Report on the eel stock and eel fishery in the Netherlands in 2011

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Rapport C144/12


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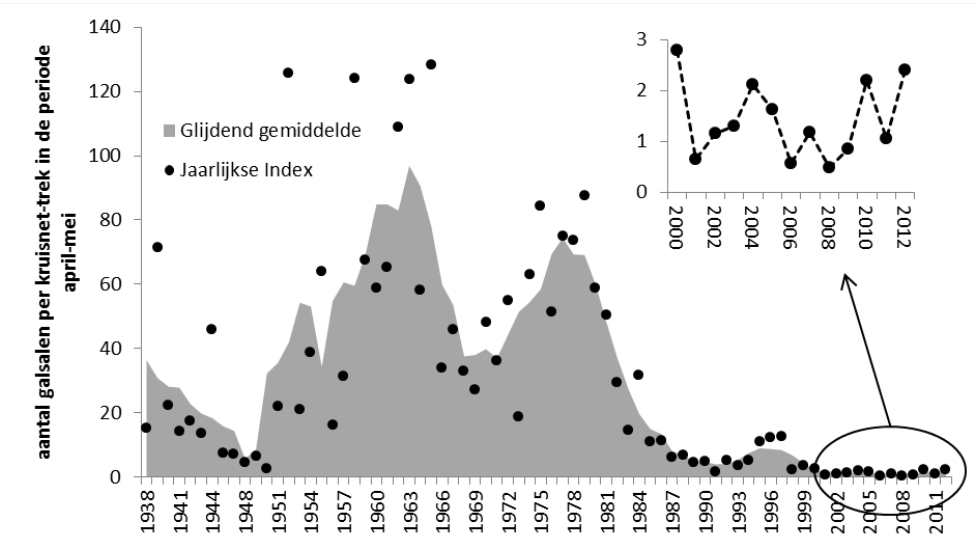
Inhoudsopgave

Nederlandse samenvatting

In dit rapport wordt een uitgebreid Engelstalig overzicht gegeven van de toestand van de aal en de aalvisserij in Nederland, zoals dat jaarlijks aan de aalwerkgroep van ICES/EIFAAC wordt gepresenteerd. In de samenvatting wordt een Nederlandstalige, verkorte presentatie van de inhoud gegeven, met de nadruk op de meest recente gegevens. Het Engelstalige overzicht beoogt compleet en gedetailleerd te zijn in de Nederlandse samenvatting staat de leesbaarheid en toegankelijkheid voorop.

In 2002 (ICES 2003) deed de gezamenlijke aalwerkgroep van de Internationale Raad voor het Zeeonderzoek ICES en de Europese Adviesraad voor de Binnenvisserij EIFAC de aanbeveling dat deelnemers jaarlijks aan de werkgroep zouden rapporteren over de toestand van de aalstand en aalvisserij in hun land. Deze rapportages konden dan vervolgens door de werkgroep gebruikt worden als uitgangspunt voor het internationale bestandsoverzicht en de daarop gebaseerde advisering. In 2003 (ICES 2004) werden gedetailleerde rapporten voor elk van de deelnemende landen opgesteld, die aan het (internationale) rapport van de werkgroep werden toegevoegd. In de jaren daarna zijn deze landenrapporten telkens bijgewerkt en aangevuld. Onderliggend rapport bevat het overzicht van de toestand van de aalstand in Nederland dat in de zomer van 2012 is opgesteld. De tijdreeksen in dit rapport lopen tot en met 2011, met uitzondering van de glasaalintrek waarvoor gegevens tot en met het voorjaar van 2012 beschikbaar zijn. De gerapporteerde gegevens zijn merendeels verzameld in het kader van Wettelijke onderzoekstaken (WOT); de analyse en rapportage heeft ook in dat kader plaatsgevonden.

