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Case Studies V: Fish Migration River: Monitoring Plan after Construction

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Fish Migration River - Monitoring plan after construction

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Fish Passage Conference 22-06-2016, Amherst

[1]Province of Friesland/ LINKit Consult
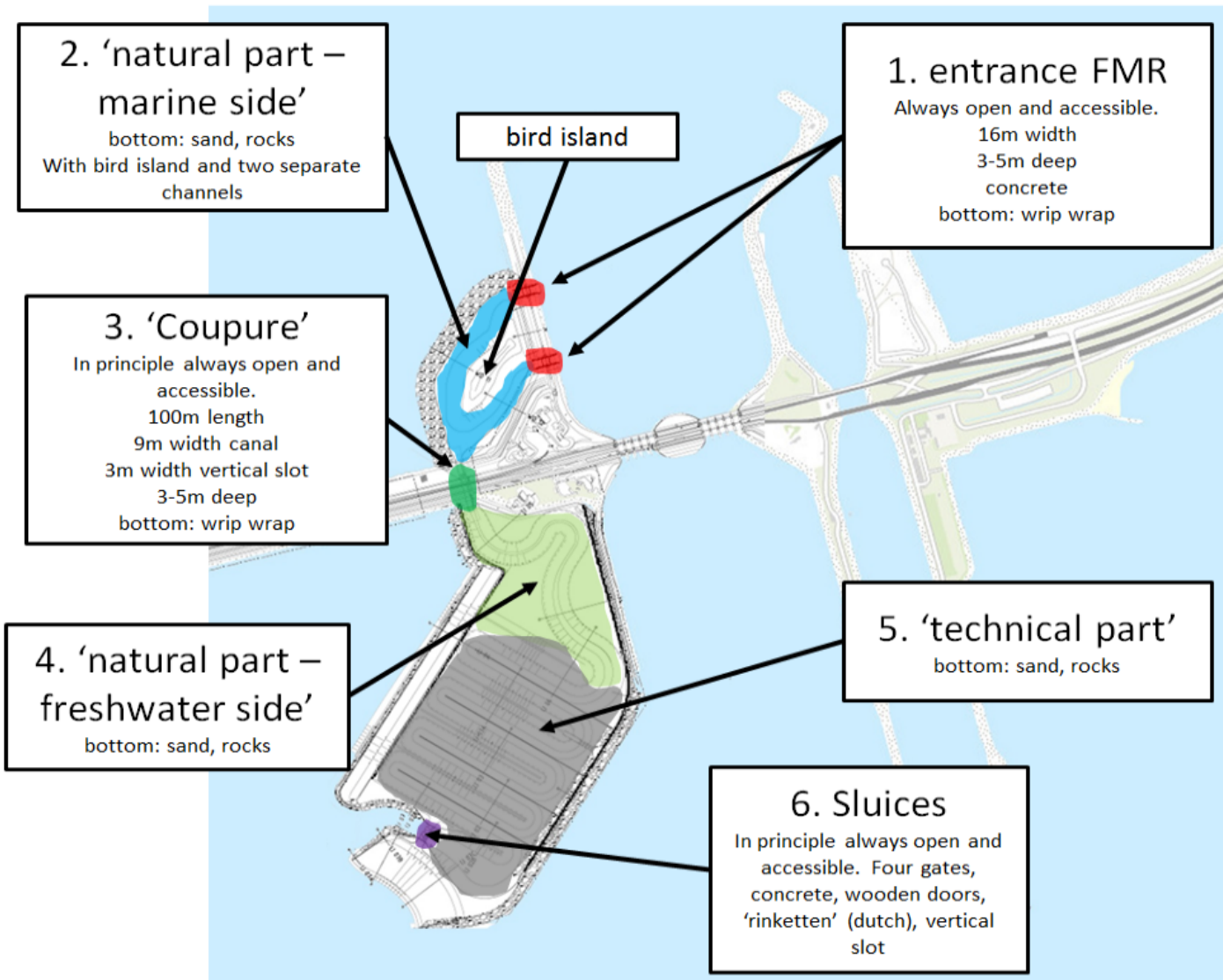[2]Wageningen University and Research Centre/ Imares

Presentation outline

1. Project Fish Migration River
2. Target species
3. Current fish migration opportunities
4. Monitoring questions
5. Monitoring methods
6. Proposed program
7. Research facility
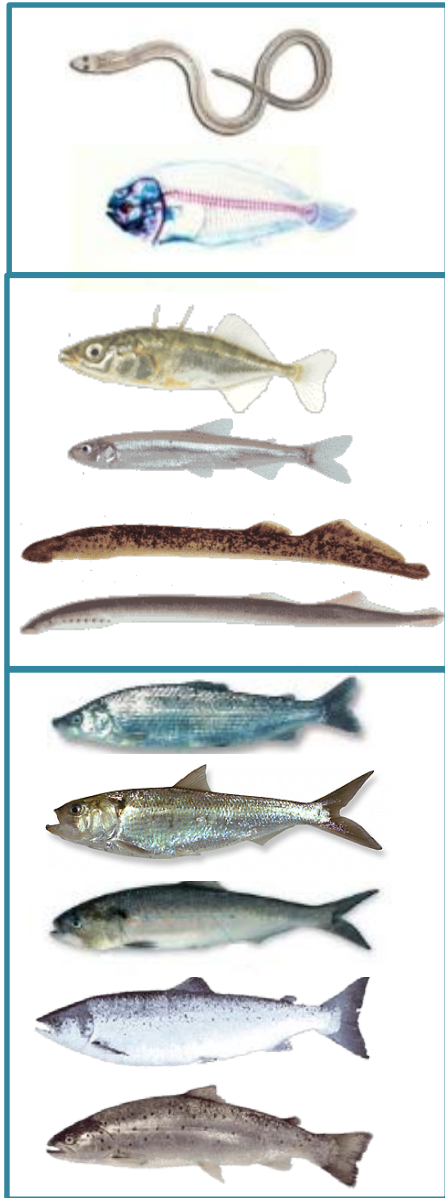8. Planning

1. Project Fish Migration River

- Afsluitdijk (closure dike) between Lake IJssel & Wadden Sea
- Tidal river fishway;
- Estuarine conditions;
- 5 km in length, 25m in width.

