Hoogheemraadschap van Rijnland

Archimedes type fish passage creates an important new fish migration route at pumping station Halfweg

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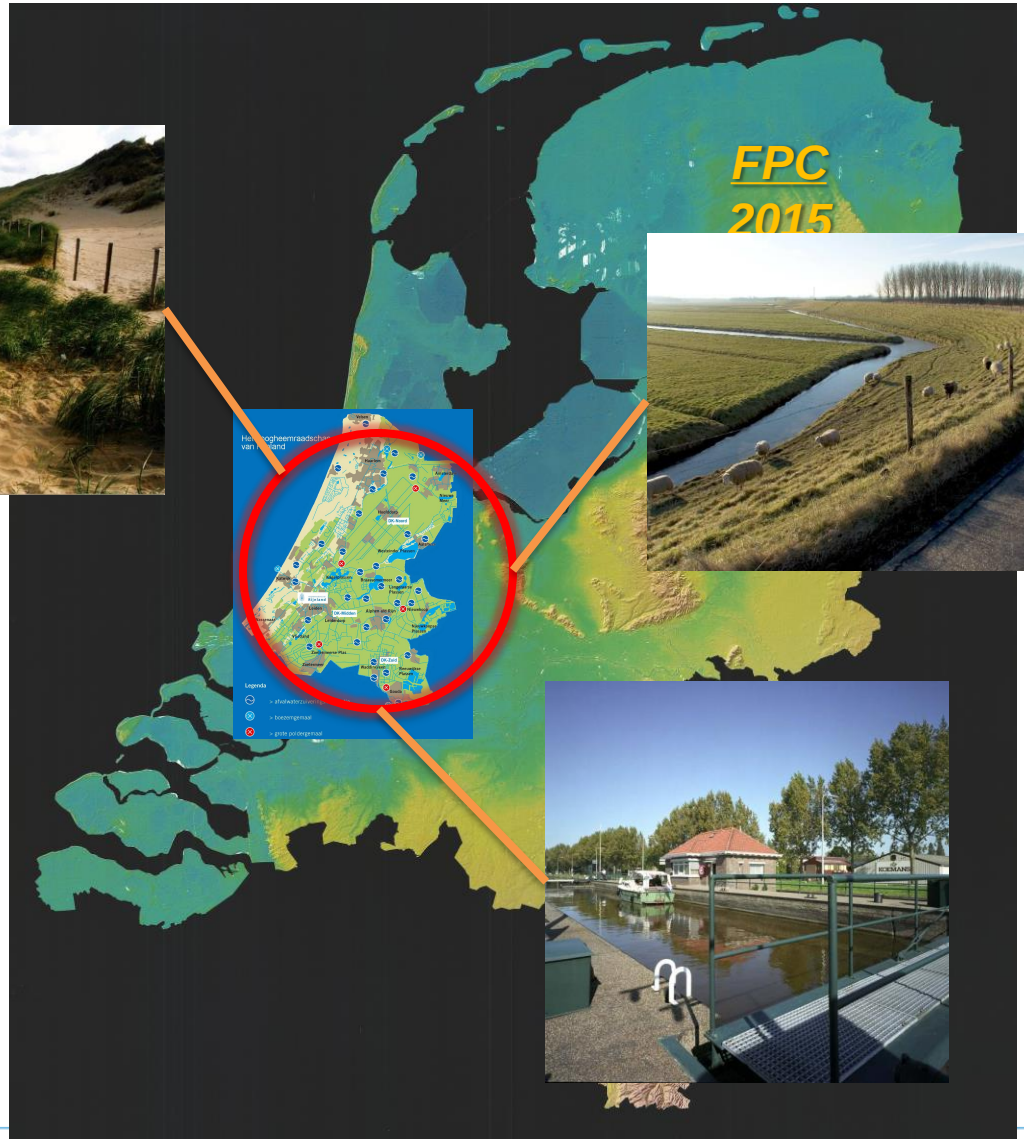
Outline

