



Rijkswaterstaat
Ministerie van Verkeer en Waterstaat

Downstream migration of silver eel from the river Roer to hydropower station Lith

André Breukelaar
RWS WNZ
Tel +31 (0)6 53776397
E-mail andre.breukelaar@rws.nl

Tim Vriese (ATKB)

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Silver eel migration study in the river Meuse

Aim of study:

- To gain insight in the migration of silver eel from the river Roer through river Meuse, to determine choice of route and migration speed of individual eels in relation to river discharge and other factors;
- To obtain an estimation of the average mortality of silver eels during downstream migration in the Dutch part of the river Meuse;
- To quantify direct and indirect mortality of eels passing hydropower station Lith and weirs;
- To compare silver eel migration with results of the Migromat® at Lith hydropower station in 2018 and 2019.



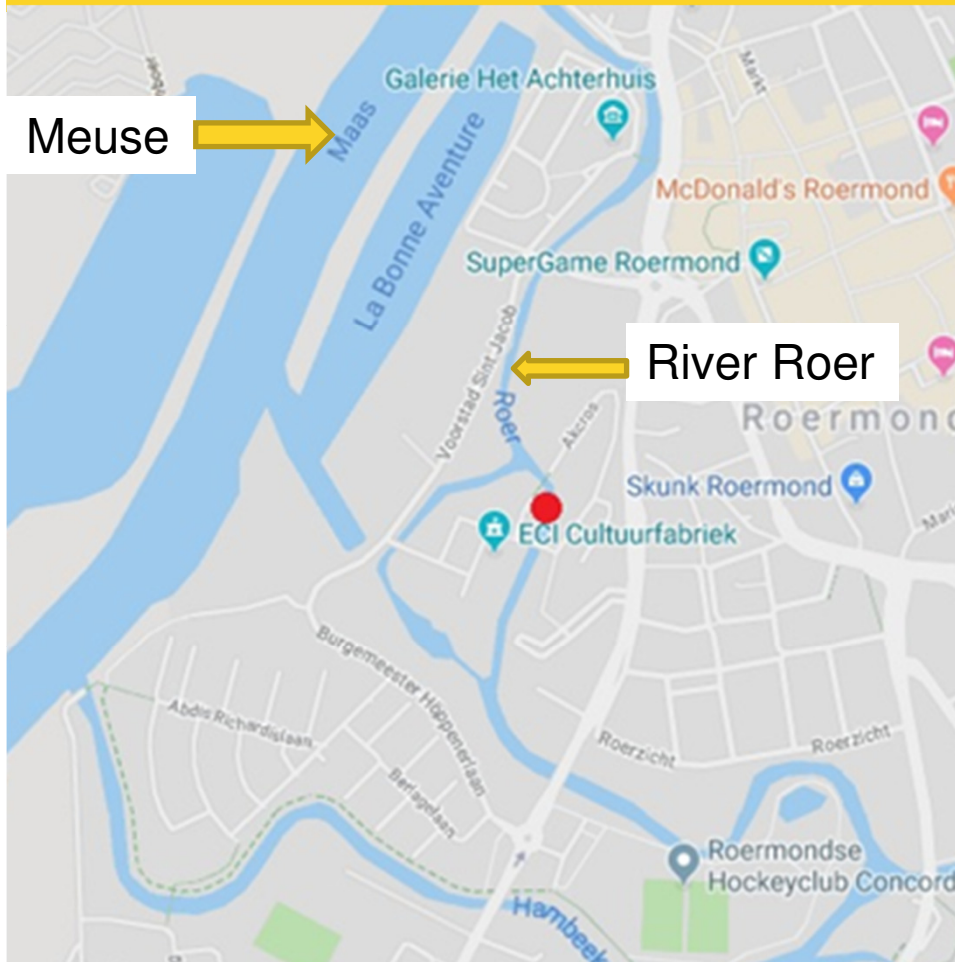
Weirs and hydropower stations in the Meuse

North Sea



- ★ = hydropower station
- = weir

**Location of release:
river Roer (tributary
of the Meuse) in
Roermond.**



42 silver eels were caught at the ECI hydropower station on the Roer river, tagged and released downstream (see red dot in the map).



