Ocean Connections: Potential Measures to Strengthen Diadromous Fish Stocks in the Wadden Sea

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Potential measures to strengthen diadromous fish stocks in the Wadden Sea

Katja Philippart


Fish Passage 2016, 20-22 June 2016, Amherst, USA
Observed decline in fish stocks in World Heritage Wadden Sea

www.waddenzeevismonitor.nl
<table>
<thead>
<tr>
<th>Fish</th>
<th>Cormorants LIJ</th>
<th>Cormorants WS</th>
<th>Seals WS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eel</td>
<td>935,000</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Herring</td>
<td>0</td>
<td>0</td>
<td>2,420,000</td>
</tr>
<tr>
<td>Twaitte Shad</td>
<td>0</td>
<td>25,000</td>
<td>0</td>
</tr>
<tr>
<td>Smelt</td>
<td>391,000</td>
<td>860,000</td>
<td>0</td>
</tr>
<tr>
<td>Flounder</td>
<td>0</td>
<td>5,350,000</td>
<td>65,000</td>
</tr>
</tbody>
</table>

40,000,000 fish y⁻¹
By-catch shrimp fisheries in western Wadden Sea

River Lamprey 4,500
Twaite Shad 210,000
Smelt 1,350,000
Flounder 845,000

2,400,000 fish per year
Targeted fisheries in Lake IJssel

**Eel** 5,870,000

**Smelt** 198,500,000

203,000,000 fish per year
Estuarine gradients in the Dutch part of the Wadden Sea
Estuarine gradients in the Dutch part of the Wadden Sea
Kornwerderzand

Presentations on 22/6/2016
9:30 Roef Mulder
9:45 Wilco de Bruijne
## Fish passing the Afsluitdijk

<table>
<thead>
<tr>
<th>Fish</th>
<th>WS → LIJ</th>
<th>LIJ → WS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>RGM</td>
<td>FFM</td>
</tr>
<tr>
<td>Eel</td>
<td>500</td>
<td>10.500.000</td>
</tr>
<tr>
<td>Herring</td>
<td>750.000</td>
<td>240.000</td>
</tr>
<tr>
<td>Smelt</td>
<td>350.000</td>
<td>9.700.000</td>
</tr>
<tr>
<td>Flounder</td>
<td>20.000</td>
<td>50.000</td>
</tr>
</tbody>
</table>

**Total:** 1.100.000 fish y\(^{-1}\)  
20.500.000 fish y\(^{-1}\)  
53.000.000 fish y\(^{-1}\)
Relative effectiveness of measures to strengthen diadromous fish stocks in the western Wadden Sea

- Reduction Fisheries
- Regular Discharge Mgt
- Reduction Fisheries
- Regular Discharge Mgt
- Fish Friendly Mgt
- Fish Migration River

Fish numbers ("order of magnitude")
Migratory Fish Testing Facility Kornwerderzand

- Behaviour
- Migratory Fish
- Attraction Efficiency
- Tidal-driven Transport & Behaviour
- Fish-friendly discharge & locking on migration success
- Passing Efficiency
- Growth & survival in brackish waters

Decline → Habitats → Predation → Fisheries → Migration → Testing Facility → Measures
Large-scale Migration Patterns in Coastal Waters

Wadden Sea
- Preferred & possible “swim ways”
- Seasonality (match/mismatch)
- Impacts of human activities
Linked with ongoing research & monitoring programs

Migratory Fish Testing Facility Kornwerderzand
- Water temperature
- Currents
- Tide
- Salinity
- Turbulence
- Substrate
- Food availability
- Predation pressure

Decline → Habitats → Predation → Fisheries → Migration → Testing Facility → Measures
Potential measures to strengthen diadromous fish stocks in the Wadden Sea

Decline > Habitats > Predation > Fisheries > Migration > Testing Facility > Measures

Reduction fisheries Wadden Sea & Lake IJssel
Fish-friendly discharge management
Optimisation existing fish passages
Improvement critical habitats
Large brackish water areas
Fish Migration Testing Facility Kornwerderzand
ABSTRACT

The strong decline in Wadden Sea fish since the 1980s has called for action to strengthen local diadromous fish stocks. A recent explanatory study showed that most promising potential measures to strengthen local fish stocks and other natural values of this region include reduction of fishing efforts, provisioning of suitable habitats (such as brackish zones) and facilitation of fish migration.

Reduction of shrimp fishing in the Wadden Sea would decrease mortality of diadromous fish (4 million per year), and be beneficial for additional natural values of the Wadden Sea (e.g. mussel beds, birds, seals). Reduction of fishing activities for Eel and Smelt in the adjacent Lake IJssel would favour local fish stocks, and also enhance the supply of fish (e.g. Smelt) to Wadden Sea stocks.

Estuarine gradients in the Wadden Sea vary from small tidal creeks at the islands to large freshwater sluices along the mainland coast. Present natural estuarine gradients should be safeguarded and, if necessary (e.g. Ems estuary), be improved for provisioning suitable habitats for migratory fish. Furthermore, several areas are potentially suited for turning into large brackish habitats, but actual suitability still needs to be checked by means of feasibility studies.

Fish migration could be facilitated by means of improving the connectivity within freshwater systems, and between freshwater systems and the sea. Potential measures include fish-friendly discharge management and fish passages, ranging from relatively simple (e.g. fish ladder) to very complex (e.g. Fish Migration River) solutions. At present, however, the attraction and passing efficiencies of such fish passages cannot be quantified due to a lack of data.

Setting up a Migratory Fish Testing Facility and an integrated monitoring program will not only lead to more efficient and effective investments in fish passages in the Wadden Sea, but could be of international interest as well.