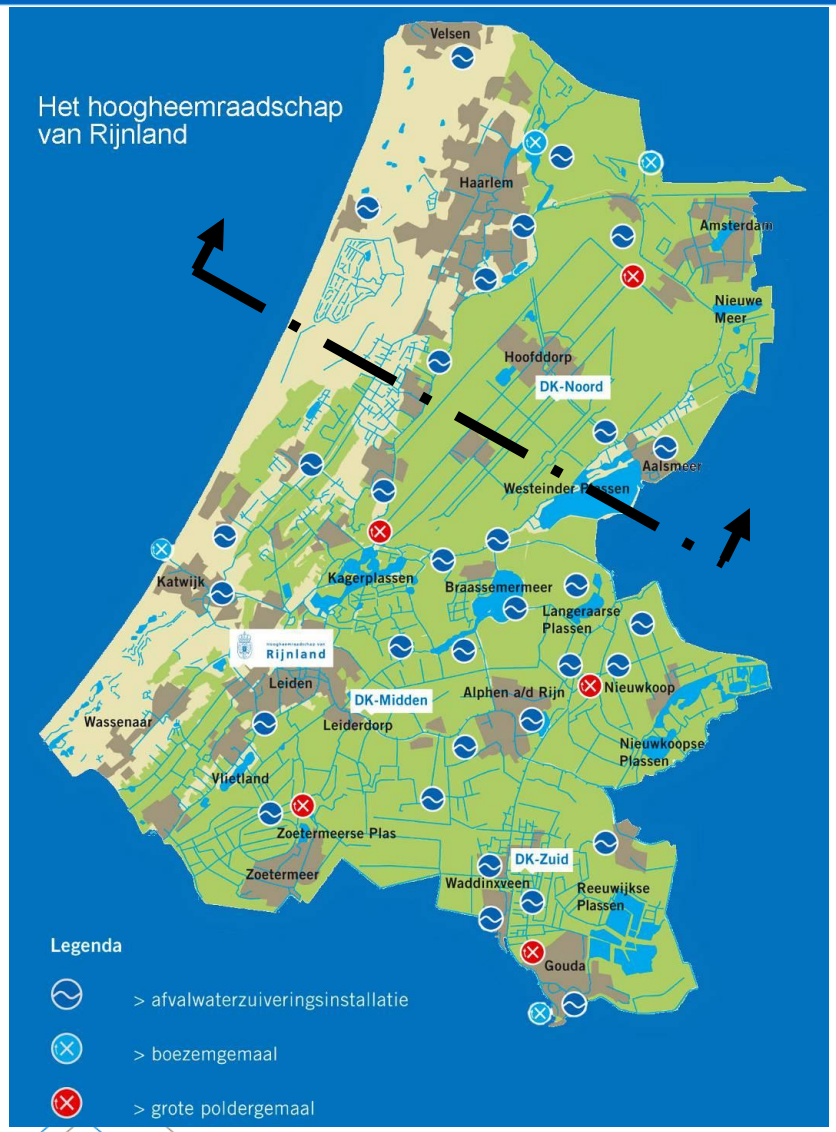
- Introduction area Water Authority Rijnland
- Problem of Fish Migration below sea level
- Policy in Fish Migration
- Situation at pumping station Halfweg
- Solution Archimedes type passage
- Monitoring Results

Water Authority Rijnland



Blue = area below sea level

Water Authority Rijnland



Facts and figures

- 1,070 km²
- 90% below sea level
- 206 polders
- **1.3 million inhabitants**
- 0.5 million households

Protected by (dyke-nation)