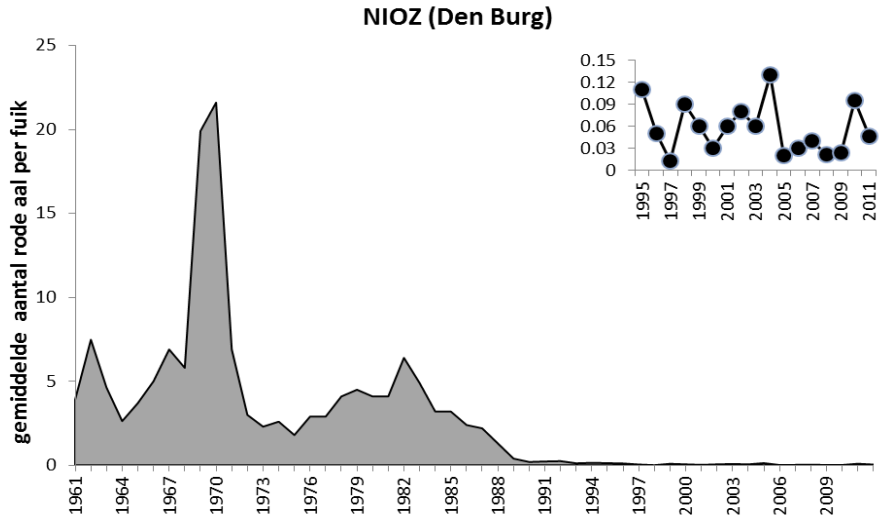
Trend Glasaal



Figuur 1. *Trend in de aanwas van glasaal bij Den Oever*.

De intrek van jonge aal (glasaal) uit zee naar onze binnenwateren wordt bemonsterd op 12 plaatsen langs de kust. In Den Oever is sinds 1938 een intensief programma uitgevoerd, elders is tussen 1970 en 1995 een netwerk van vrijwilligers opgezet. De resultaten tonen een sterke afname sinds 1980 en het glasaal niveau is momenteel minder dan 5 % van het vroegere niveau. De laatste tien jaar is de intrek van een vergelijkbaar laag niveau.

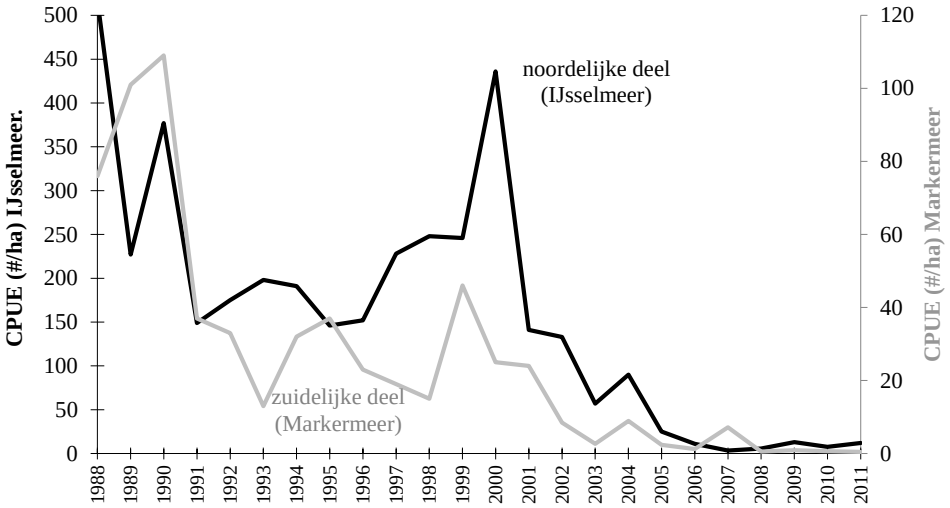
Trend Aal Waddenzee



Figuur 2. *Trend in de hoeveelheden rode aal in de NIOZ fuik (Bron: NIOZ en van de Meer et al., 2011*).

Sinds 1960 worden de vangsten rode aal in de haven bij het Horntje door medewerkers van het NIOZ nauwkeurig bijgehouden. Deze zeldzame tijdsserie (Figuur 2) is in 2010 toegevoegd aan het jaarlijkse aalrapport. Deze nieuwe dataset toont ook een duidelijk afname van de rode aal populatie sinds de jaren tachtig, vergelijkbaar met de drastische afname aan glasaal bij Den Oever.

