Report to the European Commission required in line with Article 9 of Regulation 1100/2007/EC

Implementation of Eel Management Plan (EMP) in the Netherlands

June 2012

Contents

Nederlandse samenvatting (Dutch summary)

Inleiding

De onderliggende rapportage betreft een evaluatie van de effecten van het Nederlandse aalbeheerplan tot op heden. De aalpopulatie en aalvangsten zijn sterk teruggelopen. De huidige intrek van glasaal is slechts 1-5% van de intrek in de 60-70-er jaren. Om herstel van de aalpopulatie mogelijk te maken, heeft De Raad van de Europese Unie in 2007 de "EU Regulation for the Recovery of the Eel Stock (EC 1100/2007)" vastgesteld. Deze verordening verplicht de lidstaten om met een eigen nationaal aalbeheerplan te komen en te implementeren. Het doel van deze aalbeheerplannen is daarbij als volgt omschreven: "Doel van de beheersplannen voor aal is het verminderen van de antropogene sterfte, zodat er een grote kans bestaat dat ten minste 40% van de biomassa van schieraal kan ontsnappen naar zee, gerelateerd aan de beste raming betreffende de ontsnapping die plaats zou hebben gevonden indien de mens geen invloed had uitgeoefend op het bestand. De beheersplannen voor aal worden opgesteld met het oog op het bereiken van die doelstelling op lange termijn."

Lidstaten zijn verplicht om voor 1 juli 2012 over de voortgang van de nationale aalbeheerplannen te rapporteren aan de Europese Commissie. De Europese Commissie zal een verslag opstellen over deze aalbeheerplannen. Dit verslag zal uiterlijk 31 december 2013 door de Europese Commissie worden ingediend bij het Europees Parlement en de Raad.

In het eerste deel (hoofdstuk 1 en 2) van dit rapport wordt uitgelegd hoe gemonitoord is en worden schattingen gegeven over de uittrekkende schieraal, de visserij-inspanning en de vangsten in vergelijking met de situatie voordat het aalbeheerplan van kracht was. Ook worden de mortaliteitsfactoren buiten de visserij beschreven. Daarna (hoofdstuk 3 en 4) volgt een overzicht van alle maatregelen die in het Nederlandse aalbeheerplan zijn opgenomen. Hierbij wordt gekeken of de maatregelen op tijd geïmplementeerd zijn, wat de reden hiervoor is als dat niet het geval is en tegen welke problemen is aangelopen.

Al met al moet worden geconcludeerd dat de aalsterfte door menselijk handelen in Nederland aanzienlijk is afgenomen. Als neveneffect is te merken dat de binnenvissers bezig zijn met een omslag naar duurzame visserij. De pilot decentraal aalbeheer in Friesland is daarvan een voorbeeld. Nederland zal de komende jaren doorgaan met de ingezette maatregelen. Feit blijft dat veel tijd nodig is voordat de effecten op de aalpopulatie zichtbaar worden.

Maatregelen hebben geleid tot een substantiële verbetering van de overleving

Het aalbeheerplan is geëvalueerd in het licht van de voornoemde "beheersdoelen" uit de Aalverordening. De methodiek die bij deze evaluatie daarbij is gehanteerd komt voort uit de ICES - "werkgroep aal". De evaluatie is uitgevoerd door middel van modellen, vangstgegevens, veldwaarnemingen en statistische analyses, uitvoerig beschreven in de rapportage. Het geheel van deze inspanning resulteerde in schattingen voor (2008) en na (2011) de implementatie van het Aalbeheerplan van met name:

- De biomassa uittrekkende schieraal: 440 t in 2008, 480 t in 2011
- De pristine biomassa aan uittrekkende schieraal: 10.400 t
- De doelstelling Aalverordening voor Nederland: 4160 ton (40%van de pristine biomassa)
- De uittrek van schieraal ten opzichte van deze doelstelling: 11% in 2008, 12%in 2011
- De reductie in antropogene sterfte door de genomen maatregelen:de antropogene sterfte van glasaal naar schieraal is afgenomen van 85% in 2008 naar 67% in 2011. Dit betekent dat de overleving van glasaal tot uittrekkende schieraal is verdubbeld van 15% tot 33%.

Deze schattingen zijn ruw en de daarmee gepaard gaande onzekerheid is in de rapportage omschreven.

Effecten van het Nederlandse aalbeheerplan op de Nederlandse aalpopulatie zullen pas na vele jaren zichtbaar worden.

De evaluatie laat zien dat de maatregelen uit het Nederlandse beheerplan aal hebben geleid tot een substantiële teruggang in sterfte door menselijk handelen. Deze reductie is voornamelijk het gevolg van beperkingen van de visserij (recreatief en beroep).

De aalpopulatie in Nederland en de uittrek van schieraal zullen pas veel later substantieel verbeteren. De reden dat dit zo lang duurt, is dat aal een langlevende soort is. Het duurt meer dan een jaar voordat glasaal na geboorte aankomt voor de Nederlandse kust en de binnenwateren op zwemt. Vervolgens duurt het 5-15 jaar voordat deze aal "schier" wordt, en als schieraal terugtrekt naar zee.

Het blijft onzeker of de genomen maatregelen op termijn werkelijk zullen leiden tot een duurzaam verbeterde aalstand. De reden is dat niet zeker is wat de oorzaak of oorzaken zijn van de achteruitgang in de aalstand.

Implementatie van maatregelen

Onderstaande tabel geeft een overzicht van de implementatie van de maatregelen uit het aalbeheerplan. Hieruit blijkt dat hoewel een deel van de maatregelen tijdig is ingegaan, er ook een aantal later is gestart. De redenen daarvoor worden hierna kort toegelicht. De laatste maatregel was onvoorzien: het sluiten van de belangrijkste grote rivieren en enkele kanalen voor de aalvisserij in verband met verontreiniging van aal met PCB's en dioxinen.

Tabel I Overzicht van de implementatie maatregelen

Nr	Maatregelen op tijd geïmplementeerd	Geplande implementatie	Gerealiseerde implementatie
1	Terugzetten van aal (a) op zee en (b) op binnenwater door sportvissers	2009	1 oktober 2009
2	Verbod op recreatieve visserij, gebruikmakend van professionele vistuigen.	2011	1 januari 2011*
3	Gesloten aalvisseizoen 1 september tot 1 december	2009	1 oktober 2009**
4	Stoppen met uitgave van peurvergunningen op Staatswateren.	2009	1 mei 2009
5	Onderzoek naar het kweken van aal in gevangenschap.	doorlopend	EU-project
6	Oplossen van migratieknelpunten bij sluizen, gemalen en andere kunstwerken; van de 1800 belangrijkste knelpunten worden 900 opgelost voor 2015 de overige 900 voor 2027.	2015-2027	2015-2027
7	Aangepast turbinebeheer bij de 3 grote waterkrachtcentrales.	2009	2011 17-11
8	Visserijvrije zones in gebieden die belangrijk zijn voor aalmigratie.	2010	1 April 2011***
9	Uitzet van glas- en pootaal.	2009	Start 2010, daarna doorlopend.

10	Sluiten van de visserij in de belangrijkste grote rivieren, met als aanleiding dioxineverontreiniging.		1 April 2011

*Het gebruik van fuiken en staand want in de recreatieve visserij in de kustgebieden is verboden sinds 1 januari 2011. Later op 1 januari 2012 is staand want in de Waddenzee en Westerschelde weer toegestaan. En in mei 2012 ook weer in de Noordzee. Reden hiervoor is dat met staand want geen aal gevangen wordt.
**In 2009 2 maanden gesloten, oktober en november
*** Vanwege het sluiten van de belangrijkste grote rivieren, die dienst doen als "migratie snelwegen" is besloten deze maatregel niet meer in te voeren. Het besluit is genomen op grond van een wetenschappelijke analyse.