1. Project Fish Migration River

2. 'natural part – marine side'
bottom: sand, rocks
With bird island and two separate channels

bird island

1. entrance FMR
Always open and accessible.
16m width
3-5m deep
concrete
bottom: wrip wrap

3. 'Coupure'
In principle always open and accessible.
100m length
9m width canal
3m width vertical slot
3-5m deep
bottom: wrip wrap

4. 'natural part – freshwater side'
bottom: sand, rocks

5. 'technical part'
bottom: sand, rocks

6. Sluices
In principle always open and accessible. Four gates, concrete, wooden doors, 'rinketten' (dutch), vertical slot

2. Target species Fish Migration River

1. 3 groups of diadromous species

   A. Tidal migrants (passive transport)
      - European eel (juvenile stage);
      - Flounder Larvae;

   B. 'Poor' swimming capacity
      - Three spined stickleback (semi passive transport);
      - Smelt (semi passive transport);
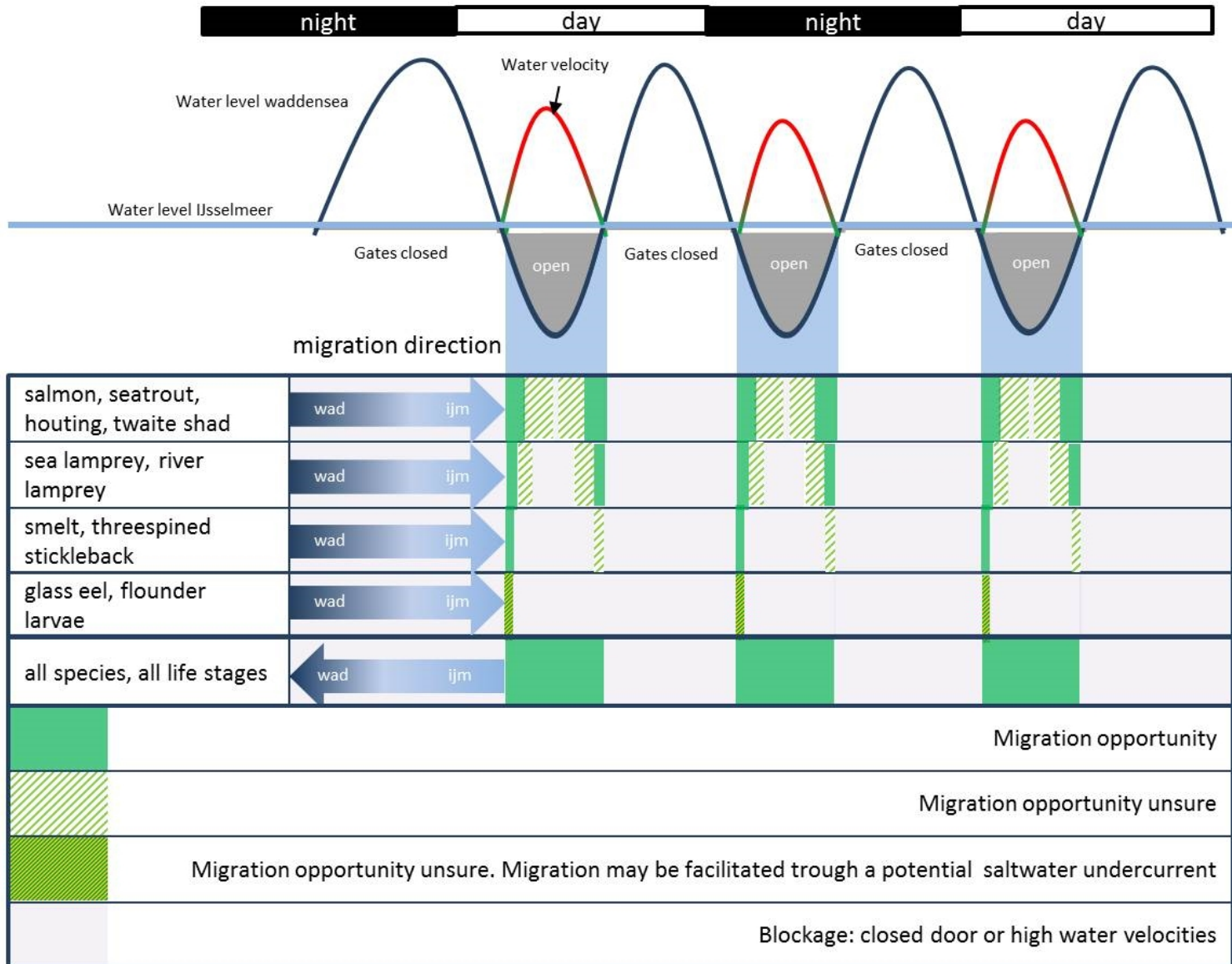   - Sea lamprey;
      - River lamprey;

