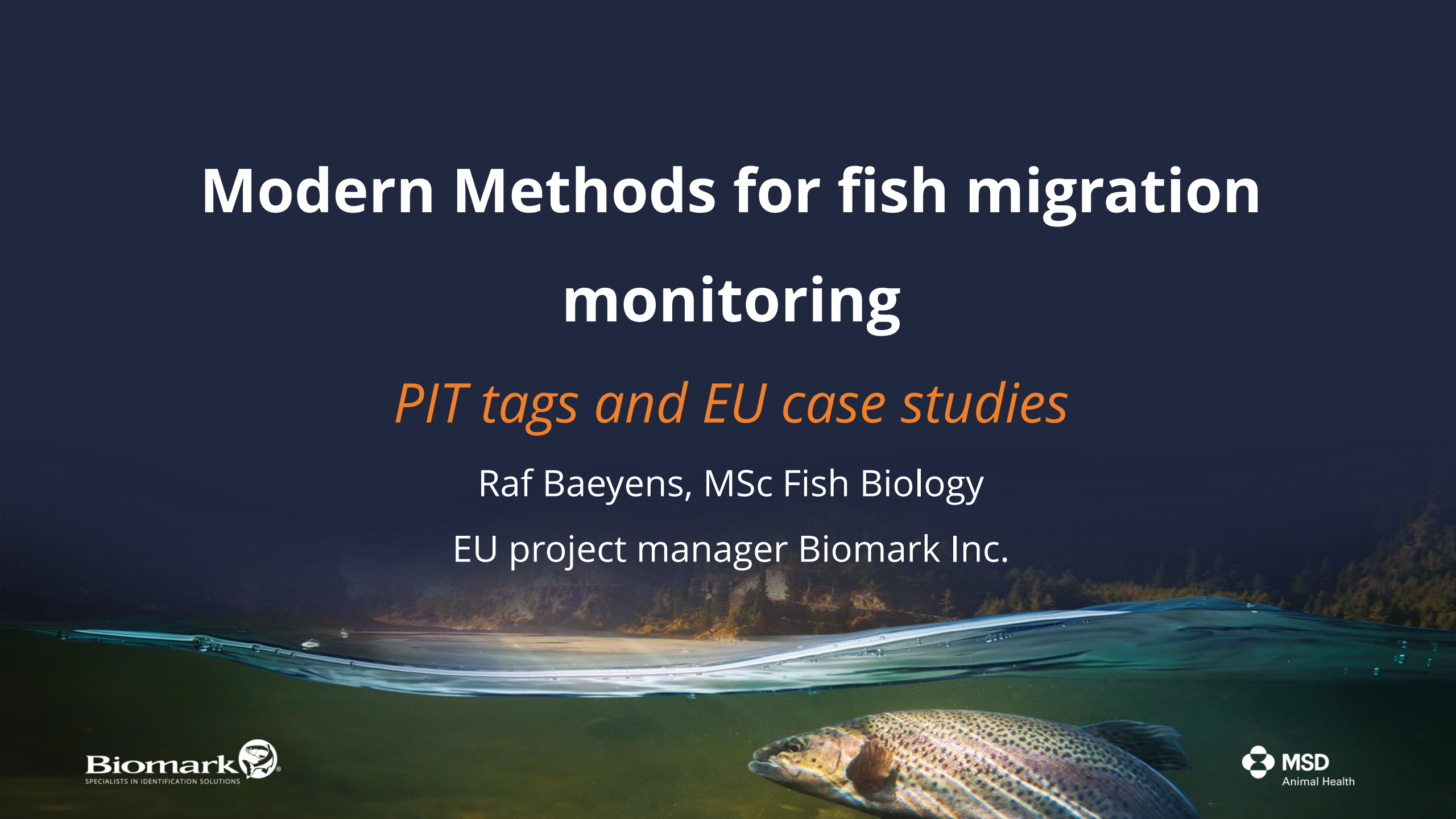
Modern Methods for fish migration monitoring

PIT tags and EU case studies

Raf Baeyens, MSc Fish Biology

EU project manager Biomark Inc.