De conclusie is dat visserijmaatregelen op tijd zijn geïmplementeerd. Het onderzoek naar het kweken van aal in gevangenschap liep al enige jaren en is sinds het in werking treden van het aalbeheerplan voortgezet.
Van het oplossen van belangrijke aalmigratieknelpunten is in eerste instantie gekeken naar de top 30 voor aal (Tom Buijse et al., 2009). In de periode 2008-2011 zijn er bij vier van de top 30 migratieknelpunten werkzaamheden verricht om de passeerbaarheid te verbeteren. Een belangrijke opmerking hierbij is wel dat de nieuwste inzichten aangeven dat een groot deel van de top 30 wellicht geen knelpunt voor uittrekkende schieraal blijkt te zijn. Nadere analyses hierover zijn nog gaande en zullen in de toekomst worden betrokken bij de uitvoering van deze maatregel.
Door de taakstelling uit het regeerakkoord zijn een aantal maatregelen in het hoofdwatersysteem getemporiseerd tot na 2015. Daarbij zitten ook vispassages. Bij de keuze is echter rekening gehouden met de effectiviteit van de vispassages. Zo zijn de vispassages tussen zoet en zout overgangen , stromend en stagnant (=stilstaand water) water zoveel mogelijk in de eerdere planning gelaten. Van de totale 628 vispassages die zijn genoemd in de stroomgebiedbeheerplannen was op 31 december 43% uitgevoerd of in uitvoering (Water in beeld).

De maatregelen die tot vermindering van mortaliteit van aal moeten leiden bij de 3 grootste waterkrachtcentrales zijn begin november 2011 geïmplementeerd. Vanaf dit moment passen de waterkrachtcentrales van NUON en ESSENT aangepast turbinebeheer toe. Daarbij wordt de volgende turbine pas aangezet als de voorgaande turbine op vollast draait. Turbines die op hoge snelheid draaien, veroorzaken namelijk minder sterfte/schade aan vissen dan turbines die op lagere snelheid draaien. Dit komt doordat de ruimte tussen de schoepen bij lagere snelheid veel kleiner is en de kans dat de vissen geraakt worden daardoor groter.
Hoewel vanaf 2009 overleg is gevoerd met de betrokken energiemaatschappijen over de te nemen maatregelen, hebben beide energiemaatschappijen deze pas geïmplementeerd in november 2011 met het oog op de komende vergunningverlening op grond van de nieuwe Waterwet.

De maatregel visserijvrije zone bleek vorig jaar overbodig. Deze maatregel was in het aalbeheerplan opgenomen met als doel gedurende de aalmigratie de aal ruim baan te geven om naar zee te trekken. Het grootste deel van de tijd waarin de migratie van schieraal plaatsvindt, is echter al in de gesloten tijd voor de aalvisserij. Toen later (april 2011) ook nog de belangrijkste grote rivieren, die tevens de belangrijkste migratieroutes voor schieraal zijn, gesloten werden, is de maatregel na wetenschappelijk advies als overbodig bestempeld.

Glas- en pootaal worden in het voorjaar uitgezet. Toen het aalbeheerplan in oktober 2009 in werking trad, was het voor 2009 te laat om dat jaar nog glas- en pootaal uit te zetten. In 2010 is de uitzet wel volgens plan verlopen. In 2011 is het niet gelukt het totale bedrag voor 2011 te besteden. Dit kwam door aanbestedingsproblemen en het warme voorjaar van 2011 en de daarmee

geringe glasaalvangsten in april en mei. Het niet besteedde bedrag is toegevoegd aan het in 2012 uit te geven bedrag.

De effecten van het Nederlandse aalbeheerplen op de Nederlandse aalpopulatie zullen echter pas na vele jaren zichtbaar worden. Dit omdat de aal een lange levenscyclus heeft. Tot die tijd blijft het huidige aalbeheerplan inclusief de daarin opgenomen maatregelen van kracht.

Chapter 1: Outline the monitoring, effectiveness and outcome of the eel management plan

Requested by format European Commission: Outline the monitoring, effectiveness and outcome of the eel management plans implemented on your territory in co-operation with neighbouring countries. Do you have any indication/evidence/data to suggest that an amendment of the Regulation [and consequently the eel plans] is necessary to achieve the objective set out in Article 2(4) of the Regulation and to ensure the recovery of the species?

1.1 Monitoring progress EMP

A wide range of new and existing programmes are in place to record the abundance of glass eel, yellow eel and silver eel, to monitor commercial and recreational catches and to register changes in barrier mortality (hydropower plants, pumping stations). These data are used to calculate the biomass of escaping silver eel using the recently developed Yellow Eel Model. For further details see the attached scientific report of IMARES.

Glass eel: Glass eel abundance is recorded at 12 locations along the Dutch coast with the longest series at Den Oever dating back to the 1930s.

Yellow eel and silver eel: In regionally managed water bodies, eel abundance is recorded as part of the Water Framework Directive Fish Monitoring Programme. All water bodies are surveyed at least once every six years. In nationally managed waters (major rivers, IJsselmeer/Markermeer) eel abundance is determined on an annual basis. A specific silver eel index to monitor the relative abundance of migrating silver eel on the most important migration routes along the coast will start in the fall of 2012.

Commercial fishery: Until recently, only landings from IJsselmeer/Markermeer were recorded, however, on 1 January 2010 an obligatory online catch registration system was introduced (weekly landings per individual). On 1 January 2012 the registration system was updated and currently both catches and fishing efforts are recorded on a weekly basis. The Market Sampling Programme (size, frequency; biological samples) which has been in place since the 1960s on IJsselmeer/Markermeer was extended to cover the whole of the Netherlands in 2009/2010.

Recreational fishery: In 2009 the Recreation Fishery Programme was launched. Every other year the number of recreational fishermen is determined on the basis of a screening survey (2009, 2011) and 2000-2500 individuals are selected for a 12-month logbook programme (2010; 2012) for an estimation of the catches.

Hydropower plants: Telemetry studies were conducted in the two major rivers Meuse and Rhine in 2002/2004 (before EMP) and 2010/2011 (after EMP). Telemetry (and mark-recapture) studies will continue in the future to monitor change in silver eel mortality caused by passage through hydropower plants.

Barriers: The progress of the planned infrastructural improvements for fish migrations of the ~1800 barriers identified as important for eel will be monitored annually starting in 2012. In this report the progress of improving fish passage at the 30 most important migration barriers has been evaluated.

1.2 Effectiveness implemented measures of the EMP

Commercial and recreational fishery: The most effective measures of the EMP were the measures developed to reduce the impact of commercial and recreational fisheries. The introduction of a closed season (polluted rivers) has roughly halved the landings of commercial and recreational fishery between 2008 and 2011. The introduction of a catch & release fishery for eel in most waters for recreational fishery has achieved a similar reduction of the landings. The achieved reduction in anthropogenic mortality (*see* fig 1.1) between 2008 and 2011 is almost exclusively the result of the reduction in landings.

Barriers: The commitments under the government's coalition agreement made it necessary to suspend a number of measures until after 2015. These measures also concern fish passages. The effectiveness of the passages was a determining factor. Passages in the fresh and salt, or running and stagnant water transition zones remained in the planning. On 31 December 2011, work was done or had been done on 43% of the 628 fish passages referred to in the catchment area management plans (Water in Beeld)

Hydropower plants: In the period 2009-2011 the measures to achieve a 35% reduction in mortality by hydropower plants had little effect. In the first place, fish-friendly turbine management was not implemented till late November 2011. Secondly, due to technical difficulties (wear and tear turbines at maximum water flow), the intended mortality reduction of 35% as described in the EMP will not be achieved, the maximum reduction in mortality using adjusted turbine management will be 24%.