   C. 'Strong' swimming capacity
      - North Sea Houting;
      - Twaite shad;
      - Allis shad;
      - Atlantic salon;
      - Sea trout;

2. Estuarine species

3. Fresh water species

3. Current fish migration opportunity's

4. Research questions monitoring plan

Q1: What is the overall passage efficiency of the Kornwerderzand complex per target species?
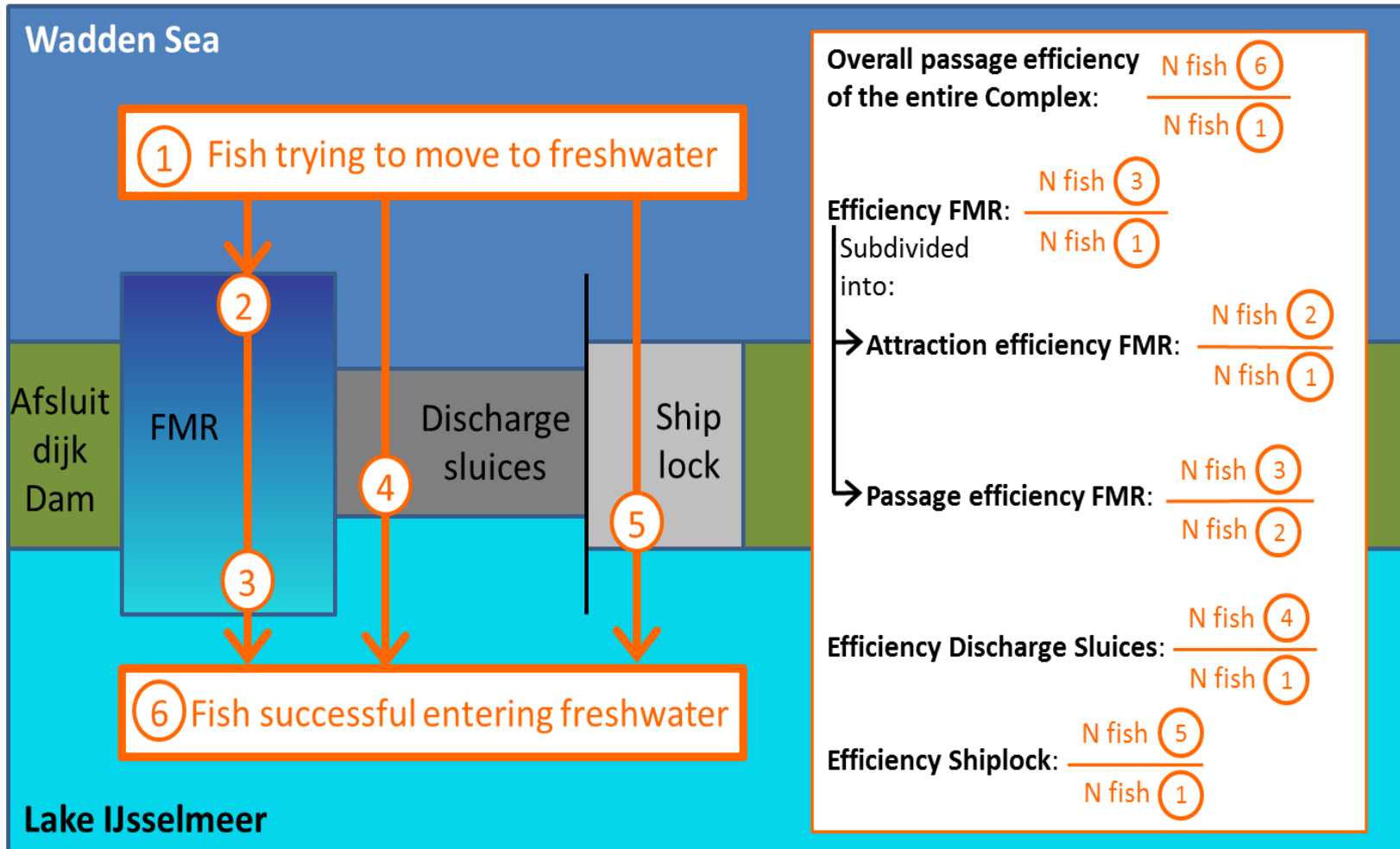
Q2: Is there a need for optimizing the functioning of the FMR and how can this be achieved?

Q3: Is the FMR also used as a habitat by fish and its predators?

Q4: What is the effectiveness of the FMR on fish population levels?