Methods: NEDAP Trail system®:
Implantable transponders;
Detection stations.

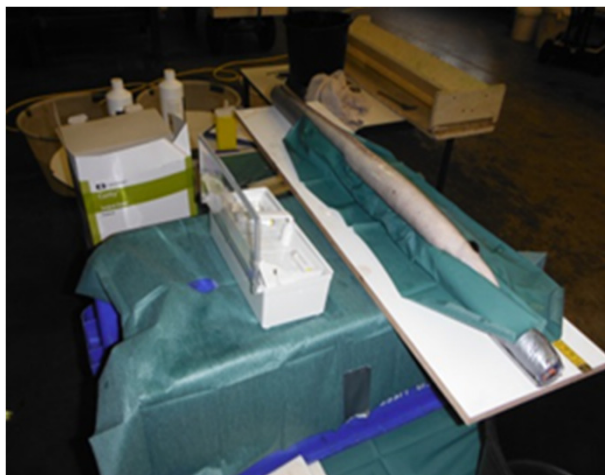


32 silver eels were tagged and released on 8 november 2018 and 10 eels were tagged and released on 14th december.



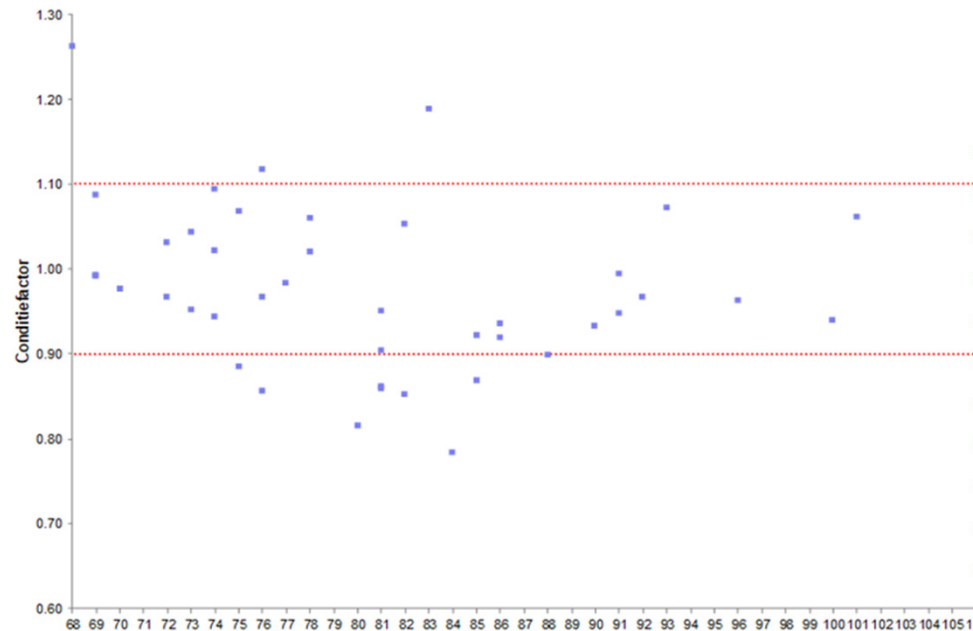


Implantation of a transponder