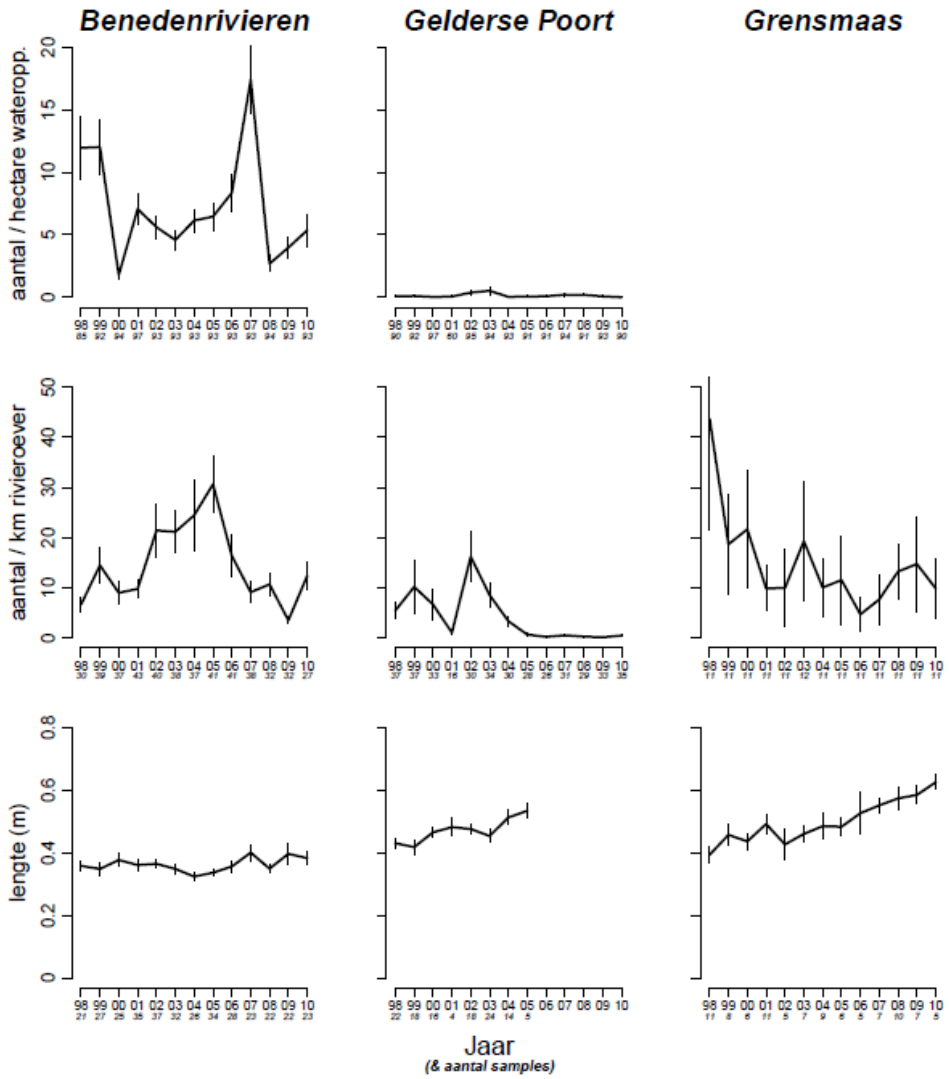
Trend Aal Ijsselmeer



Figuur 3. *Trend in de hoeveelheid (aantallen per ha) (rode) aal in het IJsselmeer en Markermeer op basis van de vangst met de electrostramienkor*.

De bestandsopname met de electrostramienkor in IJsselmeer/Markermeer toont een scherpe afname aan rode aal sinds 2000.