Glass eel stocking: A protocol was drawn up for the introduction of glass eel with criteria for the selection of waters (Klein Breteler, 2008). Another protocol was drawn up to optimise chances for glass eel survival (Kuijs & de Graaf, 2011). The effectiveness of the current glass eel stocking programme is unclear. Impact of the stocking program in the period 2009-2011 will not be visible until the glass eel has grown past 30 cm in length and has recruited into the fishery and eel monitoring programmes. Therefore it falls outside the period currently being evaluated. Introducing translocated glass eel from France, Spain and England into Dutch waters will undoubtedly increase the biomass of silver eel in Dutch waters.

1.3 Outcome of the EMP

Over the past two years the ICES Study Group on International Post-Evaluation of Eel (SGIPEE) and the ICES Working Group on Eels (WGEEL), have progressively been working on a pragmatic framework for a (inter)national post-evaluation of the status of the eel stock and the effect of management measures (ICES 2010a, 2010b, 2011a).

In the Eel Management Plan (2009), the Netherlands has provided estimates of pristine biomass and of current anthropogenic impacts, and thus has set reference points to which the status of the local stock and efficacy of implemented management actions can be compared.

During the past two year ICES working groups (2010a, 2010b, 2011a) adapted the classical ICES precautionary diagram to the eel case (Fig. 1.1). In the modified ICES precautionary diagram the horizontal axis reflects the status of the stock (biomass escaping silver eel, ratio Bcurrent/B0) in relation to the estimated pristine situation. On the vertical axis total anthropogenic mortality is plotted, a summation of all (quantified) sources of anthropogenic mortality during the continental phase of eel. The vertical axis indicates to what extent the current population is protected in comparison with a situation where no anthropogenic mortality occurs and the production of silver eel per glass eel is at its maximum (anthropogenic mortality, ratio Bcurrent/Bbest).

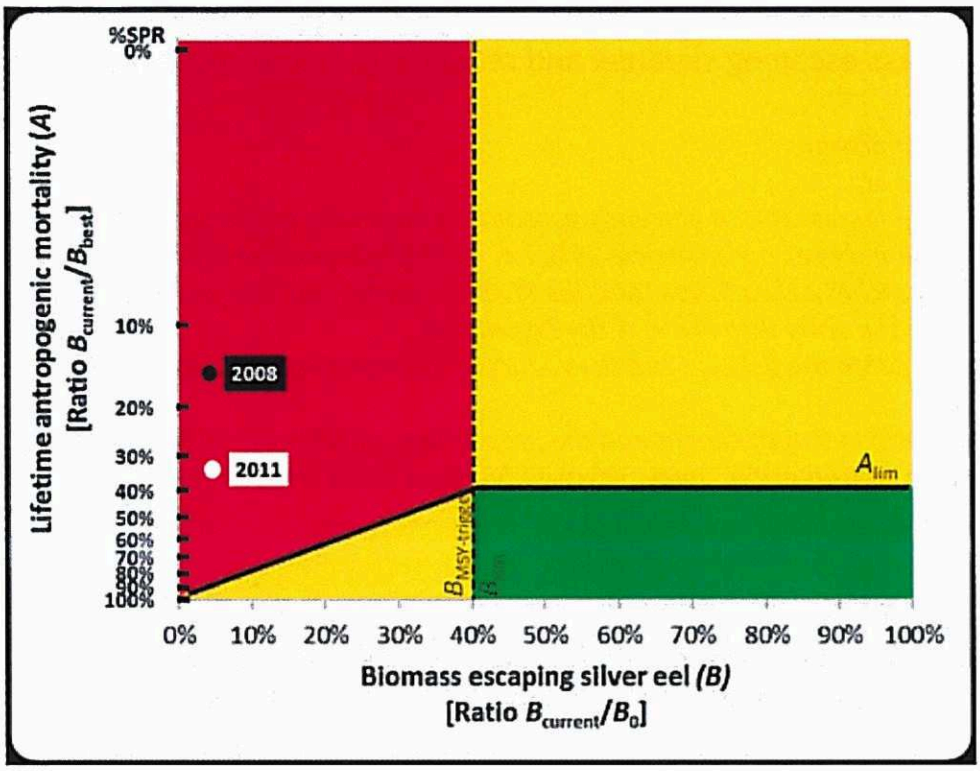

Fig. 1.1 ICES modified precautionary diagram representing the status of eel stocks in the Netherlands in 2008 and 2011. The horizontal axis represents the status of the stock in relation to pristine conditions, while the vertical axis represents the impact made by anthropogenic mortality. %SPR = spawner potential ratio, a measure for the survival to silver eel relative to pristine conditions.

The status of the eel population in 2008 and 2011 and hence, the evaluation of the Dutch Eel Management Plan is graphically presented in Fig 1.1, using the ICES Modified Precautionary Diagram. The evaluation demonstrates that before and after the implementation of the EMP the status of eel stocks in Dutch waters remained "undesirable" (high mortality, low biomass). Current biomass of escaping silver eel is below the target of 40% of the pristine situation and current anthropogenic mortality is above the recommended mortality at such low biomass of escaping silver eel (following the reference points developed by ICES, 2011b).
Measures to reduce anthropogenic mortality are relatively quick and easy to implement and will directly result in measurable improvements (vertical axis). A reduction in anthropogenic mortality is therefore a good indicator of the drive and progress in eel management.

In the Netherlands the implementation of the EMP has resulted in a decrease in anthropogenic mortality (Fig. 1.1). The observed reduction in anthropogenic mortality is almost solely the result of a decrease in fishery mortality, both commercial and recreational. Landings of both commercial and recreational fishery have halved since the implementation of the EMP. The remaining measures (hydropower plants, pumping stations etc) have so far had limited measurable impact on reduced mortality.
Between 2008 and 2011, no noticeable increase in the biomass of escaping silver eel was observed (horizontal axis; fig. 1.1). An increase was also not expected as current silver eel escapement has largely been determined by processes (recruitment, anthropogenic mortality) that occurred in the previous 5-15 years. Furthermore, an increase in glass eel recruitment, if it had occurred after 2009, will possibly result in an increase of silver eel after 5-15 years (2014-2025). The measures put in place in the eel management plan will be continued.

Chapter 2: Estimates of biomass escaping silvereel and reductions in antropogenic mortalities

Requested by format European Commission:
Provide the best available estimates of:
2.1 The proportion of the silver eel biomass that is currently escaping towards the sea to spawn, relative to the target level of escapement set out in Article 2(4), i.e. 40% of the pristine biomass.
2.2 The level of fishing effort that catches eel each year and the level of catches, and the reduction in effort and catches effected since the entry into force of the Regulation.
2.3 The level of mortality factors outside the fishery, and the reduction effected in accordance with Article 2(10);
2.4 The amount of eel less than 12 cm in length caught and the proportions of this utilised for all purposes such as restocking, direct consumption, aquaculture within the EU and outside the EU, export outside the EU.

2.1 Silver eel biomass currently escaping

The proportion of the silver eel biomass that is currently escaping towards the sea to spawn, relative to the target level of escapement set out in Article 2(4), i.e. 40% of the pristine biomass =

$$\frac{B_{current} = 482\ t}{40\%\ of\ B_{pristine} = 4.160\ t^{*}} \times 100 = 12\%$$

Details on the estimation of $B_{current}$ can be found in Bierman et al. (2012). Details on the estimation of $B_{pristine}$ can be found in the Eel Management Plan (2009) and references therein.