- 82 km primary dunes/dykes
- 1.277 km secondary regional polder-dykes

Water management

- **100 km² surface water**
- 10905 km waterways

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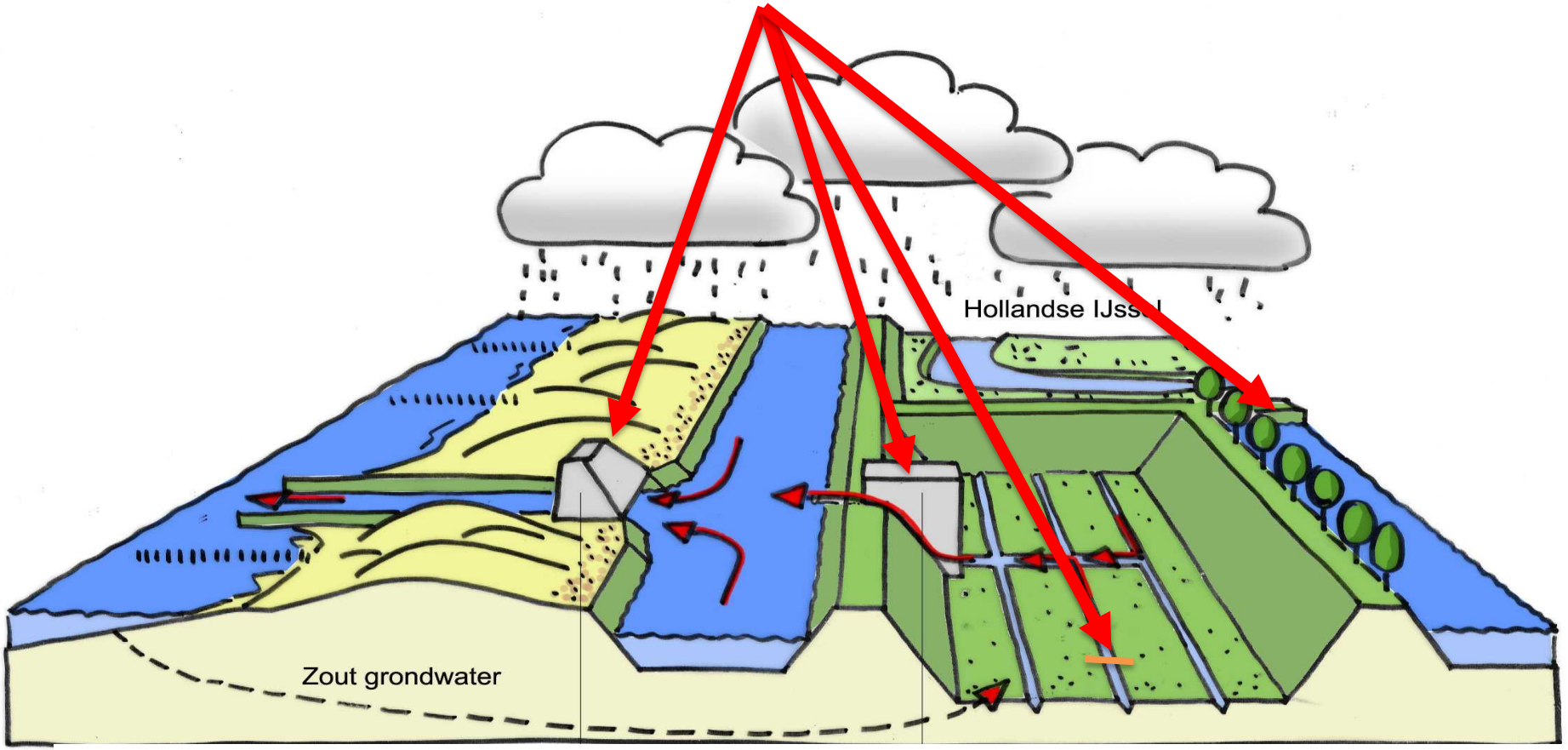
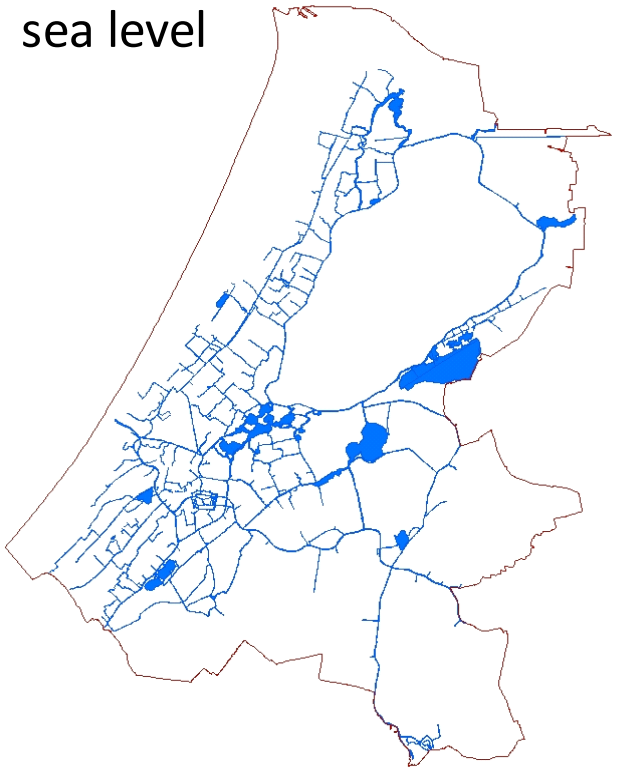
Migrating Fish → barriers