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Content

- Intro
- Fish migration monitoring methods
- EU Case studies:
  - Austria
  - Germany
  - Other systems around Europe
- Take home message

Fish migration monitoring methods

- Nets/cages
- Camera systems
- Tagging:
  - Active tags (radio, acoustic)
  - Passive tags (**PIT tags**)

Fish migration monitoring methods

NETS/CAGES

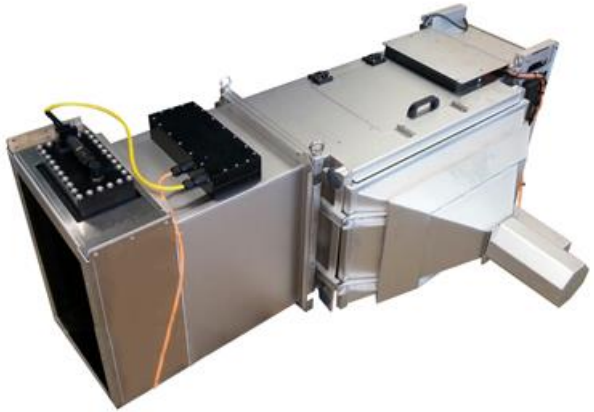
(Photo Lee Baumgartner NSW DPI)

- Easy
- Tagging still possible
- Relatively cheap

- Fish welfare
- Recurrent behavior
- Debris maintenance
- Fish vs mesh size

Fish migration monitoring methods

CAMERA SYSTEMS (VAKI RIVERWATCHER)



- VAKI: realtime data
- Video + IR Scanner (turbid/dark)
- PIT antenna possible
- Vertical slot fishways

- Derive all fish to tunnel
- Recurrent behavior
- Debris vs mesh size
- Not for small fish
- maintenance

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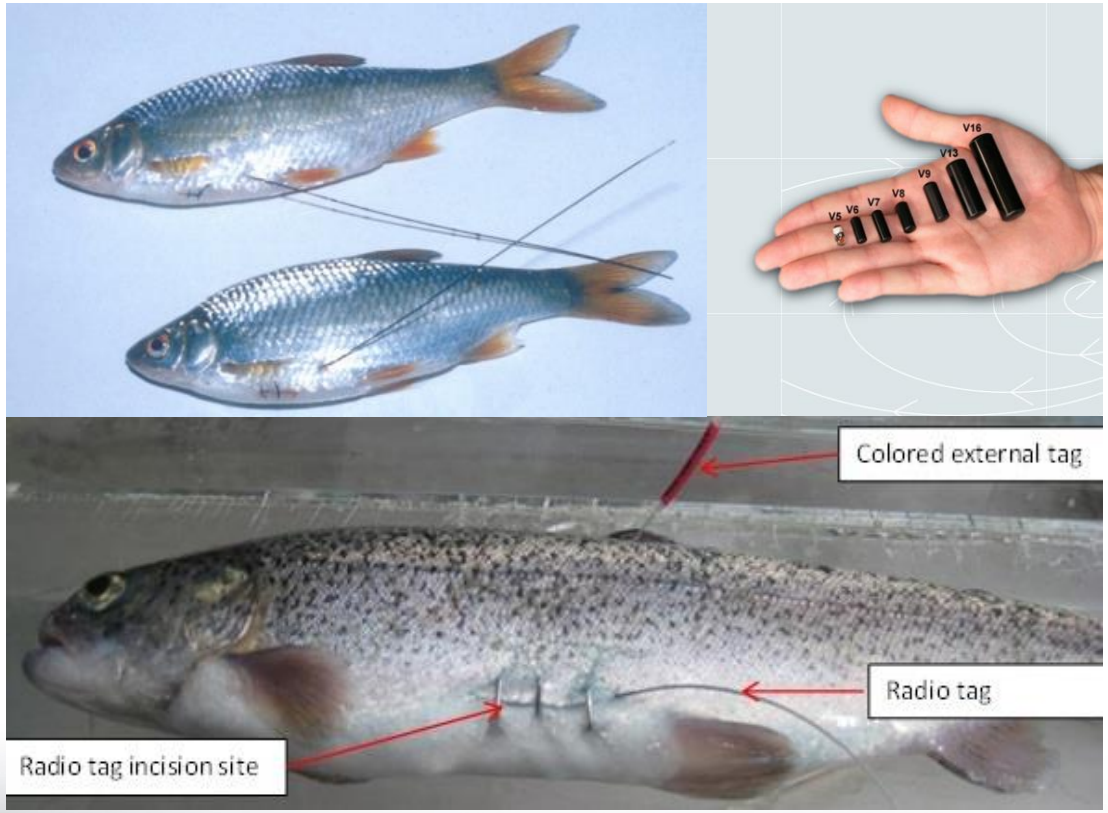
Fish migration monitoring methods

TAGGING WITH ACTIVE TAGS



https://fishaz.azgfd.com/

- Long range (acoustic)
- Deep water (acoustic)
- Salt water (acoustic)
- Sensor tags (predation, depth)
- Continuous tracking (radio)

- Fish welfare (surgery, ext. ant.)
- Expensive tags
- Battery life vs tag size
- Detailed info hard with acoustic
- Realtime data difficult
- System performance?

