3	*na*
Non photic hard bottom	3	*na*	3	*na*	3	*na*
Blue mussel bed	2	2	3	*na*	3	*na*
Eelgrass meadows	3	2	3	*na*	3	*na*
Bladder wrack habitat	*2*	1	3	*na*	3	*na*
Wreck	*na*	*na*	3	1	3	3

1-Low
2-Medium
3-High

Effects x sensitivity indices = ,,Impact scores”

Soft-bottom habitats

Table 12 Results from the EIA for soft-bottom habitats.

		Photic Sand				Photic Mud and Clay				Non-Photic Sand				Non Photic Mud and Clay			
Activity	**Gear**	*Abrasion*	*Siltation*	*Introduction marine litter*	*Species extraction*	*Abrasion*	*Siltation*	*Introduction marine litter*	*Species extraction*	*Abrasion*	*Siltation*	*Introduction marine litter*	*Species extraction*	*Abrasion*	*Siltation*	*Introduction marine litter*	*Species extraction*
Search	Light creeper	3	2			3	2			3	2			3	1		
	Heavy Creeper	6	4			6	4			6	4			6	2		
	Low impact supporting device	3	2			3	2			3	2			3	1		
	High impact supporting device	9	6			9	6			9	6			9	3		
Retrieval	Manpower/winch		2				2				2				1		
	Diver		2				2				2				1		
Zero alternative	Leaving DFG in place			6	6			6	6			6	6			6	6
Trawling	Trawling device	9	6	6	9	9	6	6	9	9	6	6	9	9	3	6	9

Effects x sensitivity indices = ,,Impact scores”

Hard-bottom habitats

Table 14 Results from the EIA for hard bottom habitat.

		Photic Hard bottom				Non photic Hard bottom			
Activity	**Gear**	*Abrasion*	*Siltation*	*Introduction marine litter*	*Species extraction*	*Abrasion*	*Siltation*	*Introduction marine litter*	*Species extraction*
Search	Light creeper	1				3			
	Heavy Creeper	2				6			
	Low impact supporting device	1				3			
	High impact supporting device	2				6			
Retrieval	Manpower/winch								
	Diver								
Zero alternative	Leaving DFG in place			6	6			6	6
Trawling	Trawling device	3		6	9	9		6	9

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Specific sensitive Baltic Sea biotopes

Eelgrass-dominated soft bottom

Table 13 Results from the EIA for eelgrass meadows habitat.

		Eelgrass meadow			
Activity	**Gear**	*Abrasion*	*Siltation*	*Introduction marine litter*	*Species extraction*
Search	Light creeper	6	2		
	Heavy Creeper	6	2		
	Low impact supporting device	3	2		
	High impact supporting device	9	6		
Retrieval	Manpower/winch		2		
	Diver		2		
Zero alternative	Leaving DFG in place			6	6
Trawling	Trawling device	9	6	6	9

Bladder Wrack-dominated hard bottom

Table 15 Results from the EIA for bladder wrack habitat.

		Bladder wrack			
Activity	**Gear**	*Abrasion*	*Siltation*	*Introduction marine litter*	*Species extraction*
Search	Light creeper	2	2		
	Heavy Creeper	4	2		
	Low impact supporting device	2	2		
	High impact supporting device	4	2		
Retrieval	Manpower/winch				
	Diver				
Zero alternative	Leaving DFG in place			6	6
Trawling	Trawling device	6	2	6	9

Expected impacts

Low impact:

- **Hard-sediment substrate (photic)**
- **(Blue mussel beds)**
- **(Bladder wrack meadows)**

BUT: Salinity gradient affects regrowth!

Moderate impact:

- **All soft sediments & silts**
- **Non-photic hard-sediment substrate**

High impact:

