# Alien species and food webs in the Marine Strategy Framework Directive:
# *What is expected from scientists?*

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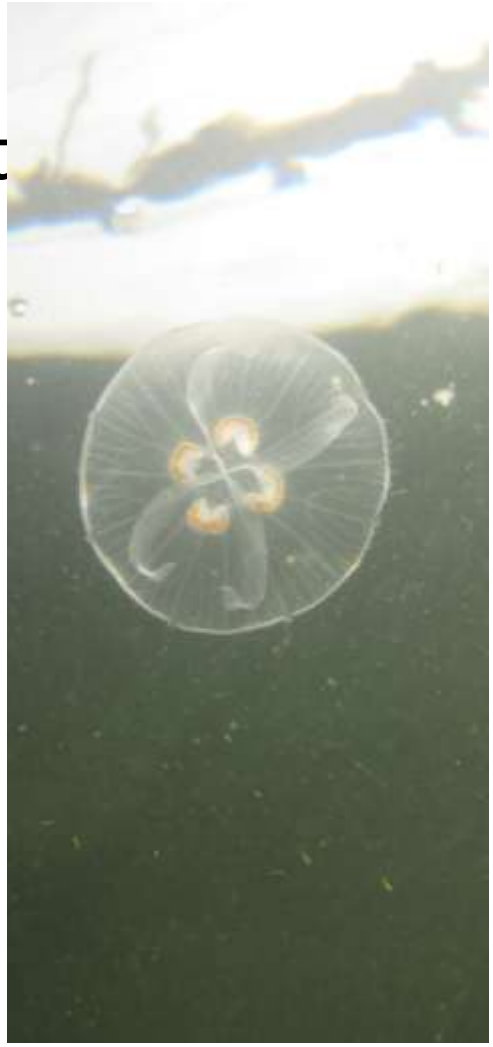
# Why MSFD is challenging for Europe?

- Qualitative descriptors: a holistic aspect to the marine environment
- ’New’ aspects to the traditional assessments
- Pressures affecting the GES
- Integrated status
- Regional co-operation



# Biodiversity, commercial fish, food webs and benthic communities in the MSFD

<u>Four overlapping qualitative descriptors:</u>

1. Biodiversity is maintained:

   *species, habitats, ecosystem structure.*

3. Exploited fish and shellfish are within safe biological limits:

   *mortality, biomass, population structure.*

4. Elements of food webs are at normal abundance and diversity:

   *productivity, proportion, abundance*

6. Benthic ecosystems are not adversely impacted:

   *condition of benthic community*

# Descriptors 1, 3, 4 and 6: how do they overlap and differ?

| | D 1 | D 3 | D 4 | Remarks |
|---|---|---|---|---|
| **D 1 (biodiversity)** | | | | |
| **D 3 (comm. exploited stocks)** | Fish and shellfish are part of biodiversity. | | | D1, D4 and D6 should include as many fish species as possible. |
| **D 4 (food webs)** | Key species are part of biodiversity. | Exploited fish stocks are key trophic groups. | | D4 should look at structures and energy flows. |
| **D 6 (sea floor)** | Benthic communities are part of biodiversity. | Shellfish are key species in benthic communities. | Many benthic species are key species in food webs. | D6 should focus on impacts. |

⇨ Is D1 meant for left-over indicators?

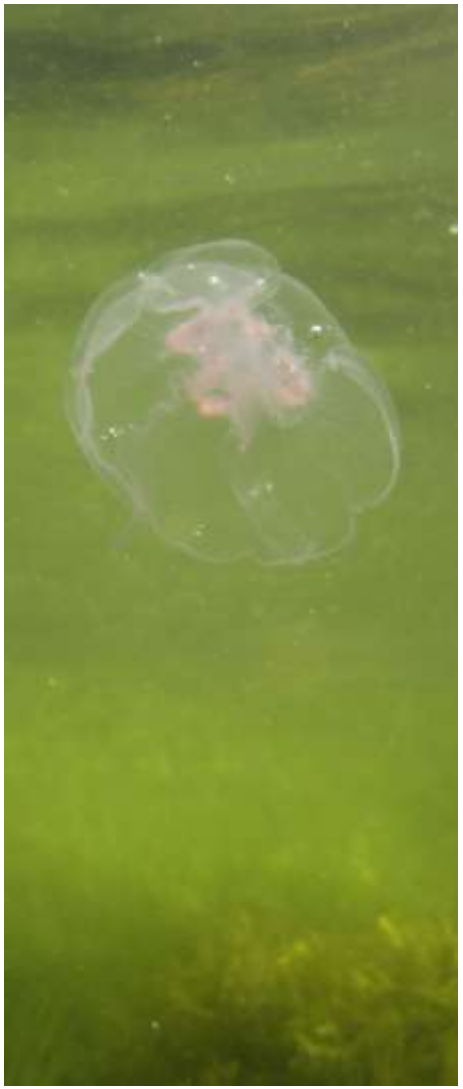
# How have we addressed D4 in the BS?

| | |
|---|---|
| **Population abundance and growth rate of marine mammals** | Operational for grey seal, ringed seal and harbor seal |
| **Productivity of white-tailed eagle** | Operational |
| **Abundance of waterbirds in the wintering season** | Under development (ready by the end of the year) |
| **Abundance and breeding success of waterbirds in the breeding season** | Under development |
| **Abundance of key fish species (e.g. perch, flounder)** | Operational |
| **Abundance of key functional fish groups** | Operational |
| **Abundance and mean size of zooplankton** | Under development |

- Strengthness: covers mammals, predatory birds, waterbirds, fish and zooplankton
- Weakness: No among-trophic-level indicators! Main fish stocks (cod, herring and sprat) should be included. Food web energy flows not analyzed.