4. Research questions monitoring plan

*Q1: What is the overall passage efficiency?*

5. Monitoring methods

- Combination of direct and indirect measurements.
- Tracking individuals with telemetry (large fish):
  - Acoustic telemetry (Vemco)
  - RFID telemetry (Nedap)
  - RFID telemetry (PIT-tag)
- Indirect (small fish):
  - Visual (Vaki/fish counter/Infra red)
  - Acoustic (Didson/Aris)
  - Trapping (fyke nets)
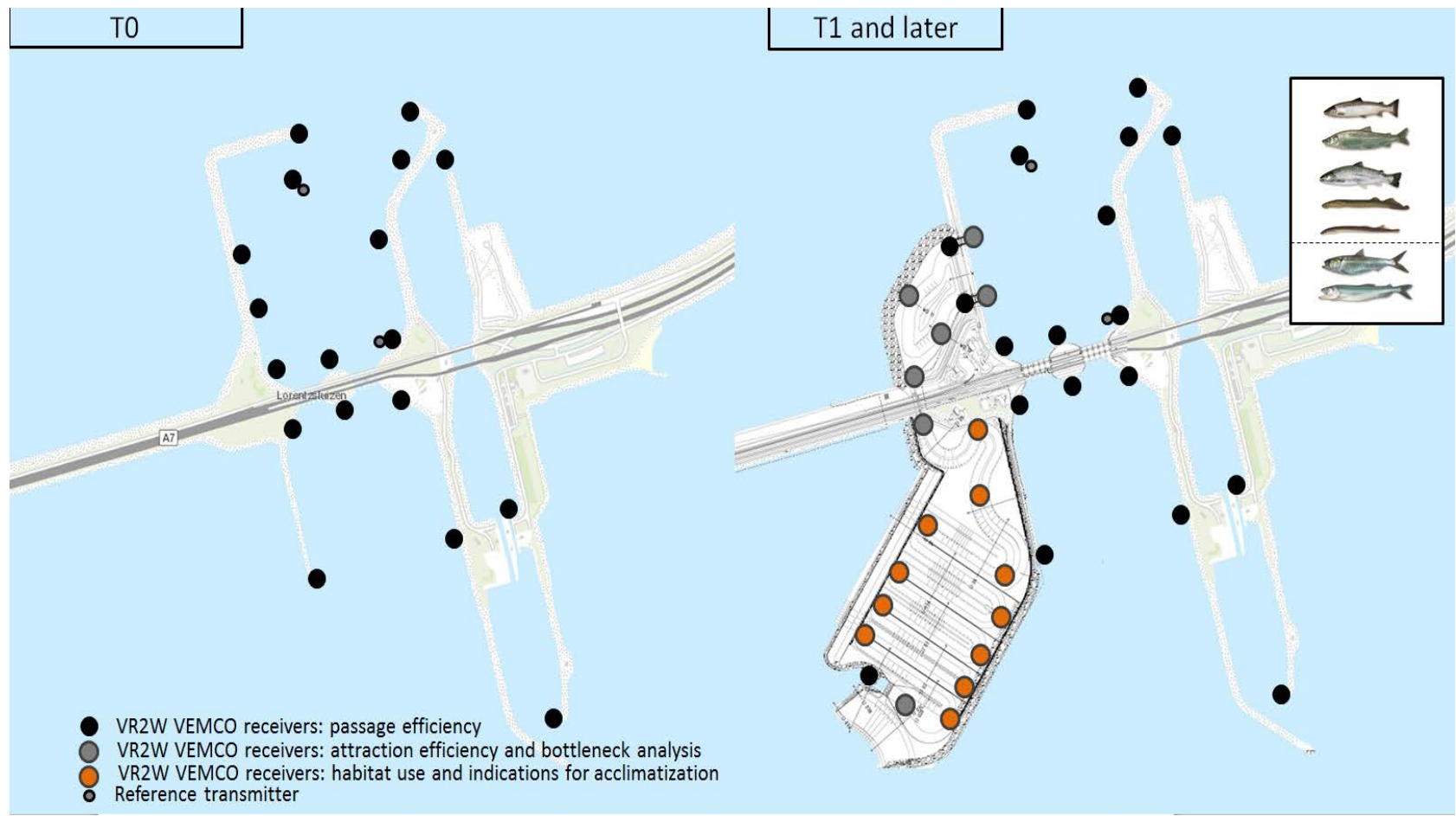 - Lift nets
  - Beach seine