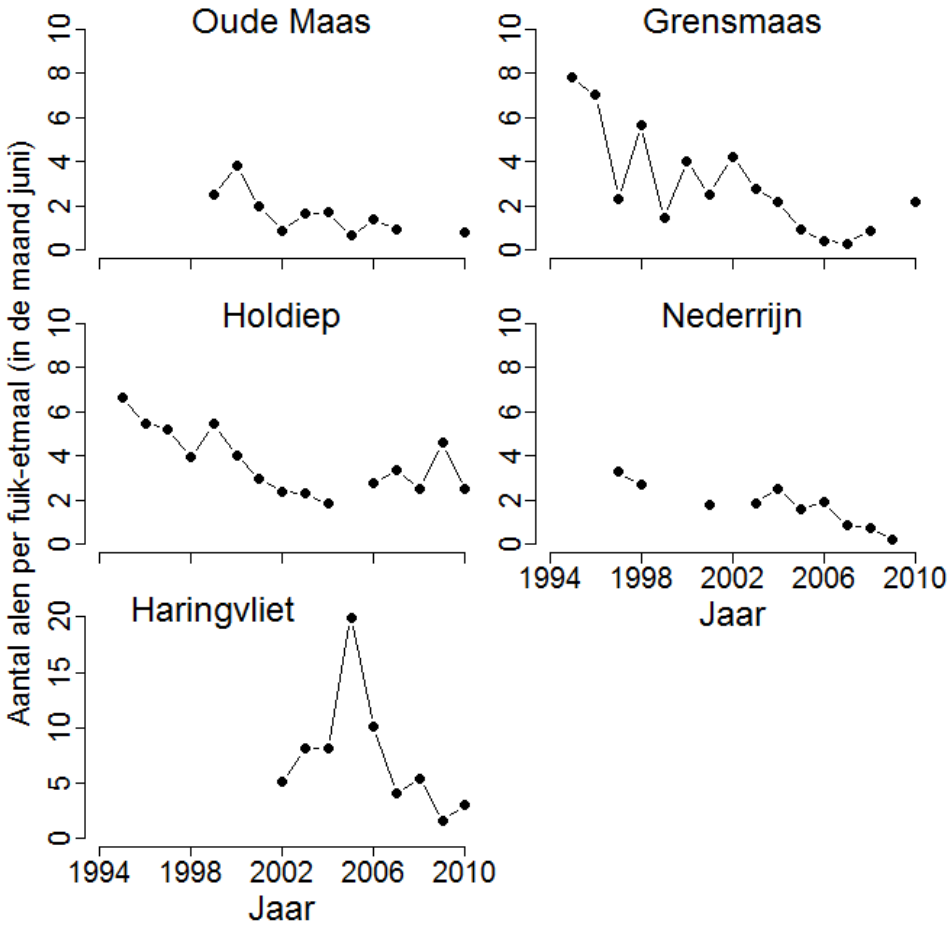
Trend Aal Rivieren



Figuur 4. *Dichtheden en gemiddelde lengte van aal in de benedenloop (benedenrivieren) en bovenloop (Gelderse Poort; Grensmaas) van de Rijn en Maas; bodemtrawl in de hoofdstroom (bovenste grafieken), electro-vissen in de littorale zone (middelste grafieken) en gemiddelde lengte aal (electro-vissen, onderste grafieken).*

Sinds 1998 vindt er een visserij-onafhankelijke survey (Active Monitoring) plaats in het rivierengebied om het verloop van de visbestanden in kaart te brengen. In de bovenloop van het rivierengebied zijn de aantallen aal afgenomen en neemt de gemiddelde lengte van de overgebleven aal toe. Dit duidt op het ontbreken of een lage aanwas van jonge aal in deze gebieden. In de benedenloop van het rivierengebied is sinds 1998 is geen afname in aantallen aal of een verandering in de gemiddelde lengte van aal waargenomen sinds 1998.

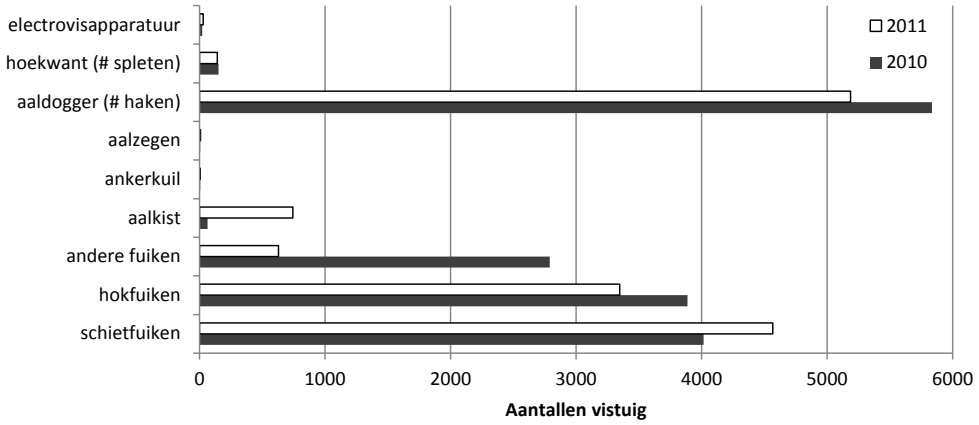
Sinds 1993 loopt op grofweg dezelfde locaties in het rivieren gebied als de Actieve Monitoring een tweede vismonitoringsprogramma in samenwerking met de beroepsvissers. In dit programma, Passieve Monitoring, registreren beroepsvissers van een beperkt aantal fuiken de vangsten van commerciële vissoorten en bijvangsten van andere soorten. Alhoewel de variatie tussen de jaren en de locaties groot is, laat dit programma op een aantal locaties een dalend trend zien in de hoeveelheden gevangen aal. Door de invoering van de gesloten periode en de gesloten gebieden voor de aalvisserij staat de voortgang van deze belangrijke tijdsreeks onder druk.



