Eels Over The Dykes 2012

TRAP & TRANSPORT OF SILVER EELS IN THE NETHERLANDS

Sustainable *Eel* Group

DUPAN

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Eels Over The Dykes – Summary

Trap & Transport of silver eels in the Netherlands- M. van der Meer, PhD – DUPAN

Eels-Over-The-Dykes to repair the interrupted life-cycle of eel

In the Netherlands there are in total 4,671 water pumping stations inhibiting adult silver eels to migrate to the sea to spawn. The recovery of the Dutch eel stock as required by the European Eel regulation is impossible without repairing this interrupted life cycle of the eel. Making thousands of pumping stations 'silver eel friendly' is very costly. Hence, trap & transport is the only short term option to increase the Dutch eel spawning stock. The principle of trap & transport is to catch the silver eels with fykes before they enter the pumps and release them behind the pumps in water with open access to the sea. As pumping stations from polders with prominent dykes are considered the most serious migration barriers for eels, in the Netherlands trap & transport is known as Eels-Over-The-Dykes (EOTD).

EOTD projects in the Netherlands

EOTD projects in the Netherlands started in 2011 in Friesland, because this was the only province in which fishing in the silver eel season was allowed due to a pilot with quota fishery. In the autumn of 2012 the government provided exemptions to extend the EOTD fishery to the provinces of Noord-Holland and Zeeland. In 2011 in one province 821 silver eels with a weight of 542 kilos were put over the dykes; in 2012 in three provinces 6921 silver eels with a weight of 4252 kilo were caught and released.

	2011		2012	
Province	pieces	kilos	pieces	kilos
Friesland	821	542	2.309	1.211
Noord-Holland			4.056	2.479
Zeeland			556	562
TOTAL	**821**	**542**	**6.921**	**4.252**

Adjustment of the EOTD programme in Friesland resulted in doubling the catch in kilos (from 542 to 1211 kilo) and tripling the numbers (from 821 to 2309 pieces).

In 2012 the best catch of silver eels was obtained in the province of Noord-Holland. The smaller water bodies of Zeeland produced less, but very large silver eels. In one water the average weight of the silver eels was 2 kilo!

Data collection, combat of poaching and the success of joining efforts

Fykes could only be lifted with an independent inspector (recreational fisherman) on the spot. The inspection reports show that all silver eels were quickly released in optimal condition. The inspection reports also produced a reliable database on silver eel catches. This database may help to better understand silver eel migration and further improve the design of EOTD projects. The EOTD project revealed considerable illegal activities on the water: the project suffered from theft of fykes and eels. Also, 40 illegal fykes were confiscated. A major success of these EOTD projects is that the involvement of all stakeholders improved mutual trust and understanding, especially between professional and recreational fishermen.

More Eel-Over-The-Dykes?

Based on present experience, it is recommended to maintain all stakeholders involved in future EOTD projects. Measures to limit costs of EOTD projects could be: (1) allowing the extraction of mitten crabs (and turning it into an additional source of income for the fishermen), (2) general introduction of quota fishery on eel (to reduce costs of inspection) and (3) increasing the number of EOTD sites (economy of scale). In 2013 the Dutch EOTD programme includes one hydropower plant. For migrating silver eels hydropower plants are as destructive as water pumping stations. In Europe there are 24,350 hydropower plants.

Applying EOTD programmes to a substantial part of Europe's silver eel migration barriers would give a tremendous boost to the recovery of the European eel stock.

Eels Over The Dykes

– Trap & Transport of silver eels in The Netherlands -

Magnus van der Meer, PhD

The interrupted life-cycle of eels in The Netherlands

The Netherlands are well-known for its many dykes and polders. While dykes provide security for everybody living in a polder, dykes are also barriers impossible to pass for eel. As large part of the eel production in the Netherlands takes place in fertile polder waters, eels may have to pass these barriers twice: as glass eels as well as silver eel. The high number of migration barriers *(A)* inhibit glass eels to get into their preferred polder habitat, while adult silver eels cannot leave to spawn. Without human interference of "trap and transport" of both glass eels (from the sea to the polder) and silver eels (from polder to the sea) many polders cannot contribute to maintenance and recovery of the eel stock. The recovery of the eel stock as required by the European Eel regulation (EC 1100/2007) is impossible without repairing this interrupted life cycle of the eel.