6. Proposed program

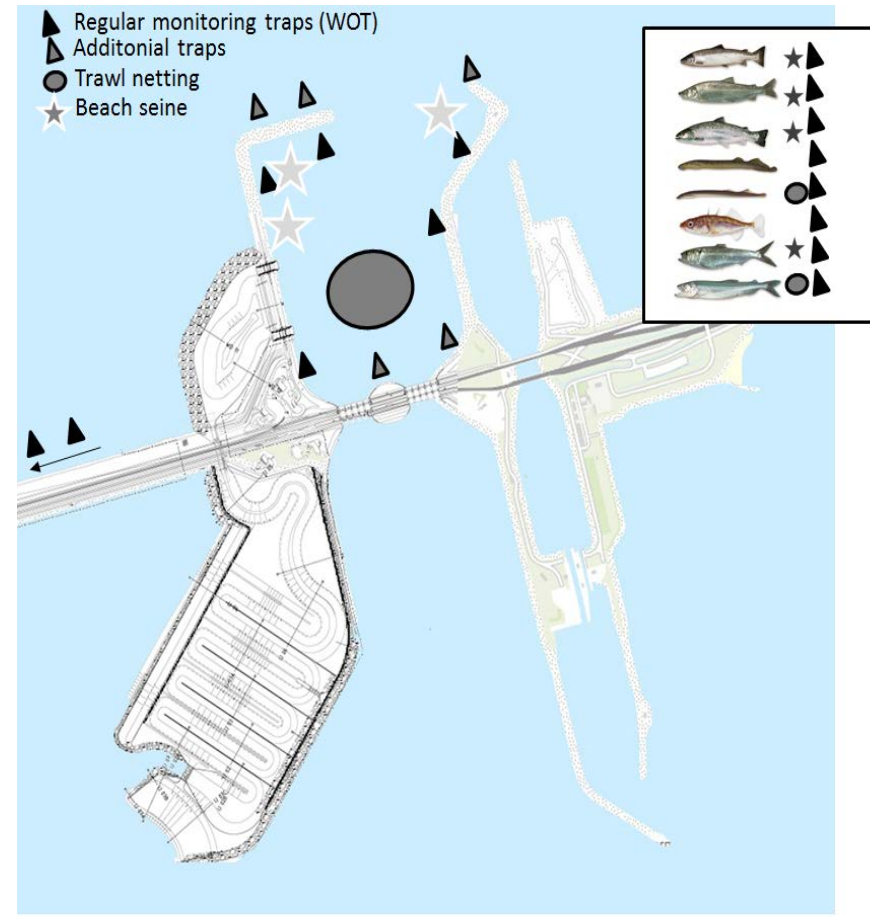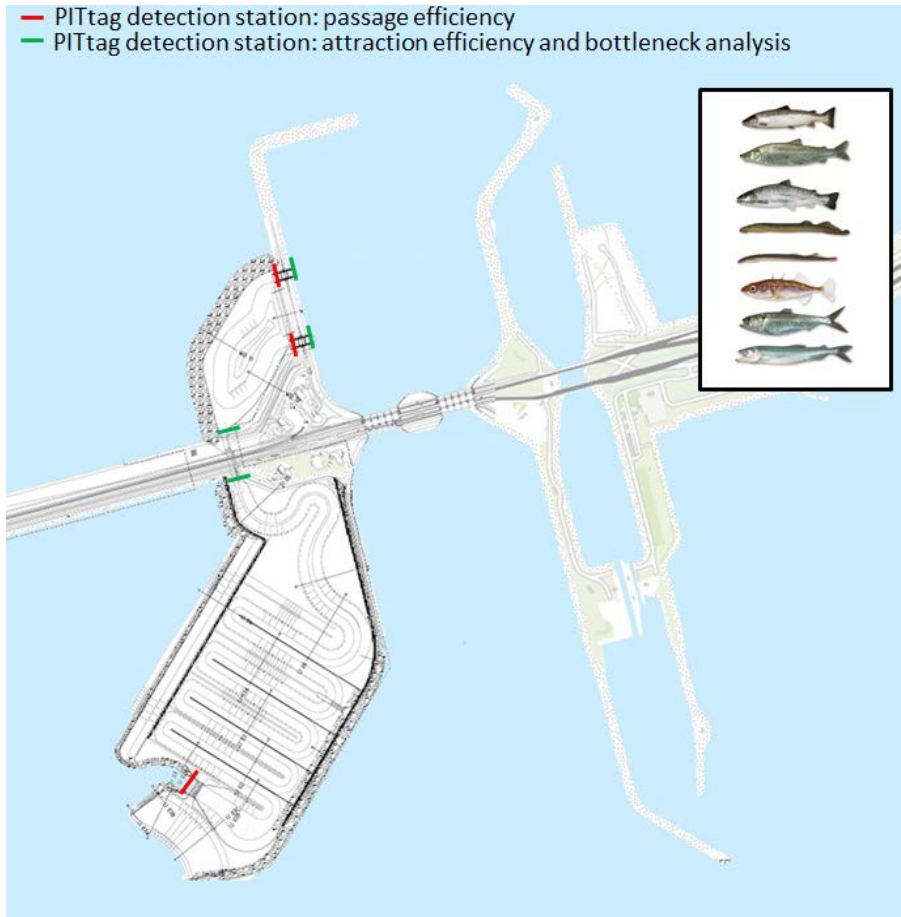- T0 Pre construction