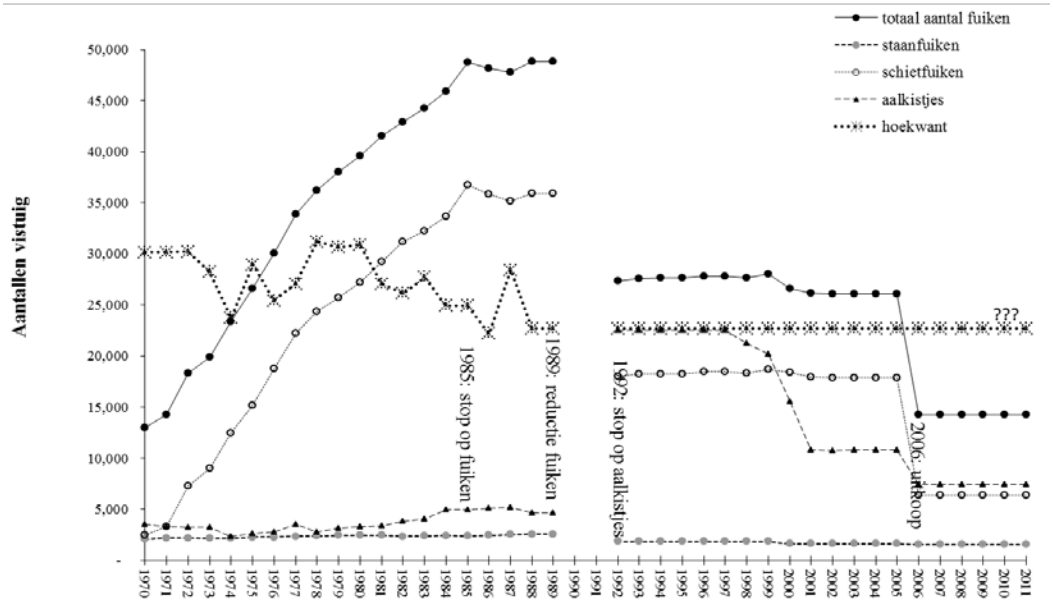
Figuur 5. *Gemiddeld aantal rode alen per fuik-dag (schietfuiken) in de beneden- en bovenloop van de Rijn en de Maas in Nederland.*

Trend Aalvangsten Beroepsvisserij

De visserij op aal in Nederland is nauwelijks gedocumenteerd; het aantal vergunningen is bekend, maar van de aantallen vistuigen, het gebruik daarvan en de vangsten zijn slechts schattingen beschikbaar, en deze schattingen verouderen nu snel. Invoering van de Europese Aalverordening en het Nederlandse Aal Beheersplan zal de documentatie naar verwachting snel verbeteren. De eerste stap is gezet met de invoering van de verplichte vangstregistratie voor aalvissers per 1/1/2010. Een nadeel van de huidige registratie is dat rode aal en schieraal vangsten gecombineerd worden geregistreerd en dat vistuig en visserijinspanning niet worden gedocumenteerd. Het Min EZ heeft per 1/1/2012 de visserijinspanning opnemen in de verplichte digitale vangstregistratie. In 2010 en 2011 heeft het Min EZ een landelijke inventarisatie uitgevoerd naar het aanwezige vistuig in de aalvisserij.



Figuur 6. *Overzicht van de door de beroepsvissers opgegeven vistuigen tijdens het 2010 aalseizoen. (exclusief IJsselmeer/Markermeer en gesloten gebieden*).