Fish migration monitoring methods

TAGGING WITH PASSIVE TAGS (PIT)

- Small tags (5g fish)
- Cheap tags
- Injectable (welfare)
- Tag ‘lives’ forever
- Individual unique code
- Real time data possible
- Antenna performance diagnostics
- Low maintenance

- Limited depth
- Antenna design
- Initial investment

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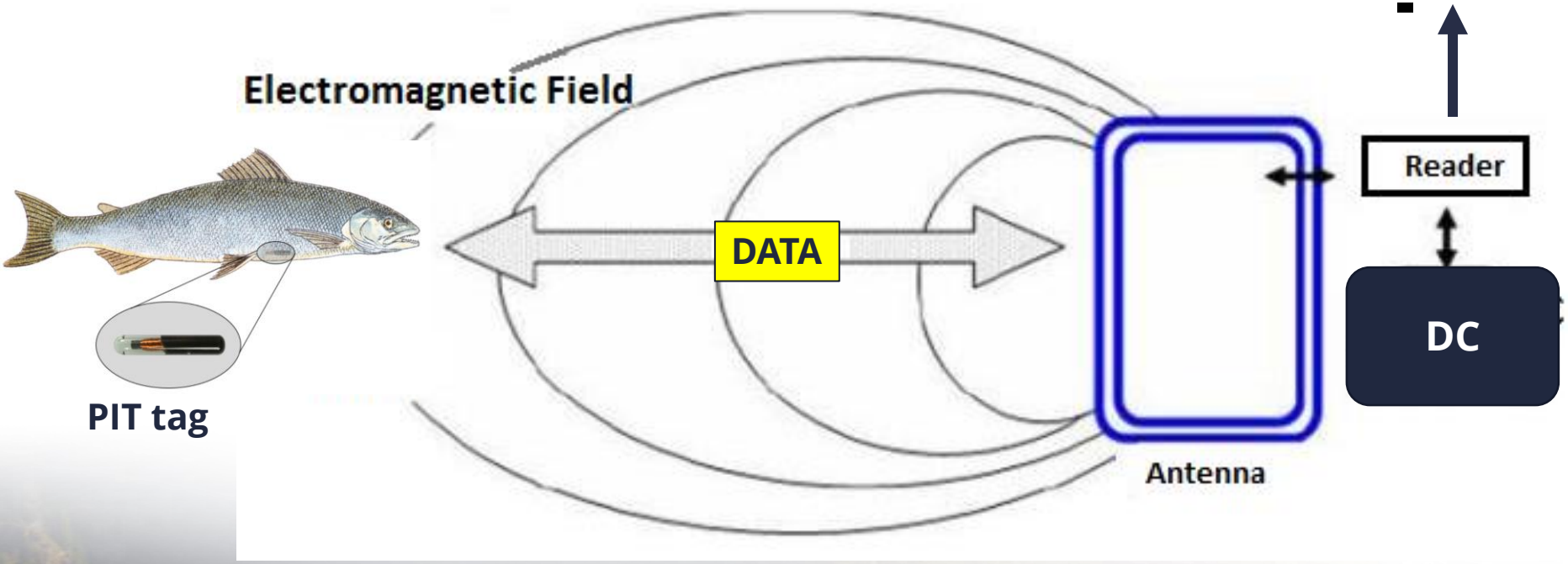
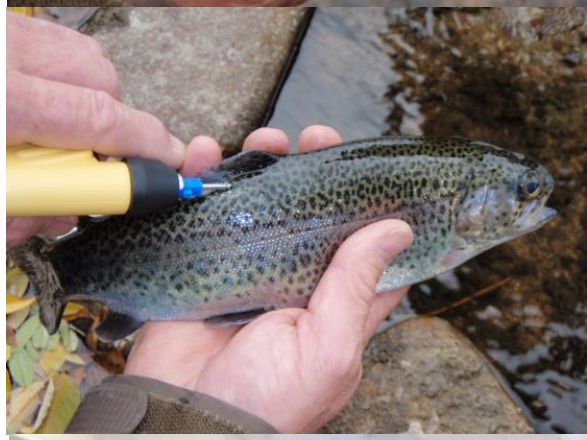
Fish migration monitoring methods

TAGGING WITH PASSIVE TAGS (PIT)