Eels-Over-The-Dike to reduce silver eel mortality

In 2009, in the framework of the national eel recovery plan of the Netherlands, fishery is closed in the silver eel fishing season (September – November). Since then silver eels in polders had the choice between staying in the polder or to leave through one or more pumping station and most likely get killed. Making all 4,671 pumping stations of the Netherlands 'silver eel friendly' is very costly. Hence, trap and transport is the most logical short term option to increase the Dutch contribution to the eel spawning stock. As pumping stations from polders with prominent dykes are considered to be the most serious migration barriers for eels in the Netherlands, 'trap and transport' is better known as Eels-Over-The-Dykes (EOTD).

EOTD pilot projects in three provinces

Friesland is the only province in the Netherlands where the eel fishery is not prohibited in autumn. Here fishermen adhere to quota for eel instead of having a closed season. Because quota fisheries require catch control they are more expensive than a fishery with a closed season. Costs for the switch of the Frisian fishermen from a closed season to a quota fishery were covered by DUPAN (Dutch Association for a Sustainable Eel Sector), *(B)*. As fishermen were allowed to fish on eel in the autumn, the Dutch Association of Professional Fishermen (CvB) started a first EOTD project in Friesland in 2011. The local water manager (Wetterskip Fryslan) and the Dutch Fishery Board (Productschap Vis) assisted in reporting the numbers and kilos of silver eels caught and released. Also silver eel quality was checked.

In 2012 the EOTD programme was enlarged from one to three provinces. EOTD outside Friesland required additional work to get exemptions for the fishery in the closed season. Also, exemptions for EOTD fishery were only provided under the condition of 100% control (meaning fykes could only be lifted with an inspector present on the spot). Local sport fishery organizations provided independent and well- trained fishery inspectors. Water managers participation in this project was very important as they facilitated access to the fishing sites. In the provinces of Noord-Holland and Zeeland the costs of the EOTD project were covered by water managers (Hoogheemraadschap Hollands Noorderkwartier en Waterschap Scheldestromen), DUPAN, recreational fishery organizations (Sportvisserij Midwest and Zuidwest Nederland) and the province of Zeeland.

Numbers and kilos of silver eels saved
In 2011 in one province 821 silver eels with a weight of 542 kilos were put over the dyke. In 2012 for three provinces the figures were 6921 silver eels with a weight of 4252 kilo.

		2011		2012	
	Pumping station	pieces	kilos	pieces	kilos
Friesland	Ezumazijl	120	84	1.332	534
	Stavoren	322	292	269	356
	Roptazijl	286	116	708	321
	Zwarte Haan	93	50	0	0
	TOTAL	821	542	2.309	1.211
Noord-Holland	Overtoom			568	406
	Zaangemaal			2.204	1.501
	De Waker			1.081	413
	Kadoelen			203	160
	TOTAL			4.056	2.479
Zeeland	Prommelsluis			64	62
	Den Osse			12	12
	Dreischor			35	44
	Loven			66	132
	Otheense Kreek			111	97
	Campen			148	162
	Paal			120	53
	TOTAL			556	562
TOTAL 3 PROVINCES		821	542	6.921	4.252

In the province of Friesland there was a EOTD programme in both 2011 and 2012 (see table). Based on 2011 results, in 2012 the fishery was limited to 3 instead of 4 pumping stations, while the fishing season was extended from 3 to 4 months: August to November. The adjustment of the fishery resulted in a similar fishery effort, but the catch in kilos doubled (from 542 to 1211 kilo), while the number of silver eels caught and released almost tripled (from 821 to 2309 pieces).
In 2012 the best catch of silver eels was obtained in the province of Noord-Holland. The smaller water bodies of Zeeland produced less, but very large sized silver eels. In one of Zeeland's waters the average size of the silver eels was 2 kilos per fish!