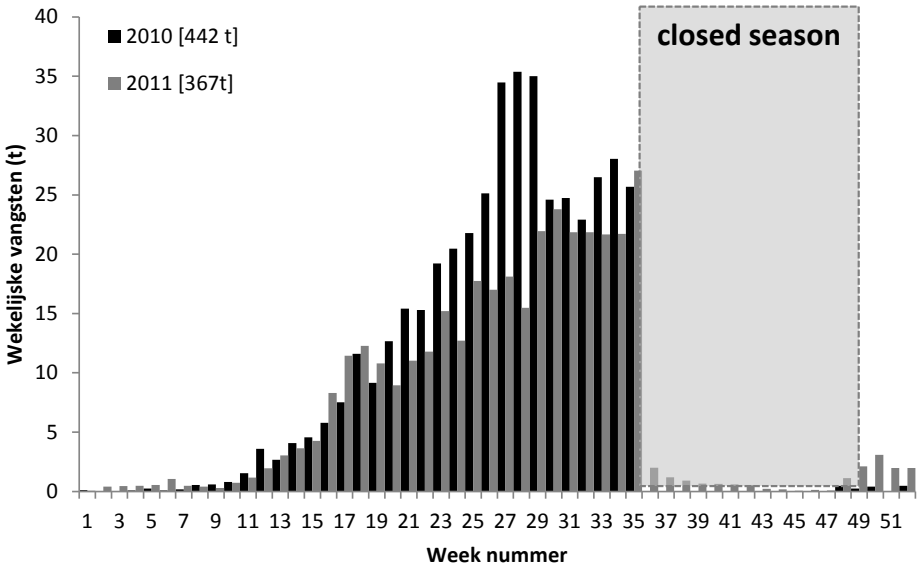
Figuur 7. *Trend in de nominale hoeveelheden vistuig binnen de aalvisserij op het IJsselmeer*.

Op het IJsselmeer is het aantal te gebruiken vistuigen gelimiteerd door merkjes, die aan de vistuigen bevestigd dienen te worden. Dit aantal is in de periode 1970-1985 sterk toegenomen; daarna is het aantal stapsgewijs verminderd. Na de laatste grote beperking in 2006 liggen de aantallen voor de meeste vistuigen nu nog steeds hoger dan in 1970. Alleen voor staanfuiken heeft er in de jaren 1970-1980 vrijwel geen groei plaatsgevonden, terwijl er later wel reducties zijn doorgevoerd. Daarmee ligt het aantal grote fuiken in 2009 een kwart lager dan in 1970. Het is momenteel echter onduidelijk welk deel van de "merkjes" ook daadwerkelijk wordt ingezet tijdens de visserij en of met de invoering van de gesloten periode en meer ongebruikte merkjes zijn ingezet. De visserijinspanning door hoekwantvissers in het IJsselmeer is ook onduidelijk. Het maximum aantal hoekwantvissers ligt vast maar iedere visser mag zelf bepalen met hoeveel "spleten" (een hoekwant met 250 haken) wordt gevist.

De visserij op aal in Nederland vindt plaats in meren, rivieren, kanalen en kustwateren, met de grootste concentraties in de wateren in de lagere delen van ons land. Voor de Zuiderzee/IJsselmeer zijn gegevens beschikbaar over de aanvoer op de afslagen sinds 1880. De aanlandingen van de Zuiderzee toonden in de periode 1880-1932 een lichte stijging van 300 naar 1000 t. Bij de afsluiting van het IJsselmeer namen de aanlandingen plotseling toe tot ca. 2500 t, om daarna verder te stijgen tot rond 3500 t in de jaren 1940-1955. Sinds 1950 heeft de aanvoer sterk gefluctueerd, maar is wel een gestage daling opgetreden tot minder dan 400 t sinds 2000, en nog maar 42 t in 2009.

Figuur 8. *Trend in de geregistreerde aanlanding van aal op alle IJsselmeerafslagen (Bron PVIS). In 2009 is de aalvisserij gedurende oktober en november gesloten en vanaf 2010 is de visserij gesloten gedurende september, oktober en november.*

Tot voor kort waren er geen betrouwbare aanlandingsgegevens van de wateren buiten het IJsselmeer. Op 1 januari 2010 heeft Min EZ een verplichte vangstregistratie ingevoerd voor alle aalvissers op de binnenwateren. De wekelijkse aalvangsten (rode aal en schieraal gecombineerd) worden per VBC gebied opgenomen in de database van het ministerie. Sinds 1 januari 2012 worden ook het typ vistuig en visserijinspanning geregistreerd.