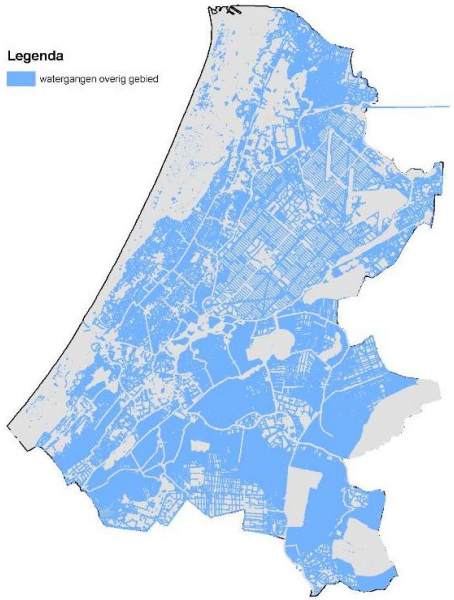
Sea Dunes Storage Basin Polders and ditches

Living area for fish in Rijnland

- Storage Basin (primary) : 50 km²
- Open system; - 0,61cm below sea level



- Secondary water courses
- 206 polders ; > - 0,61cm;
- Up to - 5 meter below sea level
- 8.000 km ditches and small canals; 50 km²



Fish Migration Policy

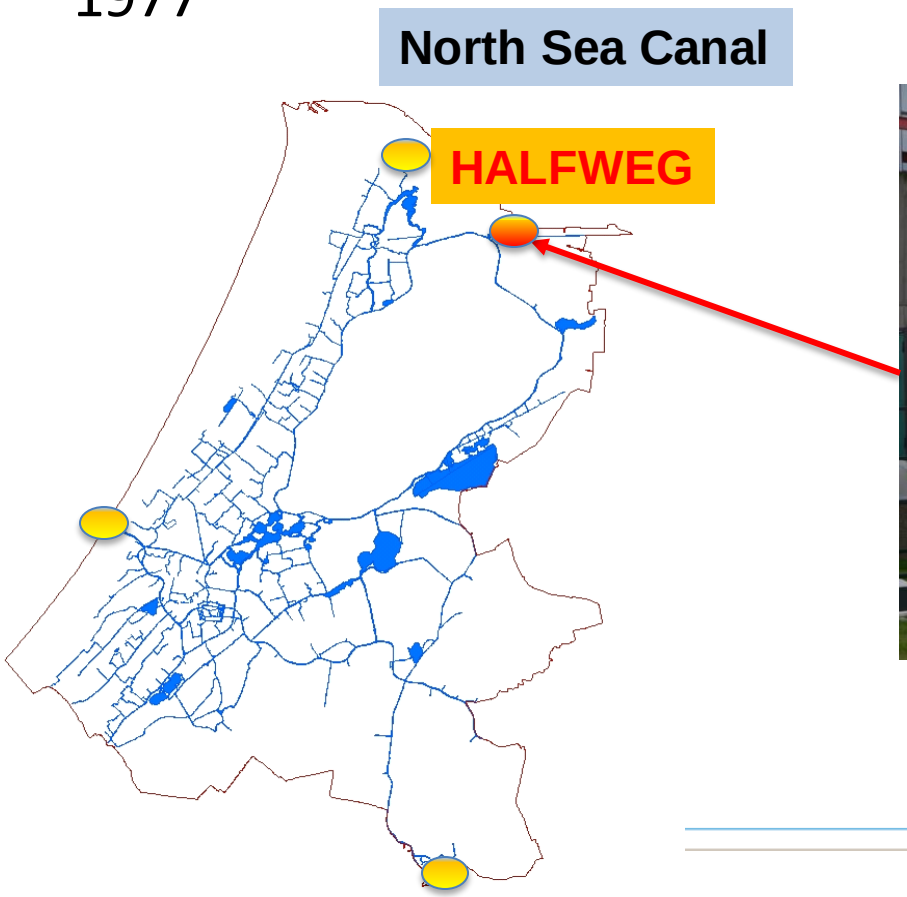
100 km^2 living area for fish

Our challenges is to improve connectivity:

- Remove bottlenecks between salt and fresh water
- Enlarge the living area for migrating fish
- Create accessible spawning areas
- Enlarge living area for fresh water species