100% control
During the effort of 100% control by-catches and irregularities during the fishery were monitored. It appeared that silver eel quality was excellent and by-catches were ignorable apart from mitten crab catches early in the season. The inspectors did not report any violations during the fishery and transport of silver eels. An important 'by-product' of the 100% control measure was that a reliable data base on silver eel catches was acquired.

Data collection on silver eel migration
Analysis of the collected data on the silver eel catches suggests that phases of the moon determine to some extent silver eel catches. However, weather conditions (such as heavy rain with storm) may overrule this. While some waters seem to produce only female eels, other waters produce male and female eels in equal numbers. Data on silver eel catches may provide important clues about silver eel migration and how to design more efficient EOTD projects *(C)*.

Mitten crab as by-catch
The project plan stated that all by-catch would be returned immediately. However, the exemption of the government only stated two fish species that should be returned to the water. Water managers and fishermen were happy the exemption did not inhibit extraction of mitten crab. However, government officials insisted in sticking to the project plan and also returning mitten crab to the water they were caught in. Hence, in spite of being valuable, harmful and unwanted, the mitten crab by-catch was from then on returned to the water.

Poaching and theft
The EOTD project provided many more eyes on the water than before. This resulted in the discovery of illegal activities near the pumping stations: over 40 illegal fykes (some with considerable numbers of eels) were spotted and removed. Also in a few occasions project fykes were emptied and in total 7 fykes were stolen. Especially in Zeeland poaching seems to be common and may have a significant impact on the eel stocks. In future EOTD project co-operation with the national fishery inspection (NVWA) and local police should be improved.

The success of joining efforts
In the EOTD projects of DUPAN all relevant stakeholders participated. During the project evaluation both recreational fishermen and professional fishermen stressed the fact that working together resulted in improved mutual trust and understanding. For this reason professional fishermen prefer to stick to 100% control in future EOTD projects. The active participation of the VBC (local fishery management unit) in Noord-Holland was very beneficial for this project and shows how inland fisheries management could be improved.

Improving the EOTD concept
The success of the EOTD projects has shown that the present concept is a viable method for saving eels from pumping station mortality. Hence, the EOTD projects in the Netherlands show that the trap and transport measure described in the European Eel Regulation can be put in practice. The experience gained was used to make a list of recommendations for future EOTD projects. One of the recommendations is to maintain the structure of the present project with all stakeholders involved. Practical recommendations were made how to improve the efficiency of the fishery. Measures to limit costs of EOTD projects could be: (1) allowing the extraction of mitten crabs (and turning it into an additional source of income for the fishermen), (2) introduction of quota fishery on eel in the entire country (to reduce costs of inspection) and (3) increasing the number of EOTD sites (economy of scale).

More Eel-Over-The-Dyke?
In the Netherlands the EOTD programme involved 4 pumping stations in 2011 and 14 in 2012. The number of eels trapped & transported per pumping station increased from 205 in the first year to 494 in the second year. In 2013 DUPAN wants to expand the EOTD programme and also involve one hydropower plant. Hydropower plants are believed to be at least as deadly as pumping stations for migrating silver eels. In the Netherlands there are 4,671 pumping stations. In Europe there are 24,350 hydropower plants *(D)*.

Conclusion
If EOTD programmes would be applied to a substantial part of these silver eel migration barriers, this would definitely give a tremendous boost to the recovery of the European eel stock.

A. The many migration barriers in the Netherlands

In the Netherlands the migration barriers for eels consist of sluices (locks), dams (weirs, barrages) and water pumping stations. Especially pumping stations are known for being either being non-passable or deadly for silver eels. In Holland there are 2278 sluices, 8488 dams and 4671 water pumping stations.

(Picture: map of the Netherlands dotted with sluices/locks, barrages and pumping stations).