2.2 Reduction fishing effort and catches

2.2.1 Commercial fishery

2.2.1.1 Effort

Fishing effort was until recently (1/1/2012) not recorded in the Netherlands. The fishing capacity for IJsselmeer/Markermeer is known (Fig. 2.1) but no record has been kept of the actual usage of the gears. Furthermore, in IJsselmeer/Markermeer the effort of the long line fishery is restricted by licences, but the number of long lines per licence is not regulated. The current long line numbers, and/or recent changes in numbers are unknown.

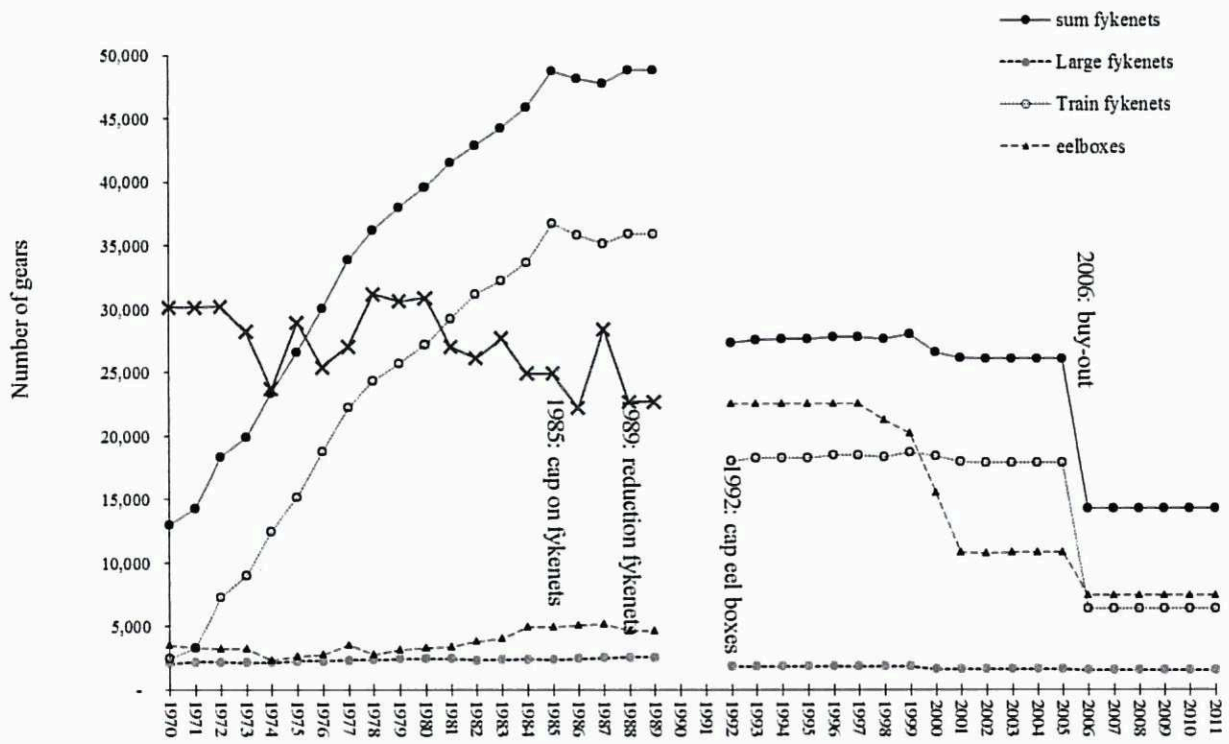

Fig. 2.1 Trend in the nominal quantity of fishing gear in eel fishery on IJsselmeer/Markermeer. Information before 1989 is based on a voluntary questionnaire in 1989 (Dekker 1991); after 1992, the licensed quantity of gear is shown. Note that long line fishery is only restricted by the number of licences, the number of long lines per licence is not regulated.

Table 2.1 provides a rough overview of eel fishing gear used in Dutch fishery before and after the implementation of the EMP. In IJsselmeer/Markermeer, no changes have occurred in quantities of fishing gear (fyke nets and eel boxes) in the period 2008-2011, although (changes in) number of bottom long lines is unclear. Although no changes in the (maximum) capacity have occurred it is not known if any changes have occurred in the actual usage of the fishing gears.

The closure of the eel fishery in the polluted areas of the rivers Rhine and Meuse has reduced the quantity of eel fishing gear to zero. In these areas fishermen are only allowed to use seine nets to catch cyprinid and percid fish.

In 2008 fishing gear quantities in a large part of the eel fishery (40% of the registered eel fishing companies) remained unresolved. In 2010 and 2011 the Ministry of Economic Affairs, Agriculture and Innovation (EL&I) contacted all eel fishing companies operating outside IJsselmeer/Markermeer and the closed areas to gain insight in the numbers and type of fishing gear used (Table 2.1 Other waters).

Table 2.1 Fishing gear types used in the Netherlands (Source: 2008 EMP and Dekker et al. 2008; 2011 Min EL&I).

	IJsselmeer/Markermeer		Rivers ("closed areas")		Other waters	
Gear	2008	2011	2008	2011	2008	2011
large fykes	1579	1579	318	0	?	3900
train fykes	6386	6386	2433	0	?	4040
other fykes			51	0	?	2800
Eel boxes	7415	7415	551	0	?	190
longlines (bottom; #blocks, 200 hooks per block)	100 (?)	100 (?)			?	150
longline (surface; #hooks)					?	5800
Electro fishing gear			+	0	?	23
Stow net					?	5
Eel seine					?	5

The introduction of a closed season as part of the EMP in 2009 has significantly reduced "effort" when defined as the number of fishing days. Table 2.2 provides an overview of the changes in length of the eel fishing season throughout the Netherlands.

Table 2.2 Changes in the length of the eel fishing season in Dutch waters.

	2008	2011	Reduced fishing season (days/%)
IJsselmeer/Markermeer			
large fykes	1 May- 31 December	1 May – 31 August & 1-31 December	91 (38%)
train fykes	1 May – 30 September	1 May – 31 August	31 (20%)
Eel boxes and long lines	12 April – 30 September	12 April – 31 August	31 (20%)
Other waters	1 Jan – 31 December	1 Jan – 31 August & 1-31 December	91 (25%)

It is difficult to properly evaluate the change in effort (number of gear and usage of gear) before and after the implementation of the EMP due to:

- the lack of information on quantities of fishing gear and usage in the waters outside IJsselmeer/Markermeer, and
- the lack of information on quantities of fishing gear (long line) and usage on IJsselmeer/Markermeer.

To avoid similar issues during the evaluation in 2015, all eel fishermen have been obliged to report effort (type of gear and quantities of gear used) on a weekly basis as of 1 January 2012 as part of the digital catch recording system which was implemented by the Min EL&I on 1 January 2010.