Working Principle





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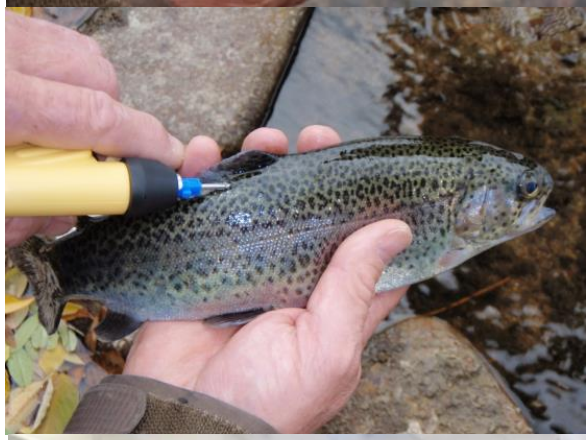
Fish migration monitoring methods

TAGGING WITH PASSIVE TAGS (PIT)

Data are essential

- Unique tag ID’s (ISO, ICAR)
- Data storage local (USB/reader) or remote (realtime)
- System performance data
- Notification emails (tags of interest, alerts)



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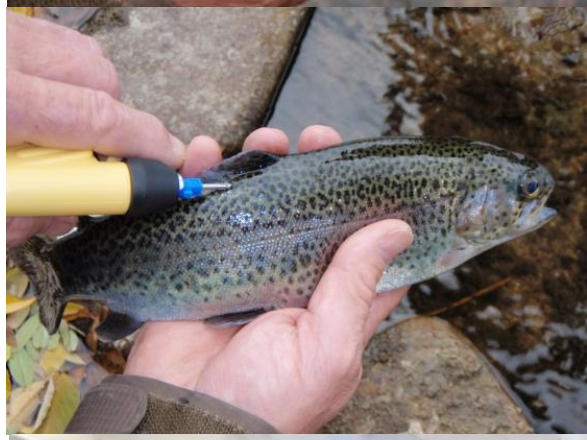

Biomark Site Module

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SITE MODULE   My Sites   Files   Search Tag   raf.baeyens@merck.com

Altenworth Photovoltaic East (9A2)