and T1 and later.
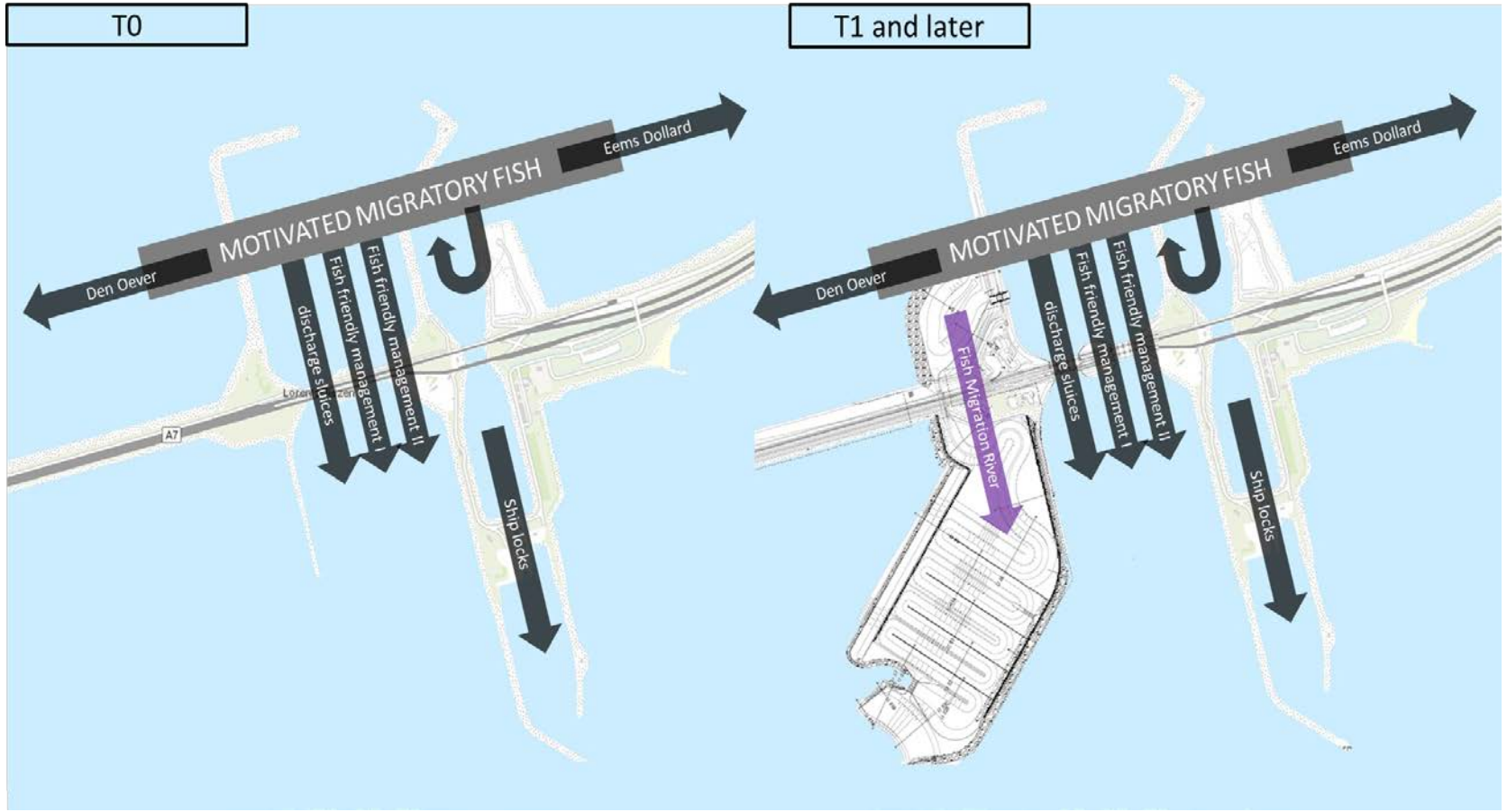
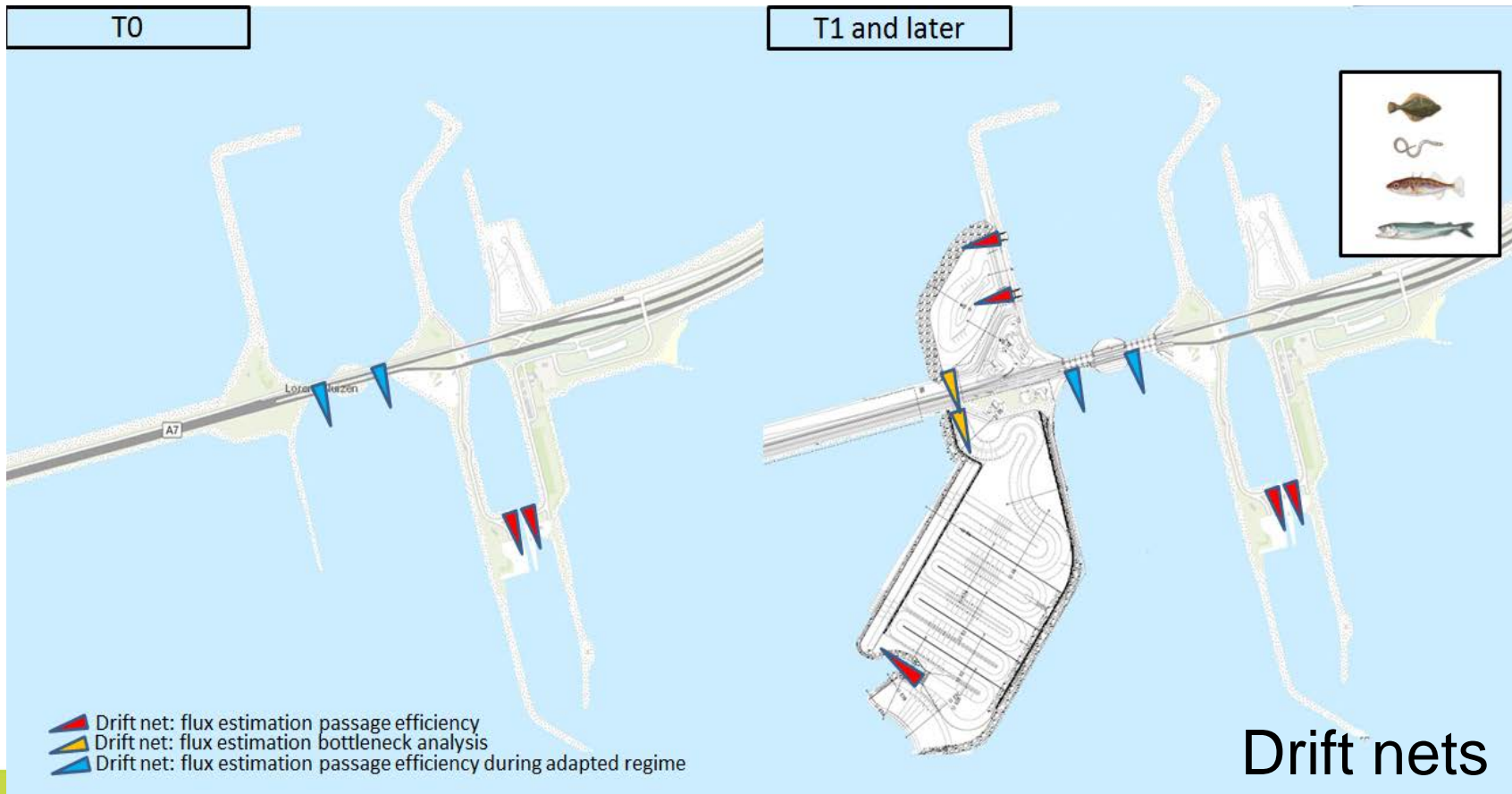# 6. Proposed program