2.2.1.2 Catches

On 1 January 2010 an obligatory eel catch registration system was introduced. Before that, eel catch data were only available for IJsselmeer/ Markermeer (Fig. 2.2). Eel catches in IJsselmeer/Markermeer have been in decline since the 1950s. Fig. 2.2 further illustrates some of

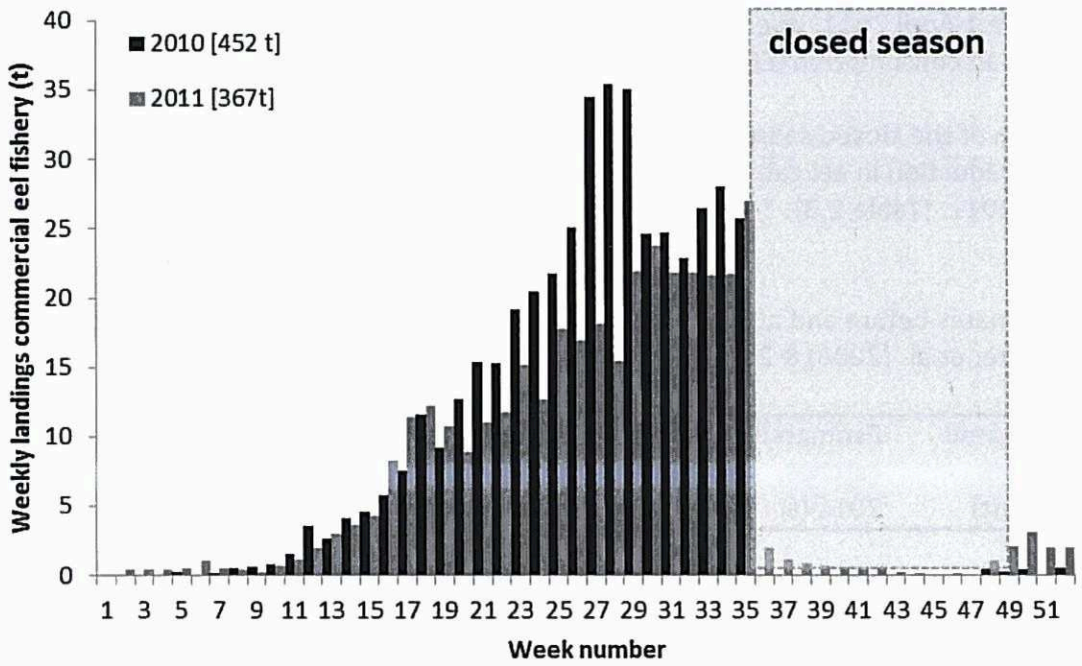

Fig. 2.2 Weekly eel catches in tonnes in 2010 and 2011 (source: Min EL&I)

the difficulties encountered when evaluating the impact of the EMP on catches. In 2010, different catch quantities for IJsselmeer/Markermeer were reported (PVIS (65 t), PO IJsselmeer (79 t) and Min EL&I (117 t).

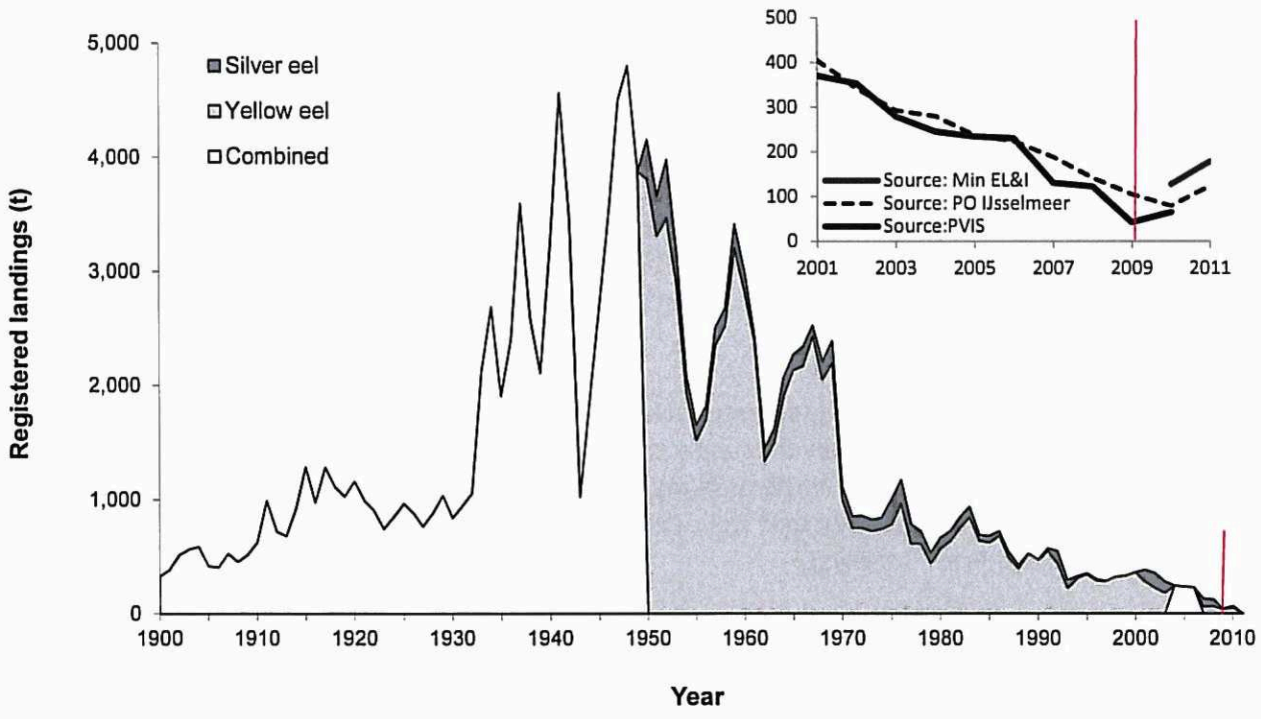

Fig. 2.3 Catch trends in IJsselmeer/Markermeer. Red line indicates implementation of EMP. Note the differences in catch estimates from the different sources. 2010 (3-month closure), 2011 (3-month closure) and from 1 April (wk 13) closed areas as well)

In 2010, 452 tonnes of eel were caught by commercial vessels in the Netherlands (Fig. 2.3). Roughly a third of this catch (172 t; Table 2.2) came from the areas that were closed to the fishery of eel and mitten crab on 1 April 2011, due to presence of eels with dioxine-levels higher than considered safe for human consumption (ER 1881/2006; Kotterman & van der Lee 2011).

Overall, the introduction of the closed season in 2009 and the closure of the polluted areas in 2010 have resulted in a 60% reduction in eel catches by commercial vessels from 920 tonnes in 2008 down to 367 tonnes in 2011. (Table 2.3). This is higher then the estimate in the eel management plan of 45%.

Table 2.3 Eel catch estimates before and after the implementation of the EMP. (Source: 2008 data EMP and Dekker et al. (2008) & 2011 based on catch registration Min EL&I).

	Estimated catches 2008 (t)	Estimated catches 2011 (t)	Estimated reduction 2011 (t)
Closed Season			
yellow eel	640*	290	55%
silver eel	280*	77	73%
total	920	367	60%

*Total estimated catch, including the areas closed for the eel fishery on 1 April 2011.

2.2.2 Recreational fishery

In 2010 an estimated ~1.5 million eels (230-275 tonnes) were captured in recreational fishery in the Netherlands (Table 2.4). Roughly two-thirds of the eel were released upon capture. The retained catch was 515,000 specimens (55-115 tonnes).

Vriese et al. (2008) estimated eel catches (retained) by recreational fishermen of 280-400 tonnes before the implementation of the EMP. In the EMP itself recreational eel catches (retained) were estimated to be around 90-300 t (EMP Table 2.3.3) before 2009.

The number of recreational fishermen retaining eel has always been modest and has further declined in 2012; 6% in 2002 (males □15 inland waters), 9% in 2004 (males □15 inland waters), 4% or ~65,000 fishermen in 2010 (males □15/females □15/children in inland and marine waters). The average number of eel taken home appears to be declining over the past 10 years from 18 in 2002, 9 in 2004 to 6 in 2010.