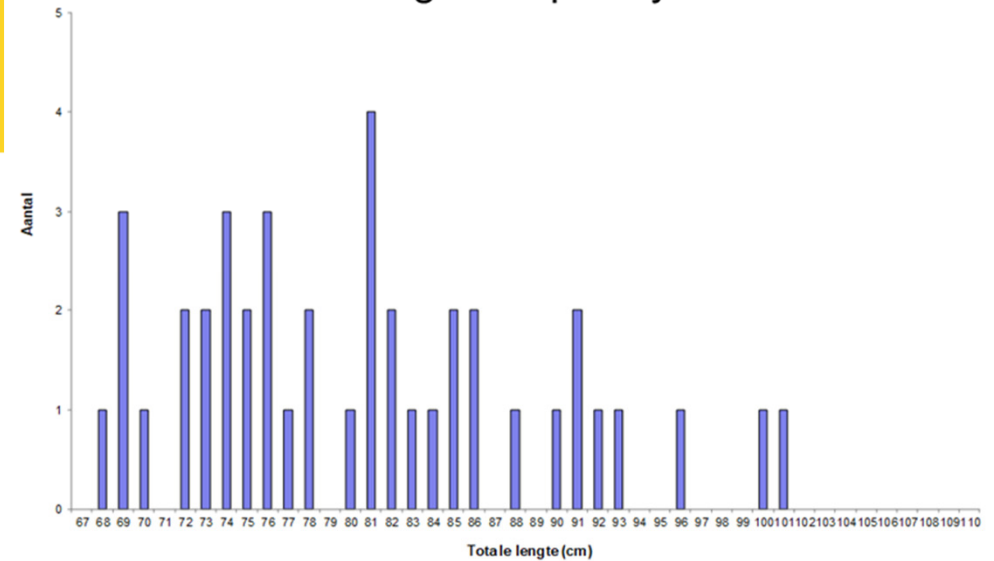


Some eel data

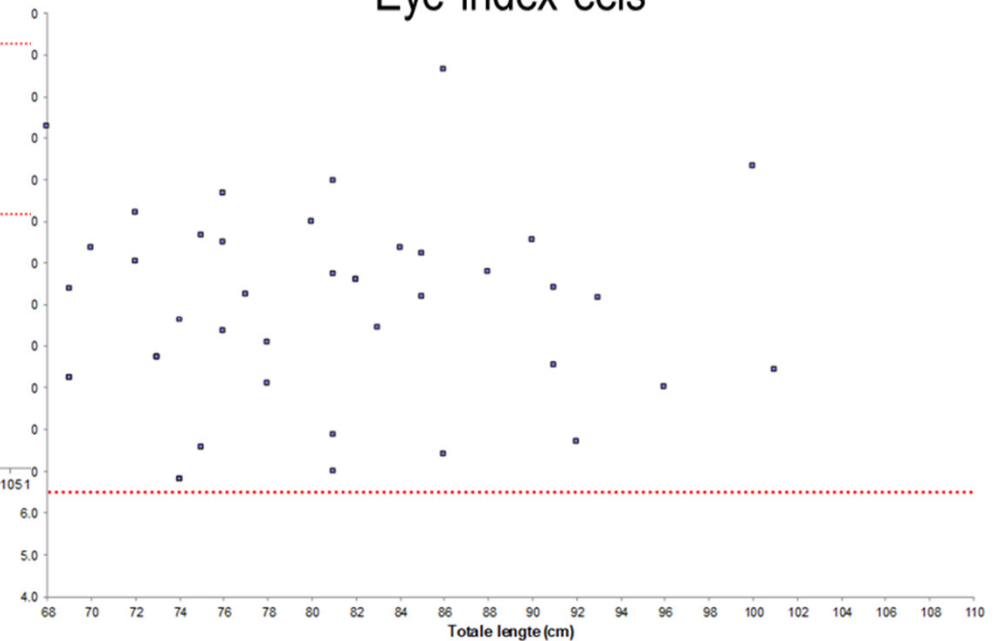
Condition eels



Length frequency eels



Eye index eels





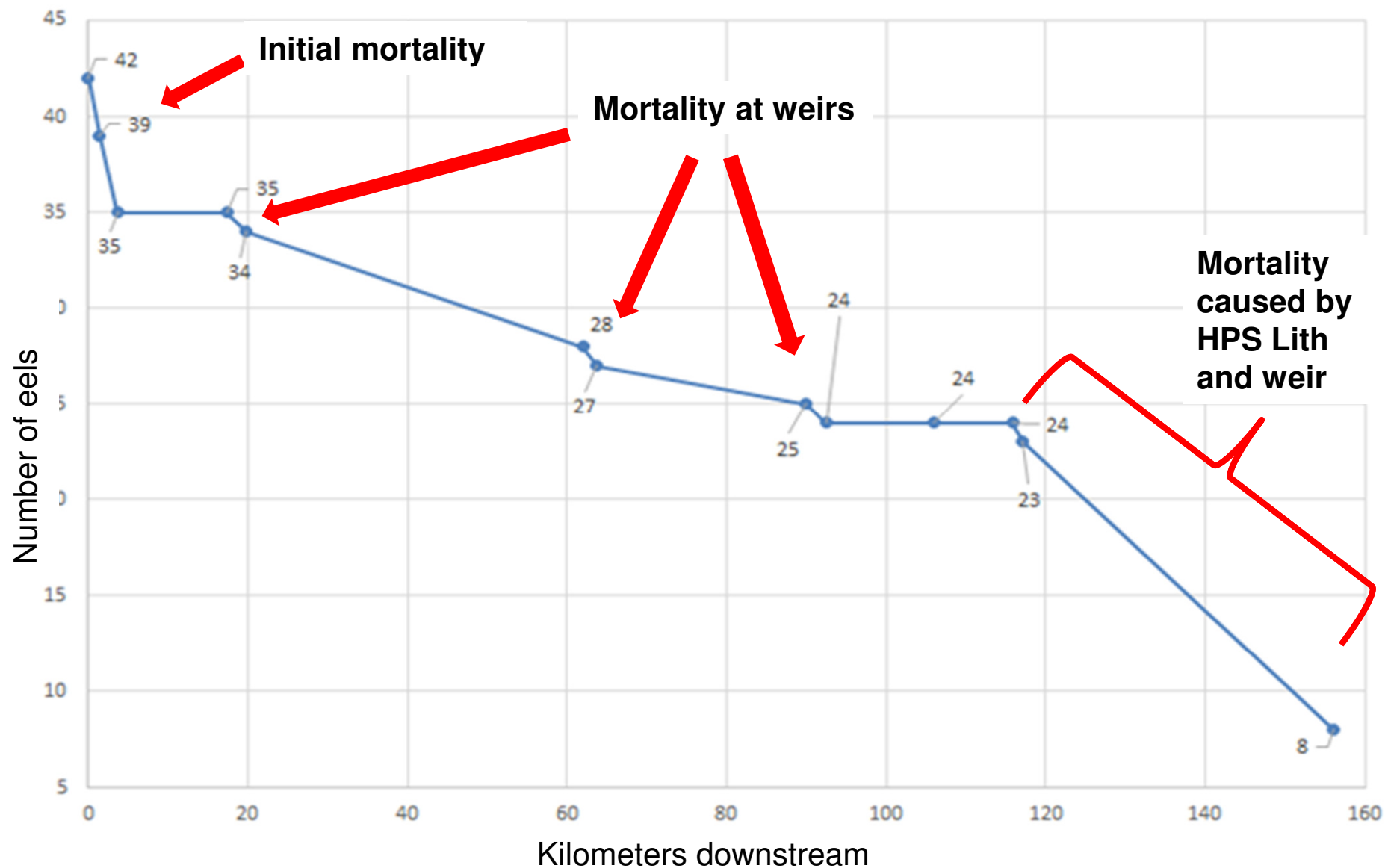
Results

Trail data were collected over the period 8 November 2018 up to 9 July 2019: in total 5,750 individual records. Of the 42 tagged silver eel, three eels were never detected at all. Percentage detected was 93%, which is considered high. A few eels started swimming in upstream direction, but later returned to the Meuse. Table on the right shows the number of eels on the different detection stations in downstream direction and the losses of eel.

