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
1924

1932

1969

1942

1957

1967

1975

Lauwersmeer

Situation in 1921

Situation in 2016

Decline >)

Habitats >)

Predation >)

Fisheries >)

Migration >)

Testing Facility >)

Measures

Situation
in 1921

Eijerlandse Gat

Marsdiep

Afsluitdijk

Wieringermeeerpolder

Amstelmeer

IJsselmeer

Andijk

Eastern Flevoland

Southern Flevoland

Lauwersmeer
Cormorants

<table>
<thead>
<tr>
<th>Fish</th>
<th>LIJ</th>
<th>WS</th>
<th>Seals</th>
<th>WS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eel</td>
<td>935.000</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Herring</td>
<td>0</td>
<td>0</td>
<td>2.420.000</td>
<td>0</td>
</tr>
<tr>
<td>Twaithe Shad</td>
<td>0</td>
<td>25.000</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Smelt</td>
<td>39.100.000</td>
<td>860.000</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Flounder</td>
<td>0</td>
<td>5.350.000</td>
<td>65.000</td>
<td></td>
</tr>
</tbody>
</table>

40.000.000 6.200.000 2.500.000 fish y⁻¹

References:


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

Legend

- Estuarine gradients
- Sluice
- Pump
- Culvert
- Locks
- SW inlet
- FW Seepage
- Open
- Planned
Kornwerderzand

Fish Migration River (planned)
Presentations on 22/6/2016
9:30 Roef Mulder
9:45 Wilco de Bruijne
<table>
<thead>
<tr>
<th>Fish</th>
<th>WS → LIJ RGM</th>
<th>LIJ → WS RGM</th>
<th>RGM FFM</th>
<th>RGM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eel</td>
<td>500</td>
<td>10.500.000</td>
<td>16.000</td>
<td></td>
</tr>
<tr>
<td>Herring</td>
<td>750.000</td>
<td>240.000</td>
<td>28.000.000</td>
<td></td>
</tr>
<tr>
<td>Smelt</td>
<td>350.000</td>
<td>9.700.000</td>
<td>23.000.000</td>
<td></td>
</tr>
<tr>
<td>Flounder</td>
<td>20.000</td>
<td>50.000</td>
<td>2.000.000</td>
<td></td>
</tr>
</tbody>
</table>

1.100.000 20.500.000 53.000.000 fish y⁻¹

Relative effectiveness of measures to strengthen diadromous fish stocks in the western Wadden Sea

<table>
<thead>
<tr>
<th>WADDEN SEA</th>
<th>LAKE IJSSEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduction Fisheries</td>
<td>Reduction Fisheries</td>
</tr>
<tr>
<td>Regular Discharge Mgt</td>
<td>Regular Discharge Mgt</td>
</tr>
<tr>
<td>Fish</td>
<td>Fish</td>
</tr>
<tr>
<td>Migration</td>
<td>Friendly Mgt</td>
</tr>
</tbody>
</table>

Fish numbers ("order of magnitude")

- River Lamprey
- Sea Lamprey
- Eel
- Herring
- Twaité Shad
- Smelt
- Sea Trout
- Houting
- 3S Stickleback
- Flounder

prognosis!
Migratory Fish Testing Facility Kornwerderzand

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

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
Potential measures to strengthen diadromous fish stocks in the Wadden Sea

1. Reduction fisheries Wadden Sea & Lake IJssel
2. Fish-friendly discharge management
3. Optimisation existing fish passages
4. Improvement critical habitats
5. Large brackish water areas
6. 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.