In addition to the ~500,000 retained eel, an estimated ~1,000,000 eels (160-175 t) were released upon capture. It is, however, highly likely that a percentage of these will not survive the ordeal of being caught due to injuries sustained in the hooking and handling process. How to deal with C&R mortality will need careful consideration and will need to be agreed internationally (ICES Working Group on Recreational Fisheries Surveys).

Table 2.4 Eel catches and percentage of retained eel in fresh and marine waters in the Netherlands in 2010 (van der Hammen & de Graaf, 2012).

	numbers			uncorrected weight (kg)			corrected weight (kg)		
	marine	fresh	sum	marine	fresh	sum	marine	fresh	sum
retained	174,215	340,536	514,751	36,287	78,259	114,546	17,161	37,374	54,535
released	108,462	872,570	981,032	23,834	137,186	161,020	26,253	149,917	176,170
sum	282,677	1,213,106	1,495,783	60,121	215,445	275,566	43,414	187,291	230,705
%	62%	28%	34%	60%	36%	42%	40%	20%	24%

2.3 Reduction of mortality outside the fishery

2.3.1 Pumping stations and other barriers

The Netherlands is a densely populated country, with an intensive use of the natural resources. Situated in the delta of four different river basins, the country is extremely rich in waterways providing potential habitats for eel. The intensive use of the country has generated enormous numbers (>15,000) of barriers (pumping stations, dams, locks, hydropower stations) for eel migration. Buijse et al. (2008) concluded that of the ~2700 identified barriers, ~1800 were of particular importance for the migration of eels (Fig. 2.4). The Eel Migration Barrier Map shows the planning for their removal (orange dots (136) before 2010; red dots (538) before 2015; purple dots (239) after 2015; black dots (608) still to be planned; green dots (255) barrier removed, or installation of fish migration device). Buijse et al. (2008) further identified a "Top 30" of migration barriers based on the size of the inland waters behind each of these priority migration barriers (Fig. 2.4).

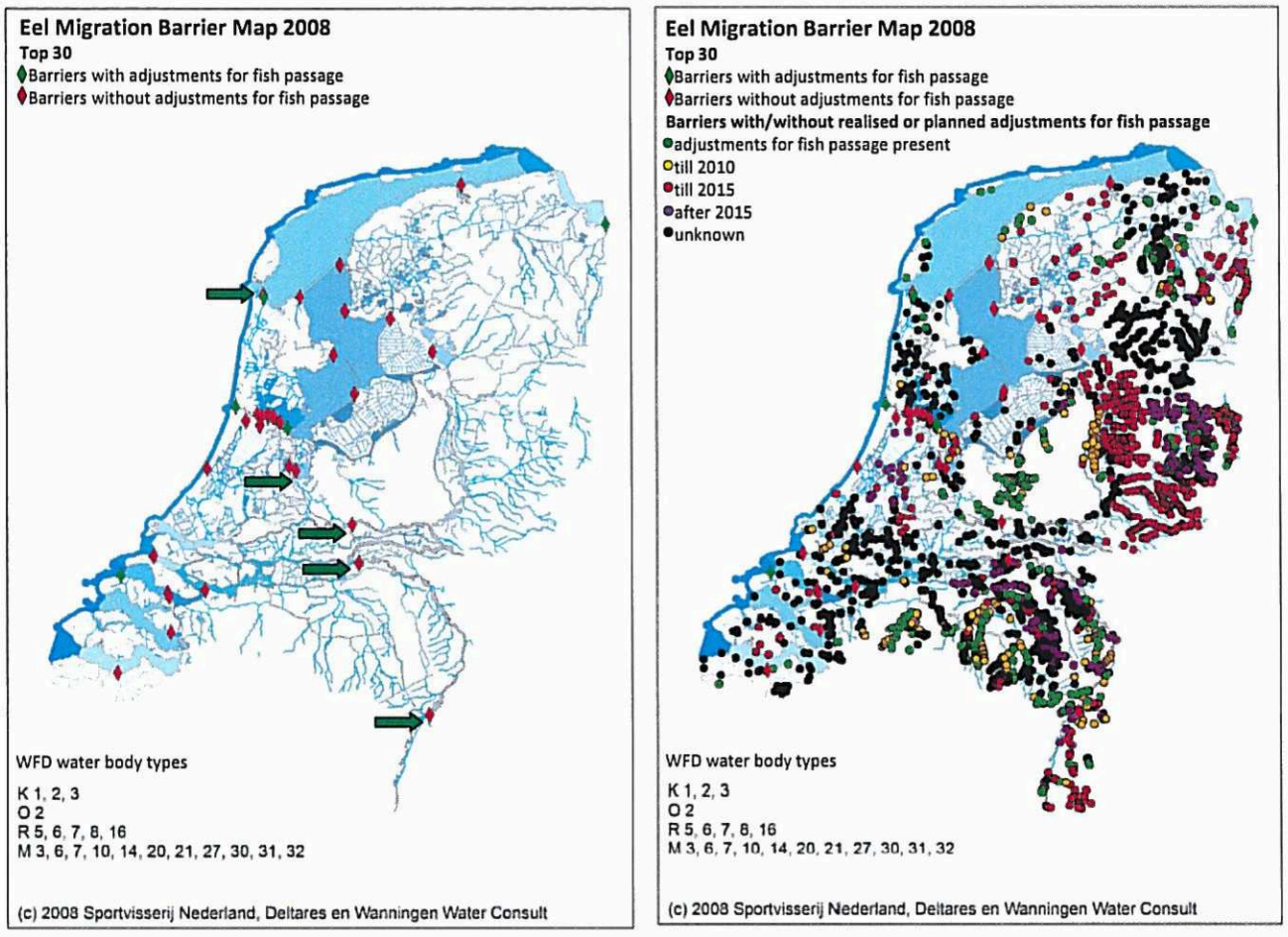

Fig. 2.4 Barriers to eel migration in the Netherlands, and planned solutions as formulated in 2008 (Buijse et al. 2008). Green arrows indicate the four "Top 30" migration barriers where adjustments were made in the period 2009-2011.

In the period 2009-2011 fish passage was improved at five of the "Top 30" barriers; Mijndense Sluis (installation of fish-friendly pump in 2011), Spuisluis Oostoever (mainly upstream migration glass eel) and fish-friendly turbine management at HPS Linne, HPS Lith and HPS Amerongen (see 2.3.2 Hydropower stations). An inventory of the status of the remaining ~1800 migration barriers is

currently being conducted but will not be available before 1 July 2012. The two improvements of fish migration at Mijndense Sluis and Spuisluis Oostoever will have a negligible effect on the total number of escaping silver eel in the period 2009-2011.

2.3.2 Hydropower stations

There are six hydropower stations in the Dutch part of the river basins of Rhine and Meuse, three of which are a factor ten larger than the others (Table 2.5). All of these stations have fish passes to allow upstream migration of eel.