- Example set up direct measurement Q1: Vemco

6. Proposed program

- Example set up direct measurement Q1: PIT-tag (left)
- Catching methods test fish for telemetry purposes (right)

PITtag detection station: passage efficiency
PITtag detection station: attraction efficiency and bottleneck analysis

Regular monitoring traps (WOT)
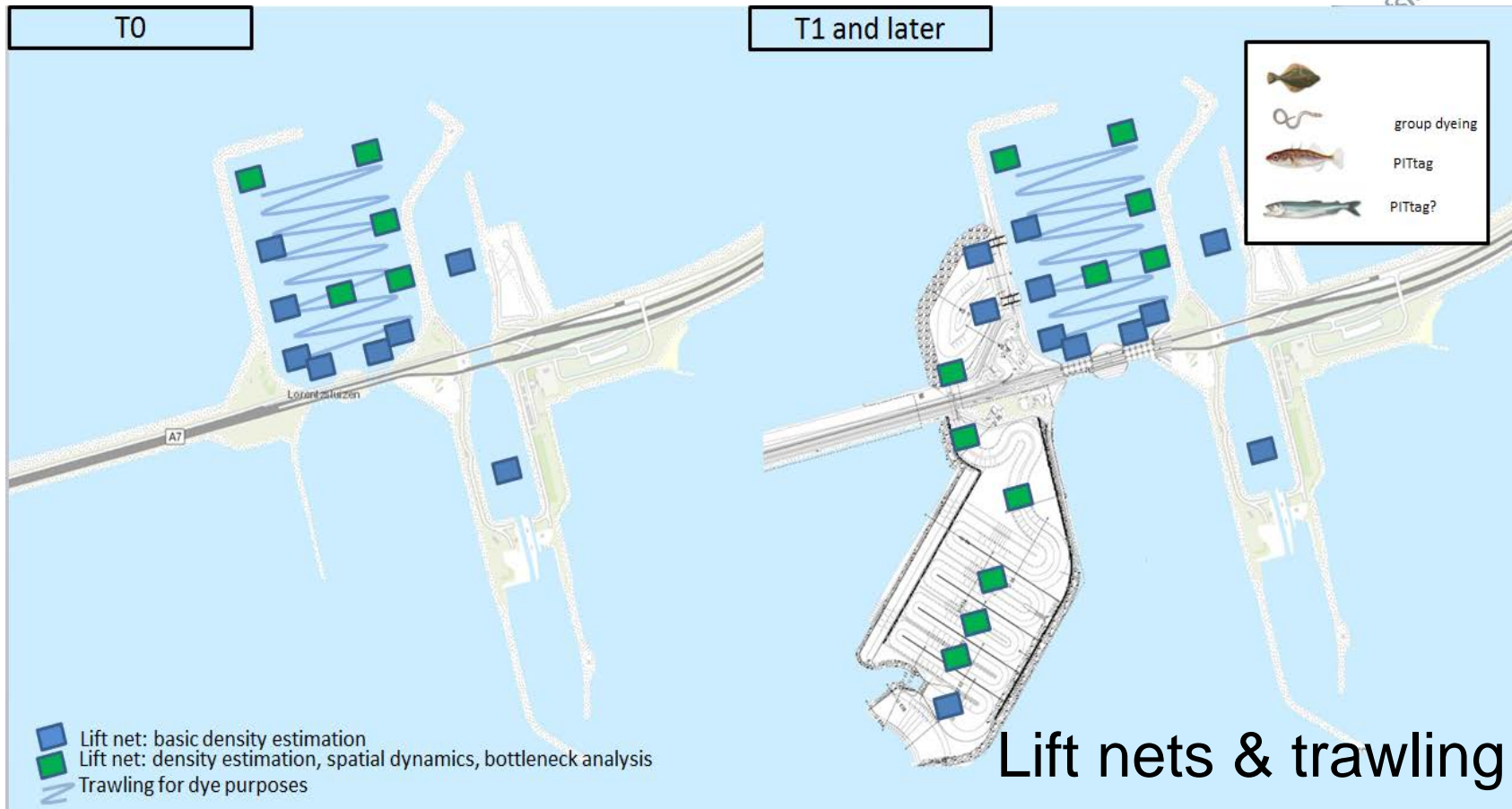Additonial traps
Trawl netting
Beach seine

6. Proposed program

- Example set up indirect measurement Q1: extensive netting program in combination with mark & recapture experiments
- Drift nets, lift nets & trawling

T0

T1 and later

Drift net: flux estimation passage efficiency
Drift net: flux estimation bottleneck analysis
Drift net: flux estimation passage efficiency during adapted regime

Drift nets

6. Proposed program

Lift nets & trawling

- Indication of delay, spatial dynamics and passage success for smaller fish, i.e. glass eel, stickleback, smelt and flounder larvae.

7. Research facility

- Little information available in literature on fish migration in the Wadden Sea.
- Parallel canals to perform on-site species specific research on:
  - o Swimming capacity
  - o Migration behaviour
- Controlled conditions for multiple parameters a.o. flow velocity, Q, entrance depth, substrate etc.
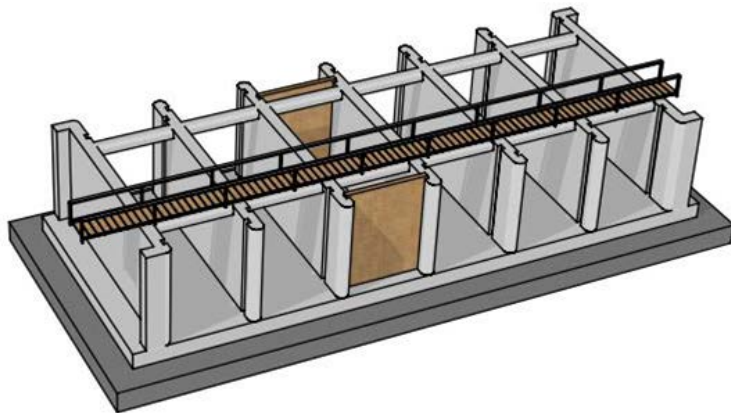