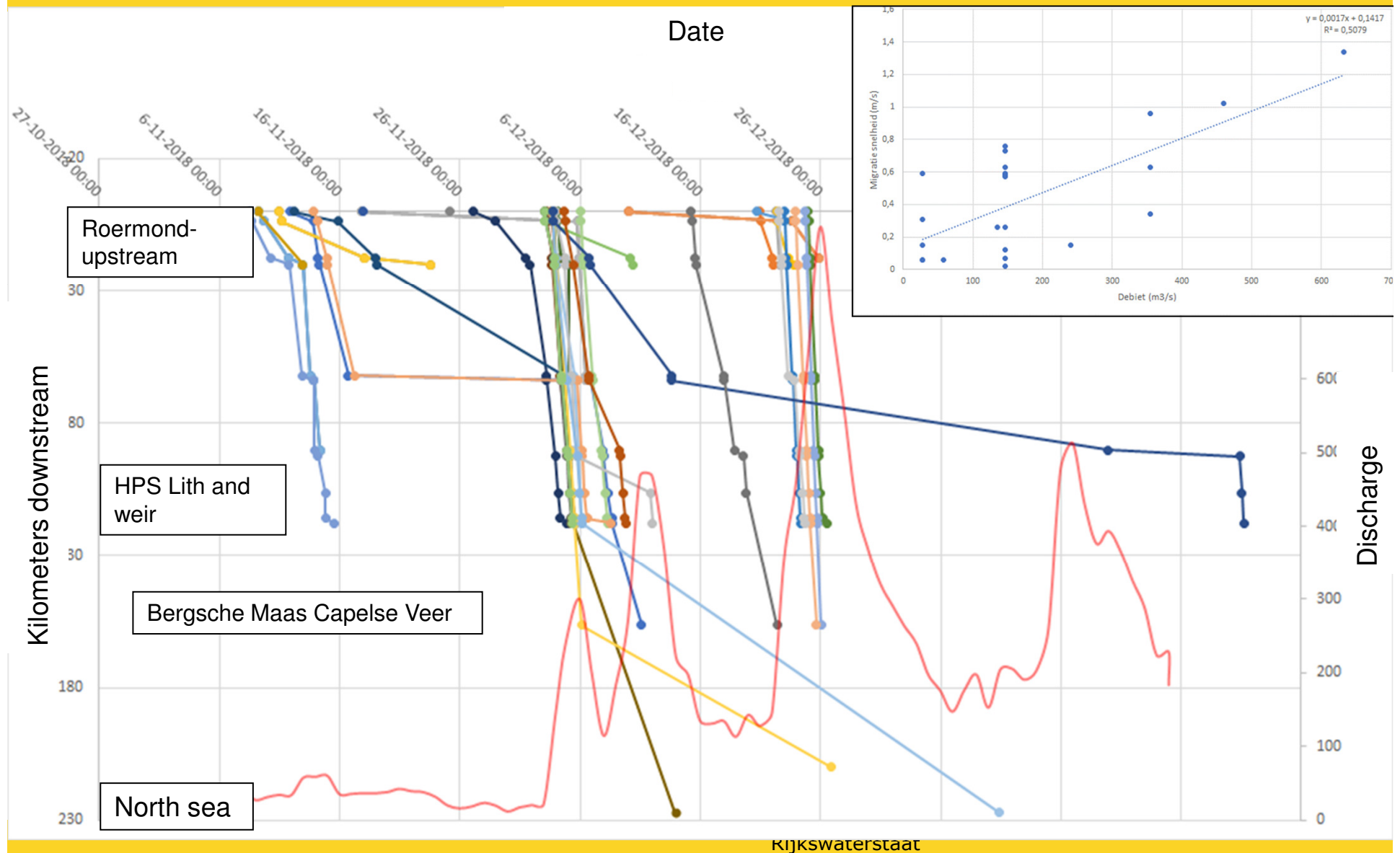
Release location / detection stations	Distance in downstream direction (km)	Number of eels	Losses
ECI-HPS	0	42	-
Roermond-upstream	1.4	39	3
Buggenum	3.7	35	4
Belfeld-upstream	17.4	35	0
Steyl	19.9	34	1
Afferden	62	28	6
Sambeek-downstream	63.8	27	1
Grave-upstream	90	25	2
Balgoij	92.5	24	1
Megen	106.1	24	0
Lith _HPS and weir	115.9	24	0
Lith-dorp (downstream)	117.2	23	1
Bergsche Maas Capelse-Veer	156.1	8	15