Table 2.5 Main hydropower stations (HPS)

River	Location	Company registered	Power	Annual Production	Year of first Use
Meuse	Alphen/Lith	Nuon	14.0 MW	44 Gwh	1990
Meuse	Linne	Essent	11.5 MW	35 Gwh	1989
Lower Rhine	Amerongen	Nuon	10.0 MW	24 Gwh	1988
Lower Rhine	Hagestein	Nuon	1.8 MW	3 Gwh	1958
Overijsselse Vecht	De Haandrik	Essent	0.2 MW	0.3 Gwh	
Roer	Roermond	Nuon	0.1 MW	0.1 Gwh	1988

The mortality and injury of silver eel due to hydropower stations has been monitored in the river Meuse. Telemetry studies of migrating silver eel in 2002 and 2004 indicated a mortality range of 16-34% in two hydropower stations in the Meuse that are set in series, almost half of the total mortality (Winter & Jansen, 2006). Preliminary results of telemetry studies in 2010 showed little change in mortality due to hydropower stations in the Meuse in the period 2009-2011 (Table 2.6). This is no surprise because fish-friendly adjustments (35% reduction in direct mortality) to the turbines did not start till 17 November 2011 at HPS Alphen/Lith and 21 November 2011 HPS Linne in the Meuse and 17 November 2011 at HPS Amerongen in the Lower Rhine. Furthermore, due to technical difficulties (wear and tear turbines at maximum water flow), the intended 35% mortality reduction will not be achieved, the maximum reduction in mortality using adjusted turbine management will be 24%. No data is currently available on the effect on mortality but it is likely that the impact is similar to the results found in the river Meuse.

Table 2.6 Observed and estimated mortality rates of silver eel in the river Meuse (2002, 2004 from Winter & Jansen, 2006; 2010 from Winter & Griffioen, unpublished data).

	2002 (n=121)		2004 (n=105)		2010 (n=121)	
	Obs (%)	Est (%)	Obs (%)	Est (%)	Obs (%)	Est (%)
successful passage to sea*	37	>37	31	>31	33	>33
commercial fisheries	15	21-15	13	19-22	0	0
recreational fisheries	1	1	2	3	0	>0
hydropower plants (total)		16-26		25-34		22-26
"unknown"	38	11-25	35	10-22		41-45

*not included possible mortality between the last detection station and the sea in Nieuwe Waterweg (-20km).

2.4 Quantities of eel <12 cm in length

The legal minimum market size for eel fishery in the Netherlands is 28 cm, therefore no eels <12 cm in length are harvested in the Netherlands. The quantity of eels <12 cm caught in the Netherlands is zero.

Chapter 3: Status of measures foreseen and implemented

Requested by format European Commission: Provide a list of the measures foreseen and implemented and a list of the measures foreseen but not implemented. Provide the date as of which each measure was implemented.

Table 3.1 gives an overview of the foreseen measures and their implementation.

Table 3.1 EMP measures aimed at achieving the 40% escapement objective.

No	EMP measure (implemented as planned)	Planned implementation	Realised implementation
1	Release of eel caught (a) at sea and (b) in inland waters by anglers	2009	1 October 2009
2	Ban on recreational fishery in coastal areas using professional gear	2011	1 January 2011*
3	Closed season from 1 September to 1 December	2009	1 October 2009**
4	Stop the issue of licences to snigglers in state-owned waters	2009	1 May 2009
5	Research into the artificial propagation of eel.	ongoing	EU-project started
6	Reducing barriers at pumping stations and other water works; of the 1800 most important migration barriers 900 will be removed by 2015 and the remaining 900 by 2027	2015-2027	2015-2027
7	Reducing barriers at hydro-electric stations by at least 35%	2009	2011 17-11
8	Introducing fishery-free zones in areas that are important for eel migration	2010	1 April 2011***
9	Restocking of glass eel and pre-grown eel from aquaculture	2009	Early 2010
10	Closure eel fishery in contaminated areas (PCBs, dioxins)		1 April 2011

* The use of fykes and long-lines in recreational fishery was banned on 1/1/2011. The use of gillnets, however, is still allowed in some marine waters.

** In 2009 there was a closed season from 1 October to 1 December.

*** Most of the areas closed for commercial fisheries on 1/4/2011 on account of contamination were in the major rivers, which are the main "high ways" for diadromous species like salmon and eel.

Chapter 4: Implementation of EMP measures

Requested by format European Commission: Have all the foreseen measures been fully implemented as described within the adopted plan(s) pertaining to your national territory? Provide an explanation for each measure included in the adopted plan(s), which has not been implemented, or implemented after the foreseen date. If an alternative measure was implemented, please describe it and compare its effectiveness in relation to the measure it has replaced or will replace.

4.1 Release of eel caught at sea and in inland waters in recreational fishery

4.1.1 Inland waters

In the summer of 2008, the national organisation of anglers (*Sportvisserij Nederland*) announced a ban on eel landings from 2009 onwards for holders of licences issued by the organisation. According to this decision, no eel may be retained, but a catch-and-release fishery remains allowed. The area for which the organisation issues fishing licences covers about 90% of the inland waters. Even though the restriction is voluntary, its enforcement takes place in accordance with the 1963 Fishery law. This because under section 21 of this law, fishing is not allowed without a licence, or permission of the owner of the fishing rights. This also includes fishing in breach of a fishing licence. The closed season for eel fisheries (see Measure 6) also applies to recreational fisheries in inland waters.

4.1.2 Marine waters

As of 1 January 2011 it has become obligatory for all recreational fishermen in all marine and coastal zones to return the eel alive to the water immediately upon capture (Official Gazette No 13978; Section 23a *Regelement voor de Binnenvisserij 1985*). The closed season for eel fisheries(see Measure 6) also applies to recreational fisheries in marine and coastal waters.

4.2 Ban on the use of professional gear in recreational fishery in coastal areas

The use of professional gear like fykes, gillnets, long-line and eel boxes in coastal waters in recreational fishery has been banned as of 1 January 2011 (Official Gazette No 19689; Section 5a *Regeling instandhoudingsmaatregelen zeevisserij*). The ban on professional gear in recreational fishery in inland waters had already been in force before the implementation of the EMP.

Once this regulation was introduced, the Dutch Parliament asked for the use of "historical" or "traditionally existing" small recreational gill nets to be allowed in the Wadden Sea and Westerscheldt. This request was honoured as no eels are caught in this type of fishing gear and as of 1 January 2012 the use of small recreational gill nets has been allowed in the Wadden Sea and Westerscheldt. By the end of May 2012 this will also be allowed (under strict conditions) in the North Sea.

4.3 Closed season from 1 September to 1 December

4.3.1 Closed season

On 1 October 2009 an annual closed season (1 September – 1 December) was introduced for the use of a range of eel fishing gears in marine, coastal and inland commercial fisheries (Official Gazette No 13978, and Section 32a, *Reglement voor de Binnenvisserij 1985*). The closed season applies to commercial and recreational fisheries in marine, coastal and inland waters.

4.3.2 Regional Eel Management (pilot Friesland)

The EMP describes the closed season as 'a temporary measure'. In future this measure could be replaced by a regional measure. In 2010 the European Commission gave the Netherlands permission to start a pilot in Friesland with regional eel management. In this pilot, which started in 2011, fishermen in Friesland were given a quota and were allowed to fish the whole year. Quotas were based on the quantities caught over 9 months in the previous year so that this approach incorporates the closed season. The first results of the pilot show that regional eel management is feasible. A decentralised approach raises fishermen's awareness of the need for more sustainable management and highlights the advantages of a decentralised approach. Increased awareness of the need for sustainable management will increase support and contribute to the efforts towards improving the status of eel stocks. For more details see the attached report "Decentraal Aalbeheer" enclosed.

4.4 No more government issued licenses for sniggling

In 2009, with the issue of 98 licences, sniggling was still allowed in state-owned inland waters. The annual renewal of the licences for this type of eel fishery was discontinued on 1 May 2009. The estimated effect of this measure in terms of extra silver eel escapement has been limited. Based on a local survey conducted among snigglers in Groningen and Drenthe by Huigen (2006), Quak (2006) made a rough estimate of the numbers of eel landed by snigglers in the Netherlands.
Quak estimated the total catch of (yellow) eel at roughly 9 tonnes. The estimate was based on ~4200 snigglers (government licences ~125, licences issued by *Sportvisserij Nederland* ~4000 and commercial fishermen ~100), fishing on average 2.35 nights with an average catch of 0.9 kg per night. Using the figures provided by Huigen (2006) and Quack (2006) the estimated annual catch by the 98 snigglers with government licences was around 207 kg or 0.21 tonnes.