Flume BAW Karlsruhe. Photo: Wilco de Bruijne

Beleef het DNA van Nederland

8. Planning

T0 pre construction phase		construction phase	T1 after construction			
T-2	T-1	T0	T1	T2	T3	T4
Administration (e.g. permits)	Administration (e.g. permits)	no extensive measurements	Administration (e.g. permits)	Administration (e.g. permits)	Administration (e.g. permits)	Administration (e.g. permits)
Contracts fisherman	pilots method developing PITtag	pilots method developing PITtag	telemetry	telemetry	telemetry	telemetry
Pilot handling fragile fish (smelt, twaite shad, etc) for different purposes (VIE, VEMCO PITtag)	telemetry	optional: acclimatization experiments (ex situ)	extensive netting program	extensive netting program	extensive netting program	extensive netting program
Installing VEMCO receivers	extensive netting program	optional: pilot handling fragile fish (smelt, twaite shad, etc) for different purposes (VIE, PITtag)	mark recapture	mark recapture	mark recapture	mark recapture
Telemetry	mark recapture		PIT-tagging	PIT-tagging	PIT-tagging	PIT-tagging
Extensive netting program				Bottleneck analysis based upon (preliminary) results	Bottleneck analysis based upon results	Bottleneck analysis based upon results
Mark recapture						
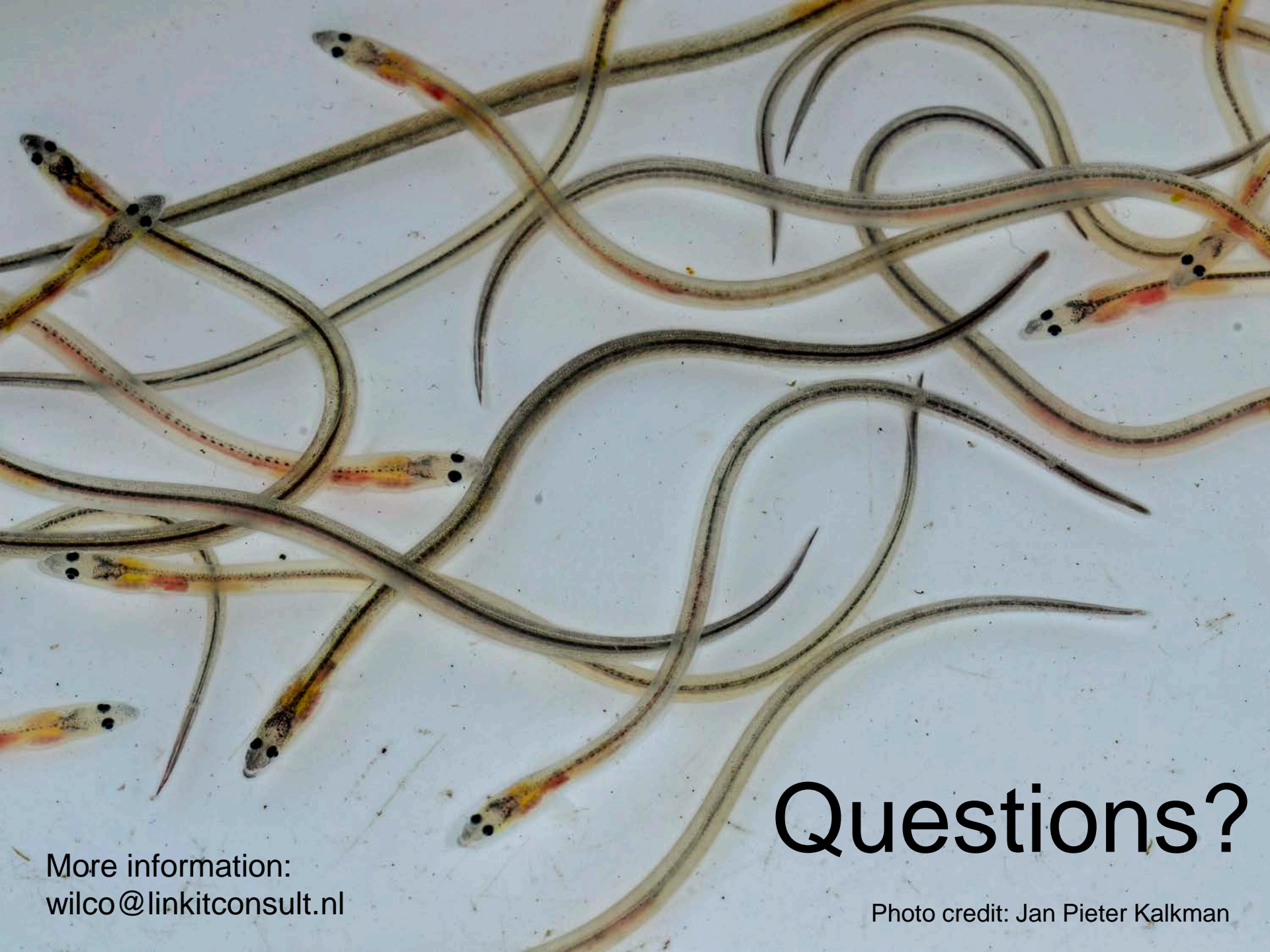
Questions?

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Photo credit: Jan Pieter Kalkman