Subscription ends: 01-01-2023

Site Status

LAST UPDATE
10-20-2021 07:36 CEST

Environmental Variables

WATER	TEMP (C) N/A	LEVEL (M) N/A
AIR	TEMP (C) N/A	
TURBIDITY	NTU N/A	

Test Tags

Latest detection: Oct. 20, 2021, 7:20 a.m.
Tag: 3E7.0000001D08

Live Tags

Latest detection: Oct. 19, 2021, 5:42 p.m.
Tag: 3DD.003D41D729
Tag count: 5,629

Site Info | Trends | Tags | Alerts | Users | Status

FROM: 20/09/2021 TO: 21/10/2021 DECIMAL: TEST TAGS: Go

Detections

Site	Date/Time	Controller	Antenna	Signal
3DD.003D41D729	10-19-2021 05:42 PM	01	05	N/A
3DD.003D41D729	10-19-2021 05:42 PM	01	05	N/A
3DD.003D41D729	10-19-2021 05:42 PM	01	05	N/A
3DD.003D41D729	10-19-2021 05:42 PM	01	05	N/A
3DD.003D41D729	10-19-2021 05:42 PM	01	05	N/A
3DD.003D41D729	10-19-2021 05:42 PM	01	05	N/A
3DD.003D41D729	10-19-2021 05:42 PM	01	05	N/A
3DD.003D5C32B7	10-18-2021 07:10 PM	01	04	N/A
3DD.003D5C32B7	10-18-2021 07:10 PM	01	04	N/A
3DD.003D5C32B7	10-18-2021 07:10 PM	01	04	N/A
3DD.003D5C32B7	10-18-2021 07:10 PM	01	04	N/A
3DD.003D5C32B7	10-18-2021 07:10 PM	01	04	N/A
3DD.003D5C32B7	10-18-2021 07:10 PM	01	04	N/A
3DD.003D5C32B7	10-18-2021 07:10 PM	01	04	N/A
3DD.003D5C32B7	10-18-2021 07:09 PM	01	04	N/A
3DD.003D5C32B7	10-18-2021 07:09 PM	01	04	N/A
3DD.003D5C32B7	10-18-2021 07:09 PM	01	04	N/A
3DD.003D5C32B7	10-18-2021 07:09 PM	01	04	N/A
3DD.003D5C32B7	10-18-2021 07:09 PM	01	04	N/A
3DD.003D5C32B7	10-18-2021 07:09 PM	01	04	N/A
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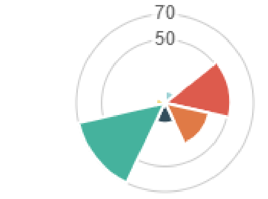
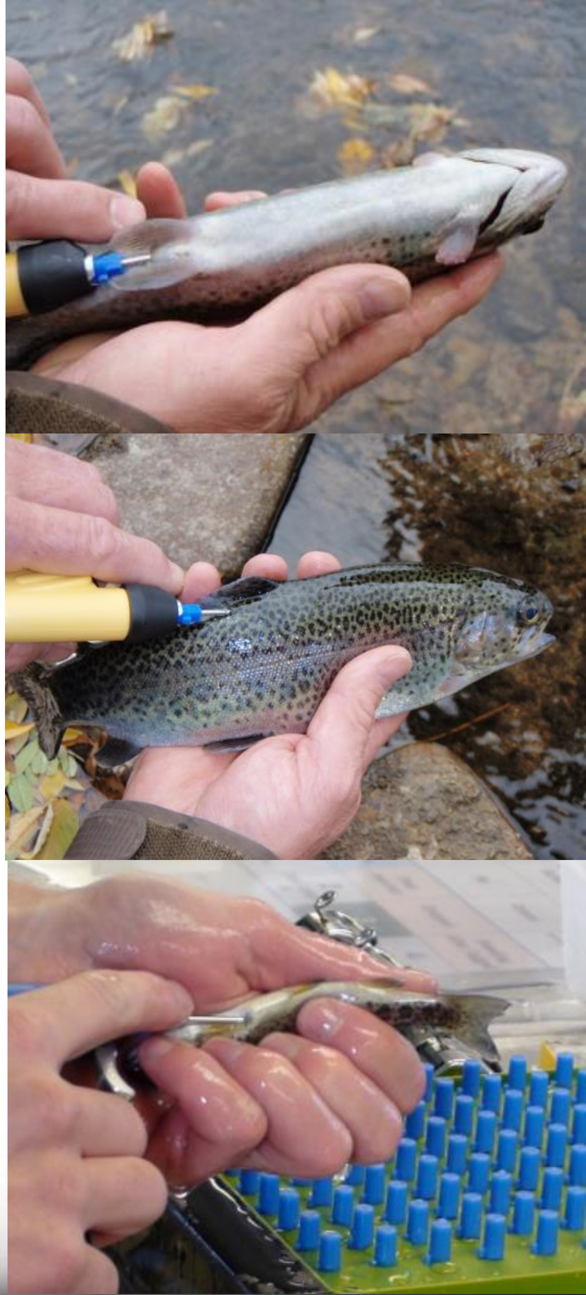


Tag Alert

Set a tag alert to get notified when a tag is detected.

Note: tag alerts are not instantaneous. Notification could be up to 4 hours after tag is processed by Site Manager.

Set Tag Alert



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BIOLogic

SITE MODULE

My Sites Files

Search Tag

raf.baeyens@merck.com

LAST UPDATE
10-20-2021 07:36 CEST

Reader ID: 01
Altenworth PV East

VOLTAGE
25.30

Antennas

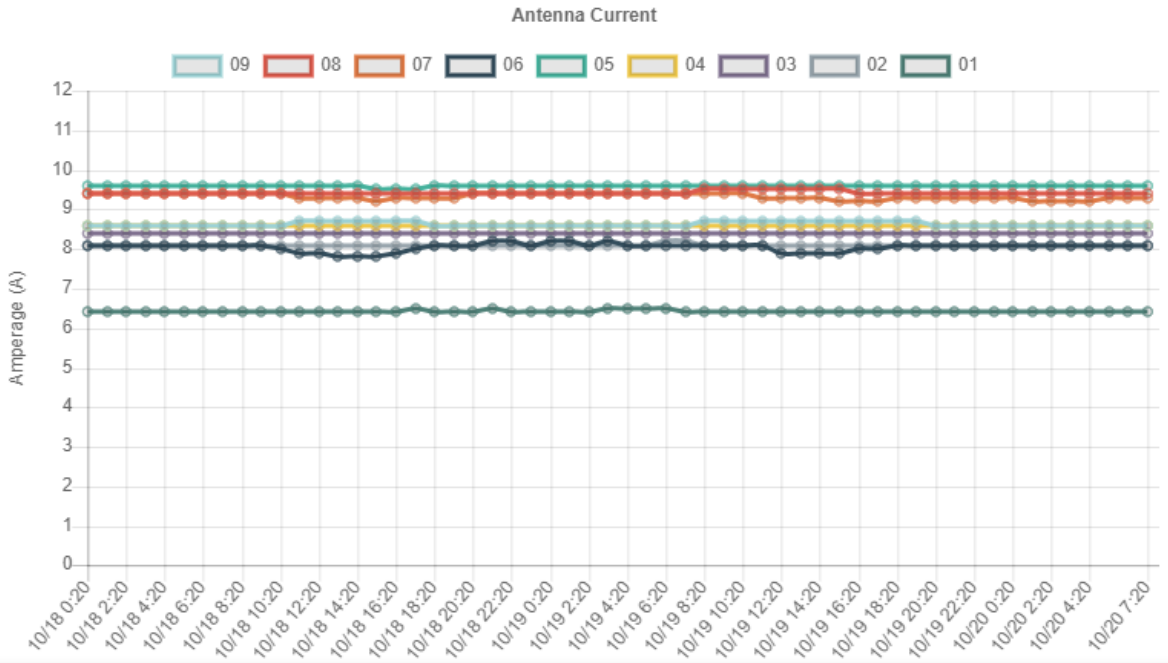
#	NOISE (%)	CURRENT (A)	CAP
01	70%	6.40	555
02	71%	8.10	609
03	70%	8.40	602
04	53%	8.60	603
05	41%	9.60	612
06	54%	8.10	606
07	51%	9.30	561
08	34%	9.40	587
09	35%	8.60	496