Focus on bottleneck Pumping station Halfweg

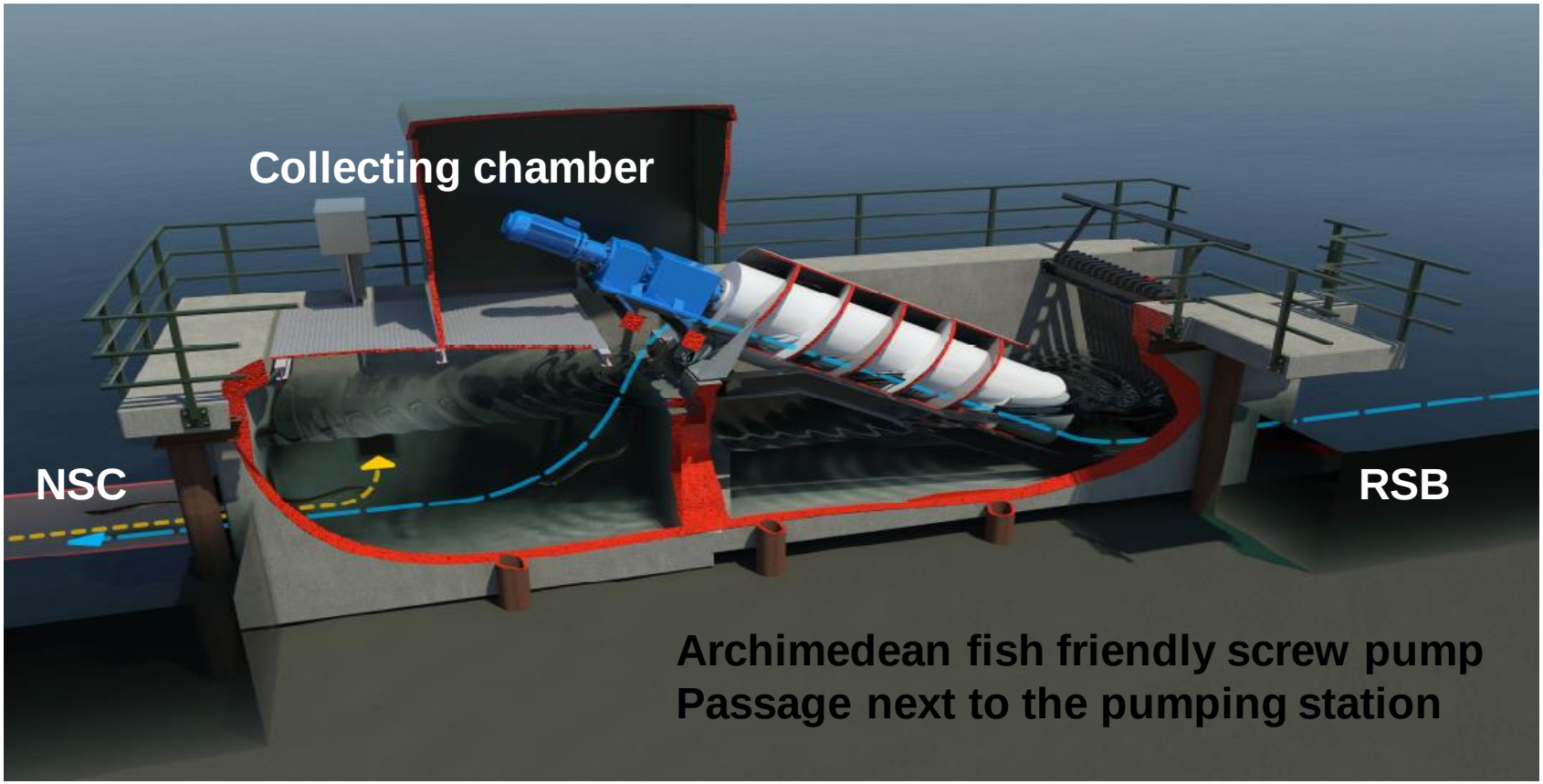
- Between Rijnland storage basin and North Sea canal since 1977



Challenge to overcome at Halfweg

- Difference in salinity between North Sea Canal (brackish) and Rijnland storage basin (fresh water)
- Difference in water levels for safety reasons (low land polders)
  - North Sea Canal – minus 0,41 cm below sea level
  - Rijnland storage basin – minus 0,61 cm below sea level
- Migrating fish encounters barrier (pumping station) from canal zone to storage basin
  - Eel, stickleback
  - Other species

Solution for fish migration at Halfweg (cross section)