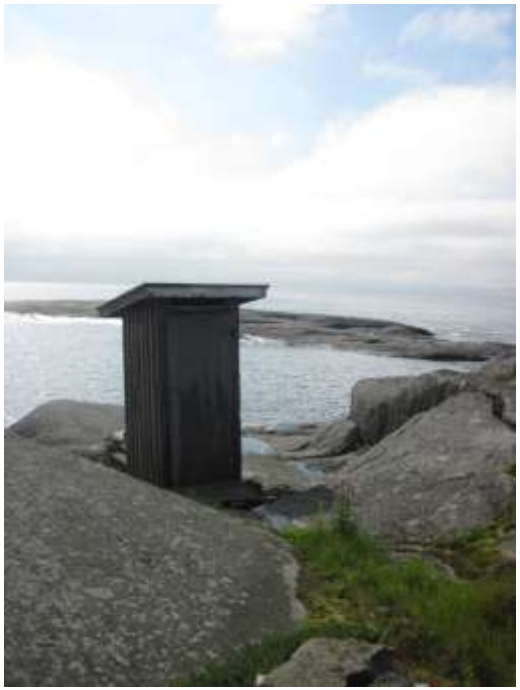
# What do we expect from food web science:

- Which are the weakest links in a food web, i.e. most sensitive to human pressures?
  - There are coctails of pressures affecting the species / trophic groups. What to focus on?
- Which trophic relationships are in a key position for wider biodiversity?
  - I.e. If a trophic link is disturbed, is the consequence particularly destructive for other species.



# Non-indigenous species in the MSFD

MSFD descriptor 2: ”Non-indigenous species introduced by human activities are at levels that do not adversely alter the ecosystem”.



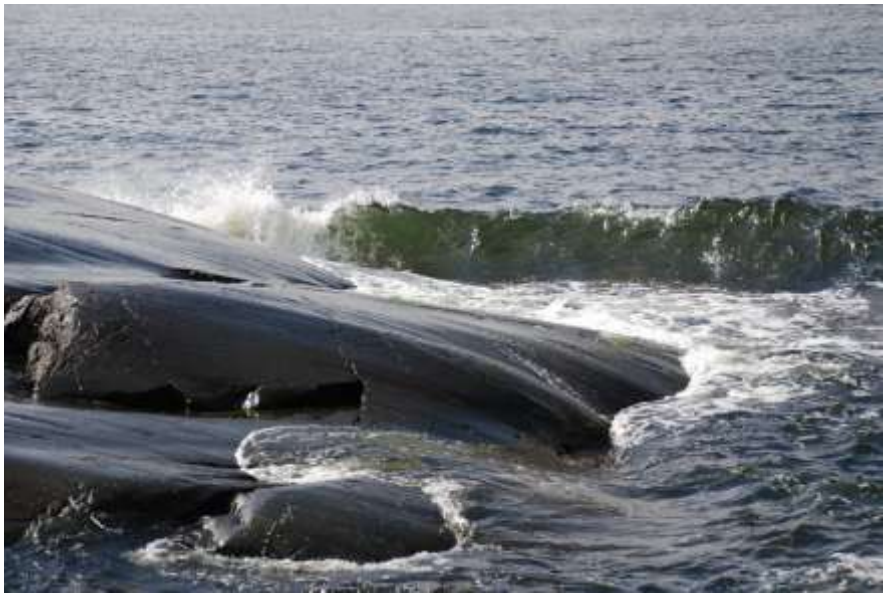
*Criterion 2.1 Abundance and state characterization of NIS, in particular invasive species.*

*Criterion 2.2 Environmental impact of invasive NIS.*

# How have we addressed D 2 in the BS?

| | |
|---|---|
| **Trends in the arrival of new NIS to the Baltic** | Assessed per sub-basin. New screening protocolls are being developed for ports. |
| **Impacts of NIS by the biopollution index** | Assessed per sub-basin. |
| **Distribution and abundance of selected invasive species** | Currently: *Dreissena* spp., *Marenzelleria* spp., *Neogobius malanostomus.* |
| **HELCOM list of NIS in the Baltic Sea** | A table summarizing the situation. |

Both criteria are covered.



# What do we expect from NIS scientists:

- Positive case studies of post-introduction management. Are they possible? Reversibility?
- Abundance and time series of NIS in 'poorly monitored habitats'.
- Meta analyses of Baltic impacts:
  - Do NIS cause secondary impacts (+ / -) through the food web? Have predators switched prey species?
  - Have red list categories changed due to NIS?