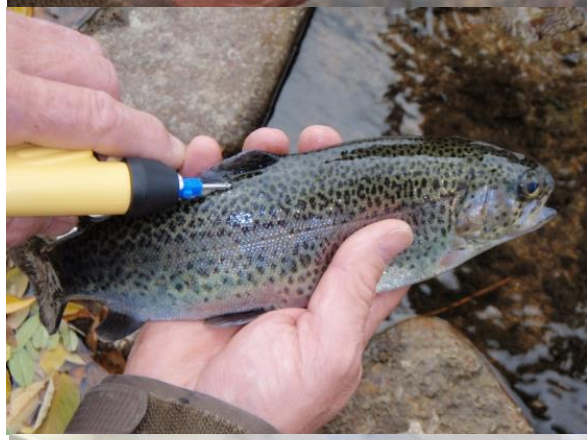
Environmental Variables

WATER TEMP (C) N/A LEVEL (M) N/A

AIR TEMP (C) N/A

TURBIDITY NTU N/A





Privacy Policy

BIOLogic

Fish migration monitoring methods

TAGGING WITH PASSIVE TAGS (PIT)

Biomark in Europe

- Systems in 15 EU countries
- 22 new sites planned
- Fishways, weirs, in-river

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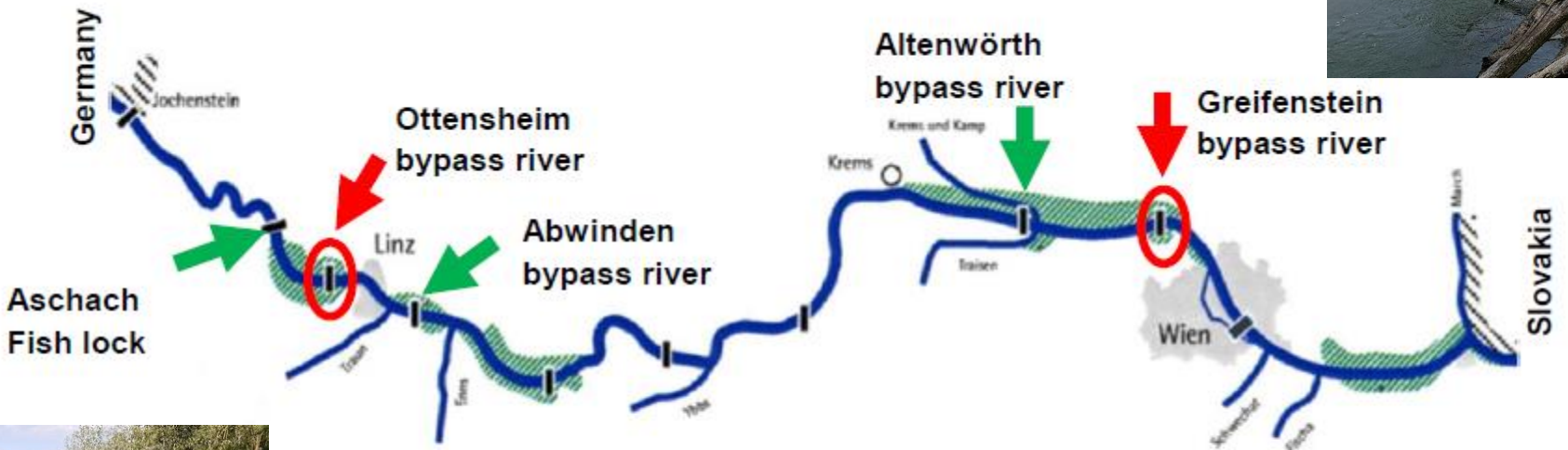
EU case studies: Austria