- **Eelgrass meadows**
- **Wrecks**

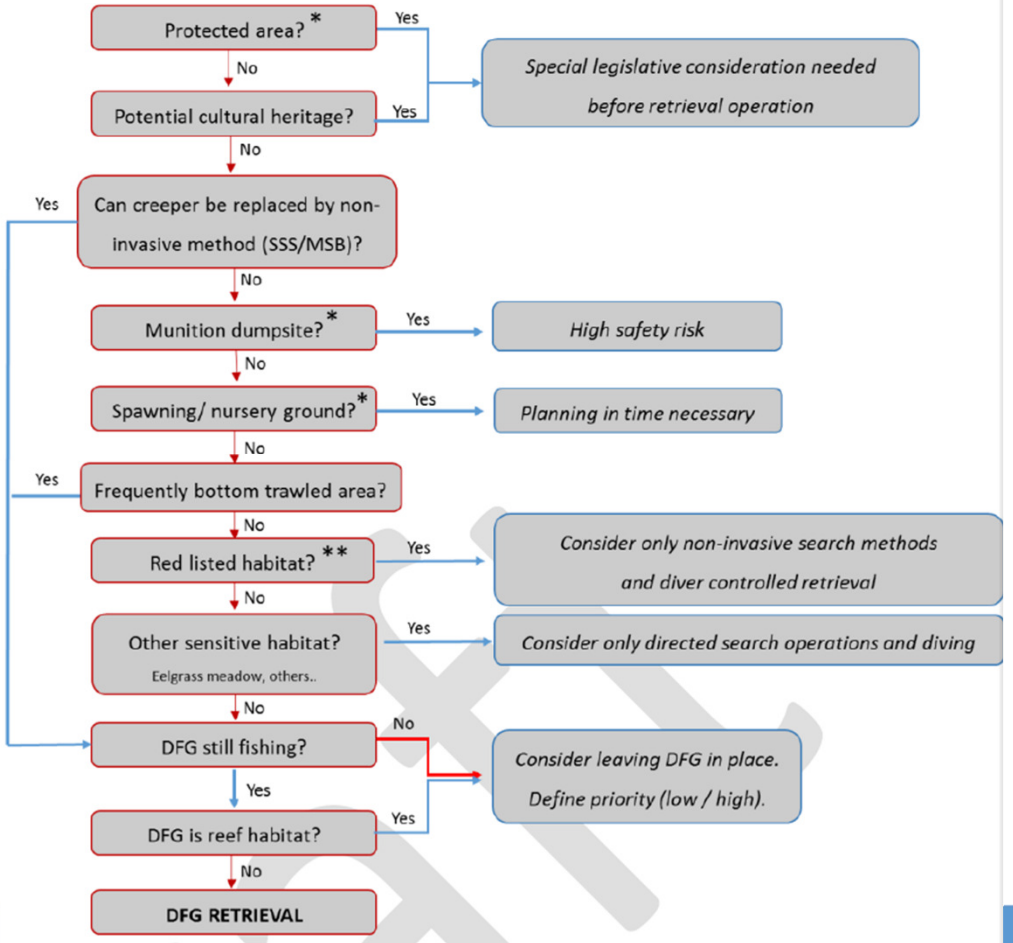
Table 18 Highest expected impact per activity on assessed habitats. "MARELITT Search" corresponds to the searching method used in MARELITT search (impact supporting device), whereas MARELITT retrieval operations are divided sepa (or anchor) and retrieval operation only with divers. Other hypothetical search meth are in this case supposed to be performed with a heavy creeper and a high-impact s

Habitat	MARELITT search	Heavy creeper / High impact supporting device	MARELITT retrieval- Hook/ anchor	MARELITT retrieval- Diver	Zero alternative	Bottom trawling
Photic sand						
Photic mud and clay						
Photic hard bottom						
Non photic sand						
Non-photic mud and clay						
Non photic hard bottom						
Blue mussel bed						
Eelgrass meadows						
Bladder wrack						
Wreck						

Best practice recommendations

Decision tree:

- **Natural protected area?**
- **Cultural heritage?**
- **Alternativ technique (sonar, underwater camera)?**
- **Sensitive or red listed habitat?**
- **Reef habitat?**
- **Are ghostnets still ghostfishing?**
- **…**



Environmental impact assessment

Guideline for or against retrieval actions in each specific situation

Decision has to be made on a case-by-case basis:

- **Is DFG search (dragging) & retrieval ecologically acceptable?**
- **Which search and retrieval methodology shall be used?**
- **What is the advantage compared to leaving the DFG in the marine environment?**

Environmental impact assessment

Guideline for or against retrieval actions in each specific situation

General results:

- **Leaving ghostnets in the marine environment is expected to have a higher impact on the marine ecosystem than the retrieval operations as carried out by MARELITT Baltic.**

- **The major impacts are ghostfishing/bycatch and introduction of marine litter, including microlitter, into the Baltic sea environment.**

Thank you for your attention!