Eel migration from release location to Bergsche Maas – Capelse Veer

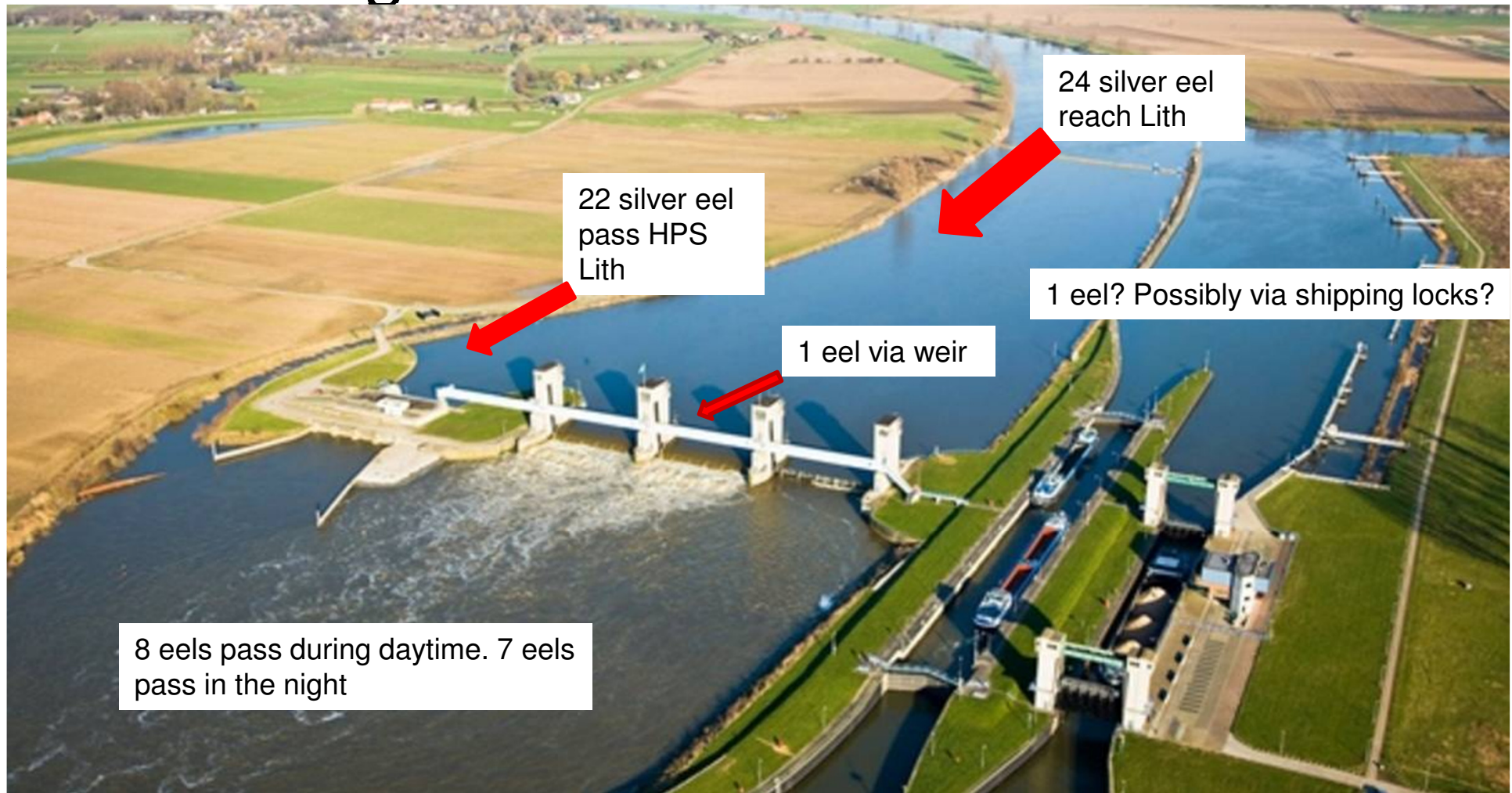


Downstream migration in time and over distance related to discharge (individual eels)