Fishway monitoring in bypass rivers along the Danube

Verbund-Profish-EZB Fluss



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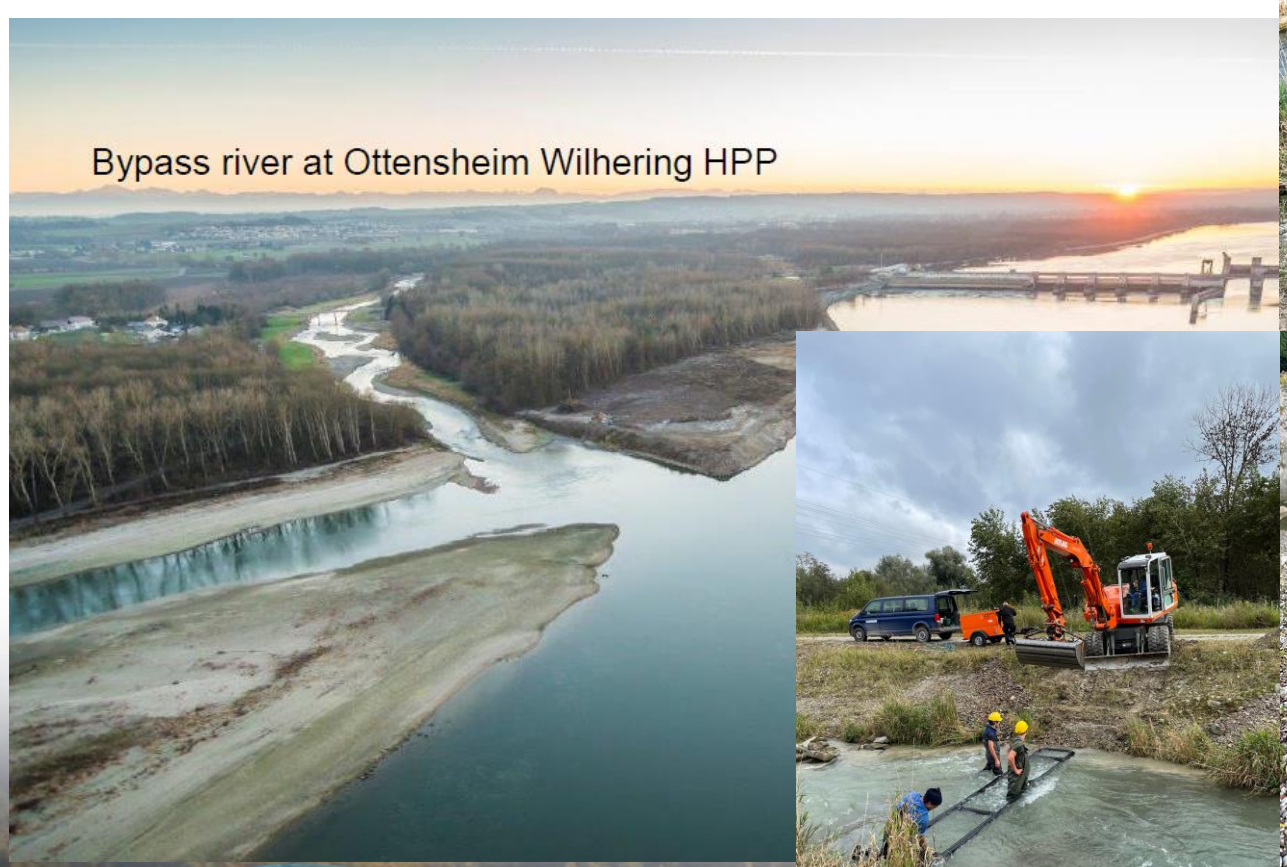
EU case studies: Austria