B. DUPAN

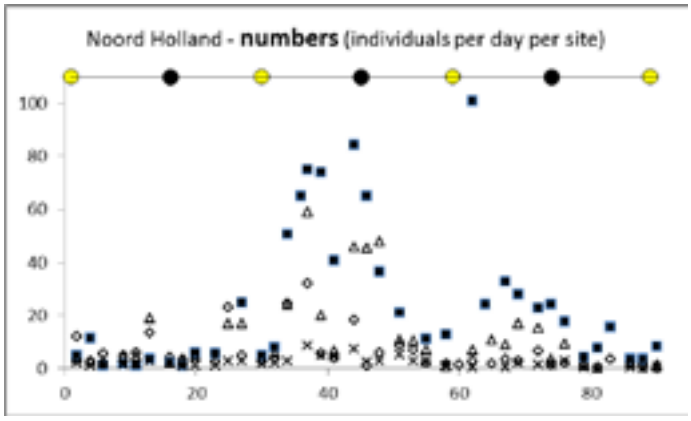
DUPAN is the Dutch Foundation for a Sustainable Eel Sector and represents eel traders (NeVePaling), fish farmers (NEVEVI) and fishermen (CvB). By cooperation of all stakeholders in the eel sector, DUPAN aims to work towards (1) the recovery of eel stocks and (2) a fully sustainably operated production chain of consumption eel. DUPAN operates a Sustainable Eel Fund (Duurzaam Paling Fonds), through which projects are financed in the area of research on eel and on activities to support recovery of the eel stock. DUPAN members sell their eel products with the logo of this fund. Consumers buying products with the logo contribute directly to the Sustainable Eel Fund.

(Picture: Logo of the Sustainable Eel Fund)

C. Data on silver eel migration

Two examples of data gather from the EOTD silver eel fishery registration:

1. Peaks in silver eel catches near pumping stations may be related to phases of the moon. The collected data on the silver eel catches suggest that catches are best around new moon and lower at full moon (see graphic), but that weather conditions (such as heavy rain with



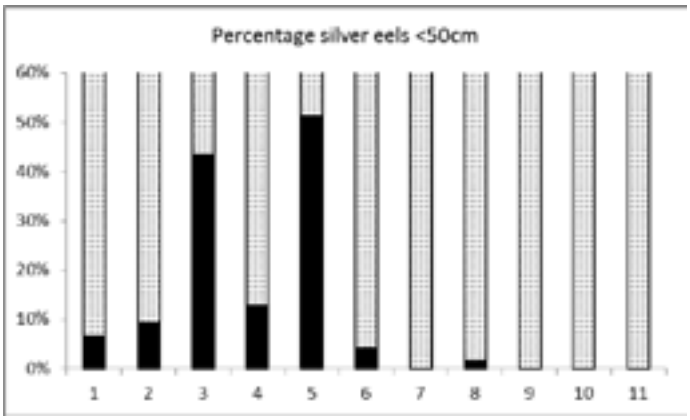
The x-axis indicates the date expressed as the number of days after September 1, 2012.

The y-axis indicates catch expressed as the number of kilos caught per fyke-day.

The line on top indicates the moon phases: full moon is a yellow circle, new moon is a black circle.

storm) may overrule this: the best catch of all was recorded shortly after full moon. It was also observed that while at new moon catches are usually best, the average weight of the silver eel is below average. At full moon catches appear lower, but average weight higher. Peaks in the catches may require additional fishery (catch and release) effort.

2. Male eels appear only available at few locations as only at two locations considerable part (43 and 51%) of silver eels were smaller than 50 cm, while at 4 locations all silver eels were larger than 50cm (see graphic below). As smaller eels are almost exclusively males and larger one only females, % of eels smaller than 50 cm may affect their priority when selecting EOTD sites.



D. Hydropower plants in Europe

Hydropower plants in Europe

Source: The end of the river, YouTube

http://www.youtube.com/watch?v=7cKFdsS7IVw

Country	Number of hydropower plants
Germany	7300
Austria	2600
Italy	2200
Sweden	2100
France	2000
Spain	1400
Czech Republic	1400
Switzerland	1200
Norway	900
Poland	700
Slovenia	500
Romania	360
Finland	220
Slovac Republic	200
UK	180
Latvia	140
Bulgaria	130
Portugal	130
Belgium	90
Greece	90
Lithunia	80
Turkey	70
Croatia	70
Bosnia Herzogovina	50
Ireland	50
Denmark	40
Estonia	40
Luxemburg	30
Hungaria	30
Macedonia	30
The Netherlands	10
Montenegro	10
TOTAL	**24.350**

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