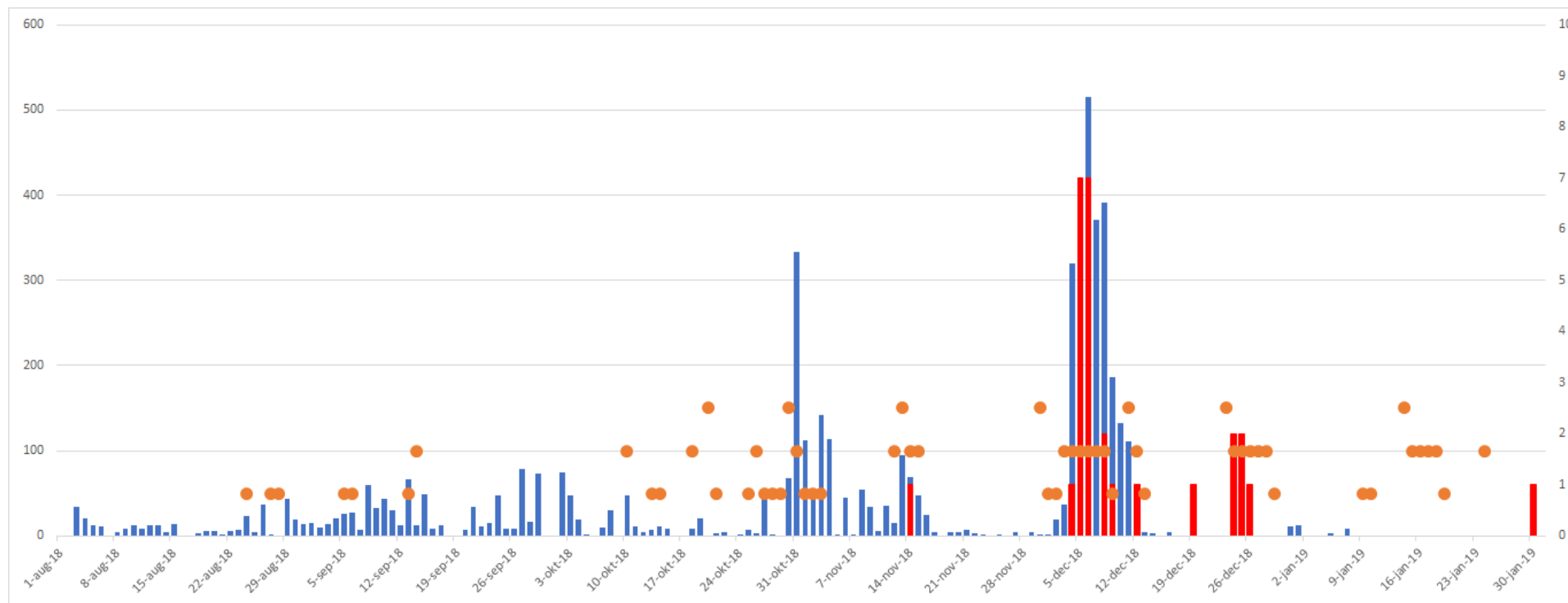




Passage of HPS Lith and weir



NEDAP eels passing HPS Lith and MIGROMAT® alarms



Period August 1st 2018 – Januari 30th 2019. VisAdvies is monitoring eels passing the HPS Lith with fyke net and cameras. **Blue bars**: numbers of eels passing HPS Lith per day. **Orange dots**: MIGROMAT® alarms (1-3 per day). **Red bars**: eels with NEDAP transponders passing HPS Lith.

NEDAP eels passing HPS Lith and MIGROMAT® alarms

Results 2018 -2019

Most of the NEDAP eels reach HPS Lith during the largest peak in the natural migration of eel. In the period 4 to 12 December 2018 15 silver eels reach HPS Lith during an alarm of the MIGROMAT®. In total 21 of 24 silver eel with NEDAP transponders pass HPS Lith during an alarm of the MIGROMAT® (87.5%). Three eels pass when there is no alarm. One of these eel passed in april 2019, when the MIGROMAT® was not in action. Leaving this eel out of the equation, 21 of 23 eels with NEDAP transponders pass HPS Lith during an alarm (which is 91%).

That seems quite a good result! However.

NEDAP eels passing HPS Lith and MIGROMAT® alarms

Results 2019 -2020

In the period 2019 – 2020 Wageningen Marine Research (WMR) also did a project with NEDAP eels on the river Meuse. In Oktober and November 2019 150 silver eel were equipped with transponders and released in the Meuse near Ohé en Laak (approximately 140 km upstream of HPS Lith). Of this group 102 eels were detected. Only 16 of these eels were detected during the period that the MIGROMAT® was in action. Of these eels 9 arrived when the MIGROMAT® gave an alarm signal (56%). The other 7 eels (44%) passed without an alarm of the MIGROMAT®.

The conclusion is that the MIGROMAT® can predict the eel migration rather well. But it is not reliable enough in all years, so it can not be used as an Early Warning System to reach the norm of eel mortality (max. 5%) at HPS Lith.



Thanks for your attention!!