Fishway monitoring in bypass rivers along the Danube

- 63 antennas at 13 locations
- In-river antennas: pass-over



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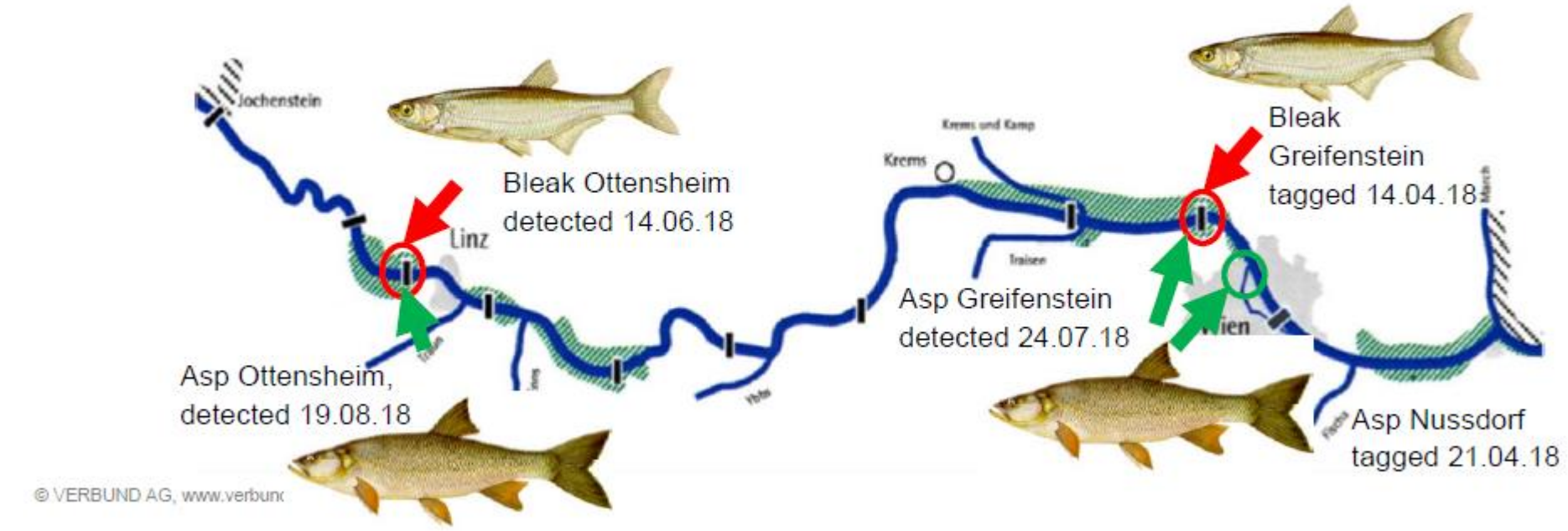
Fishway monitoring in bypass rivers along the Danube

- 16.000 fish tagged, 46 spp.
- Mainly bleak, roach, chub and nase



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Fishway monitoring in bypass rivers along the Danube

Conclusions by Profish:

PIT Tags & continuous antenna readings provide essential information about:

- **Attraction and pass ability** of the bypass rivers

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- **Number** of individuals (and species) passing the bypass is high
- **Large** and **small** fish are migrating **up** & **down**stream
- The **suitability of the bypass as fish habitat is proven**

EU case studies: Germany

Fishway monitoring in fishways along the Inn

- Ongoing install of 22 sites, 3 more planned
- Both technical and semi-natural fishways

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EU case studies: Germany

Fishway monitoring in fishways along the Inn

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Other systems around Europe

SHIELDED FISHWAY ANTENNAS

Other systems around Europe

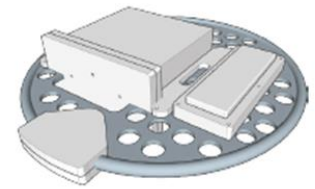
UNSHIELDED FISHWAY ANTENNAS

Other systems around Europe

SUBMERSIBLE ANTENNAS

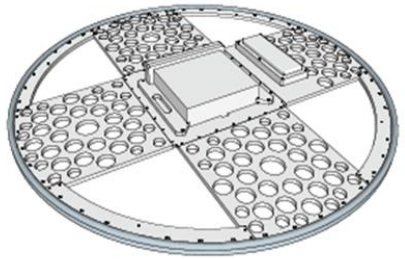
- All inclusive antenna (reader, antenna & batteries)
- 35 days standalone operation
- Deep water
- Can be baited

3 foot (0.9 m)



5 foot (1.5 m)

6 foot (1.8 m)



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Other systems around Europe

CORD ANTENNAS

More flexible
Lengths 9,12,18,24m
Pass-over, pass-through

Other systems around Europe

FLOATING ANTENNAS

- Salmon smolt

Take home message

PIT tag systems

- are reliable for long term fish migration monitoring
- are possible on many locations
- provide robust data
- require almost no maintenance after install

Combination of techniques is always best option

Biomark staff in EU is happy to provide advice and support

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Thank you !
Děkuji !

Raf.Baeyens@merck.com

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