4.5 Research into the artificial propagation of eel.

For several years the government has subsidised research at the University of Leiden aimed at the artificial propagation of eel. If a reliable technique could be developed for the mass production of glass eels, at least the aquaculture sector would no longer be dependent on glass eel caught in the wild. This will reduce the pressure on the wild stock. To date mass production of eel by means of artificial reproduction has not been yet been achieved. Since 2009 the research into the artificial propagation of eel has continued with the European research project "Pro-eel", in which the Netherlands is a partner. After two years of research, scientists made progress in some aspects such as food and the selection of reproducers, protocols for hormonal induction of males and females, hormonal control of reproduction, fertilisation and production of viable eggs and larvae. So far, the experts at Pro-Eel have managed to increase the production of viable eggs and larval survival: after completing their embryonic development, larvae were able to live up to 25 days after hatching.
The next step lies in getting the development of experiments on larval rearing and food for reproducers. The most recent project co-sponsored by the Ministry will be research into the feeding of eel-larvae. This project was launched in February 2012.

4.6 Reducing eel mortality at pumping stations and other water works

The commitments under the government's coalition agreement made it necessary to suspend a number of measures until after 2015. These measures also concern fish passages. The effectiveness of the passages was a determining factor. Passages in the fresh and salt, or running and stagnant water transition zones remained in the planning. On 31 December 2011, work was done or had been done on 43% of the 628 fish passages referred to in the catchment area management plans.

The Dutch Parliament was informed of this decision and the measures concerned on 15 April 2011. A copy of this letter to the House was sent to the Directorate-General Environment of the European Commission.

As a temporary measure silver eel could be caught before the migration barriers and released behind them (trap-and-transport). In 2012 pilots will start to gain the necessary experience for such an (interim) measure, beginning with the most important migration barriers close to the sea.

4.7 Reduction of eel mortality at hydro-electric stations

Measures will have to be put in place near the three large hydropower stations (Lith, Linne and Amerongen), to reduce (downstream) eel mortality, initially by at least 35%.

These measures were implemented in early November 2011. As of that date NUON and Essent hydropower stations have applied adjusted turbine management. In adapted turbine management the second turbine is not switched on until the first is operating at full load. Mortality is less in turbines turning at high speed because at low speed the space between the blades is smaller, which increases the risk of eel strike.

Although consultations with the hydropower companies have taken place from 2009 adapted management was not introduced until November with a view to the water licences required under the new Water Act.

Adaptation of turbine management
Mortality is less in turbines turning at high speed because at low speed the space between the blades is smaller, which increases the risk of eel strike.
A document on turbine management, written by T. Buijse in 2009, which was based on a study carried out at Linne, indicated that adaptation of turbine management could reduce fish mortality by 35%. This percentage was used for the EMP. Later however, this figure was revised (T. Buijse, August 2011) and the percentage went down to 31%.

In adapted turbine management the second turbine is not switched on until the first is operating at full load. This is already the case at flows of 70m^3/s passing through it. In practice, full load operation is not possible, as it causes too much wear. In practice turbines will operate at lower speeds, which will mean mortality reduction will be 24%.

Adapted turbine management

In adapted turbine management a second turbine is not switched on until the first is operating at full load. This is already the case at flows of 70m^3/s passing through it, and when the next turbine is switched on 2 x 35 m^3/s is passed through. The same is true for the third turbine, which is switched on at a flow of 114 m^3/s, then there is a flow of 3 x 38 m^3/s. The fourth turbine is switched on at a flow of 158 m^3/s, when a flow of 4 x 40 m^3/s passes through. Low flows cause relatively high mortality as there is less space between the blades. Fish mortality resulting from turbine passage is considerably lower if the second turbine is not switched on until the first is operating at full load. (100 to 120 m^3/s).

4.8 The establishment of fishery-free zones in areas that are important for eel migration

The establishment of fishery-free zones is no longer needed in the Netherlands because since 1 April 2011 eel fishery is no longer allowed in the major rivers in the Netherlands on account of dioxin contamination. These rivers are the most important "high ways" for diadromous species like eel and salmon. In other parts of the Netherlands there is a closed season for eel fishery from September to December.

4.9 Restocking of glass eel and pre-grown eel from aquaculture

For the period 2010 – 2013 the Dutch government budgeted EUR 1.5 million (10% of which to be subsidised by the European Fishery Fund) to restock waters with glass eel and pre-grown eel from aquaculture. But as the EMP of the Netherlands was not approved until October 2009, it was too late for restocking.

In 2010 waters were restocked as planned. But in 2011 on account of public procurement problems and the warm spring resulting in small glass eel catches in April and May the full earmarked amount for 2011 could not be spent. This was made good in 2012. A framework contract was drawn up with three glass eel/pre-grown eel suppliers, which made it easier to buy glass eel in time.

Table 4.1 Activities period 2009-2012
Restocked glass eel and pre-grown eel

Restocking	Quantities 2010	Quantities 2011
glass eel	763	164
pre-grown eel	0	1395

4.10 Closure eel fishery in contaminated (PCBs, dioxins) areas

This was an unforeseen measure at the start of the EMP's implementation. Since 1 April 2011 areas in the major rivers and some shipping channels in the Netherlands have been closed to eel fisheries as some of the eel caught in these areas were found to contain high levels of dioxin. The closed areas are part of important eel migration routes and are likely to benefit eel migration.

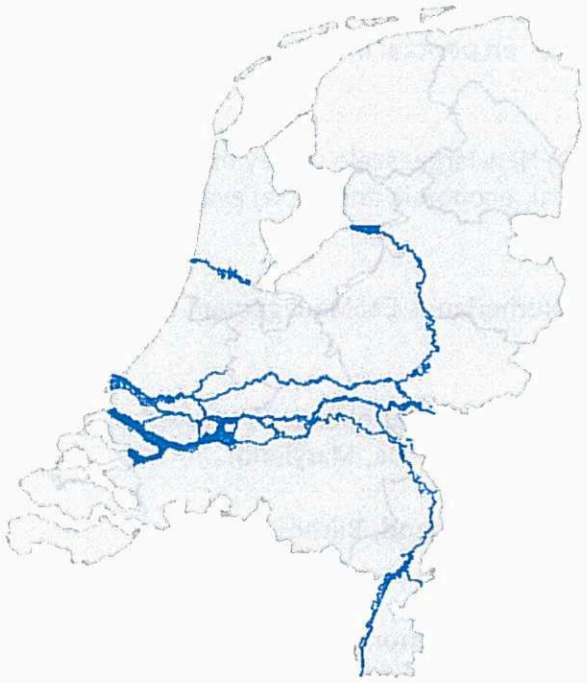

Fig. 4.1 Waters closed to eel and mitten crab fishery as of 1 April 2011.

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Annex A: Biomass and mortality estimates

	Estimate	Source
B_0	10.400 t*	EMP (2009)
$B_{current}$	482 t	Bierman et al. (2012)
B_{best}	1443 t	Bierman et al. (2012)
□F	1.06	Bierman et al. (2012)
□H	0.04	Bierman et al. (2012)
□A	1.1	Bierman et al. (2012)
R	0	

*excluding coastal waters.

Annex B: Price monitoring & reporting

Attach as an annex the annual report required in line with Article 7(5).

[Point 9 will apply once every three years in order to combine the two reporting obligations for the sake of simplification]