Halfweg Spring Migration

Monitoring

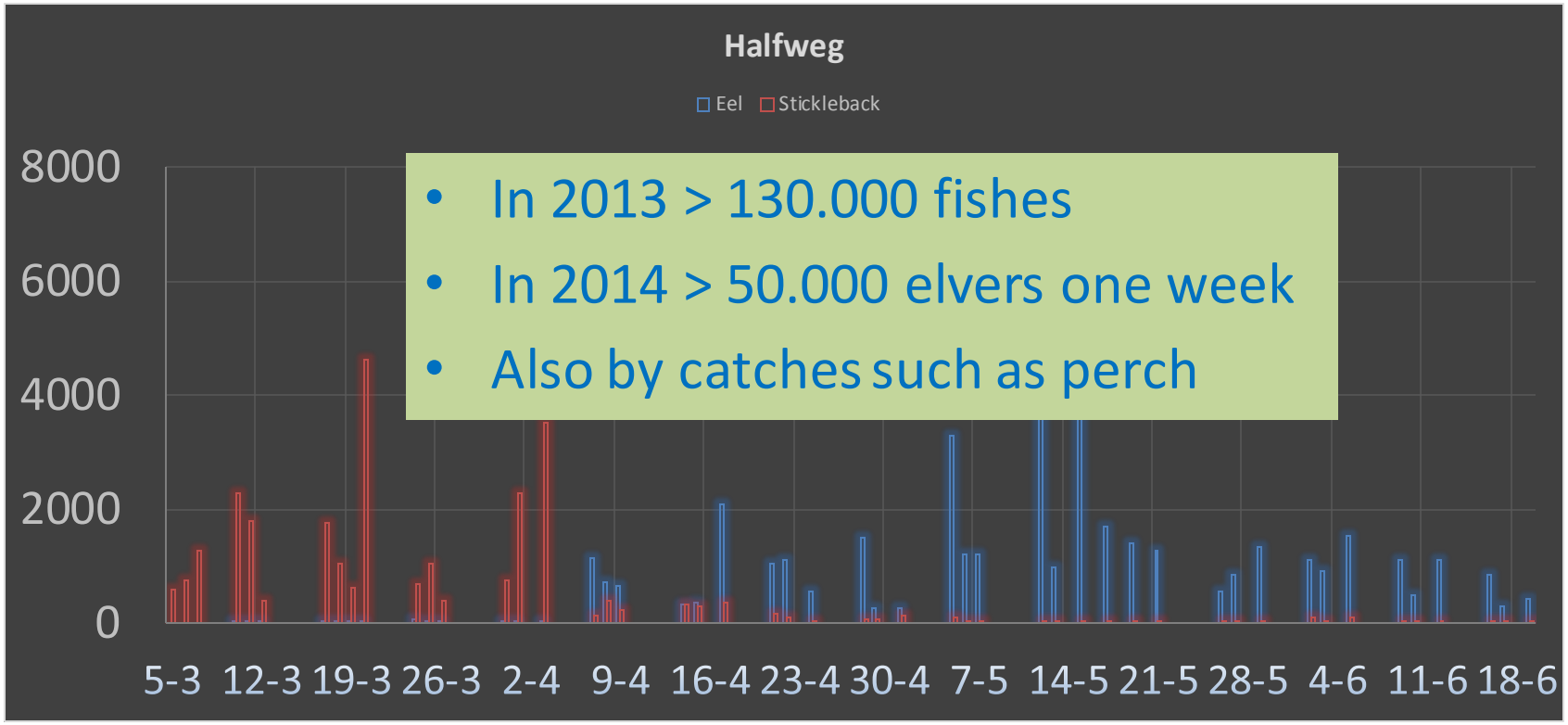
Fine meshed fyke

Elvers

3 nights/week

Stickleback

Result: spring migration 2015



- In 2013 > 130.000 fishes
- In 2014 > 50.000 elvers one week
- Also by catches such as perch

Results: autumn migration

Fish passage

Pumping station

Go with the flow
fish friendly pumps

Conclusions

- The Archimedean type fish passage at pumping Station Halfweg successfully removed a barrier for fish migration especially in spring
- Optimalization and attracting more fish may occur through:
  - Changes in pumping regime (longer)
  - Better following the natural day/night cycle
  - Efficiency/performance studies
- Long term monitoring is needed to see the actual effects on fish populations, especially eel (as an endangered species) and the ecology in the area (food chain) as a whole

Any ?

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