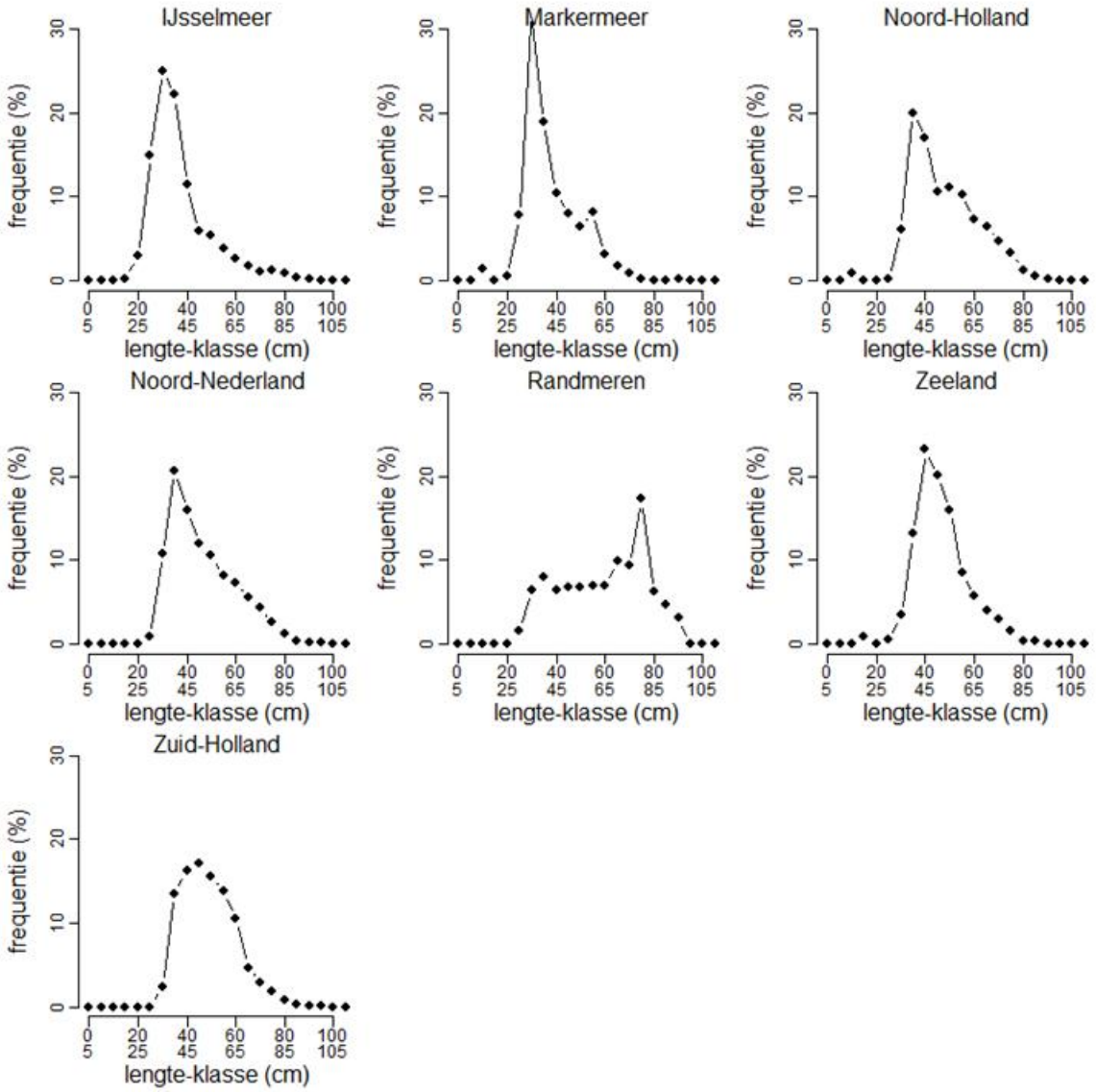
Figuur 9. *Verloop van de wekelijkse aanlandingen aal in de binnenwateren in 2010 en 2011*.

Van de 440 t die in 2010 werd gevangen kwam ongeveer 170 t aal uit de gebieden die per 1 april 2011 zijn gesloten voor de aal- en wolhandkrabvisserij ("gesloten gebieden"). De resterende 270 t werd gevangen in de resterende "open gebieden". In 2011 is de vangst (367 t) "open gebieden" aanzienlijk hoger dan in 2010 (270 t). Door het gebrek aan een robuuste inspanningsregistratie is niet mogelijk om te zien of deze stijging in aanlanding veroorzaakt wordt door een toename aan aal of een toename in visserijinspanning.

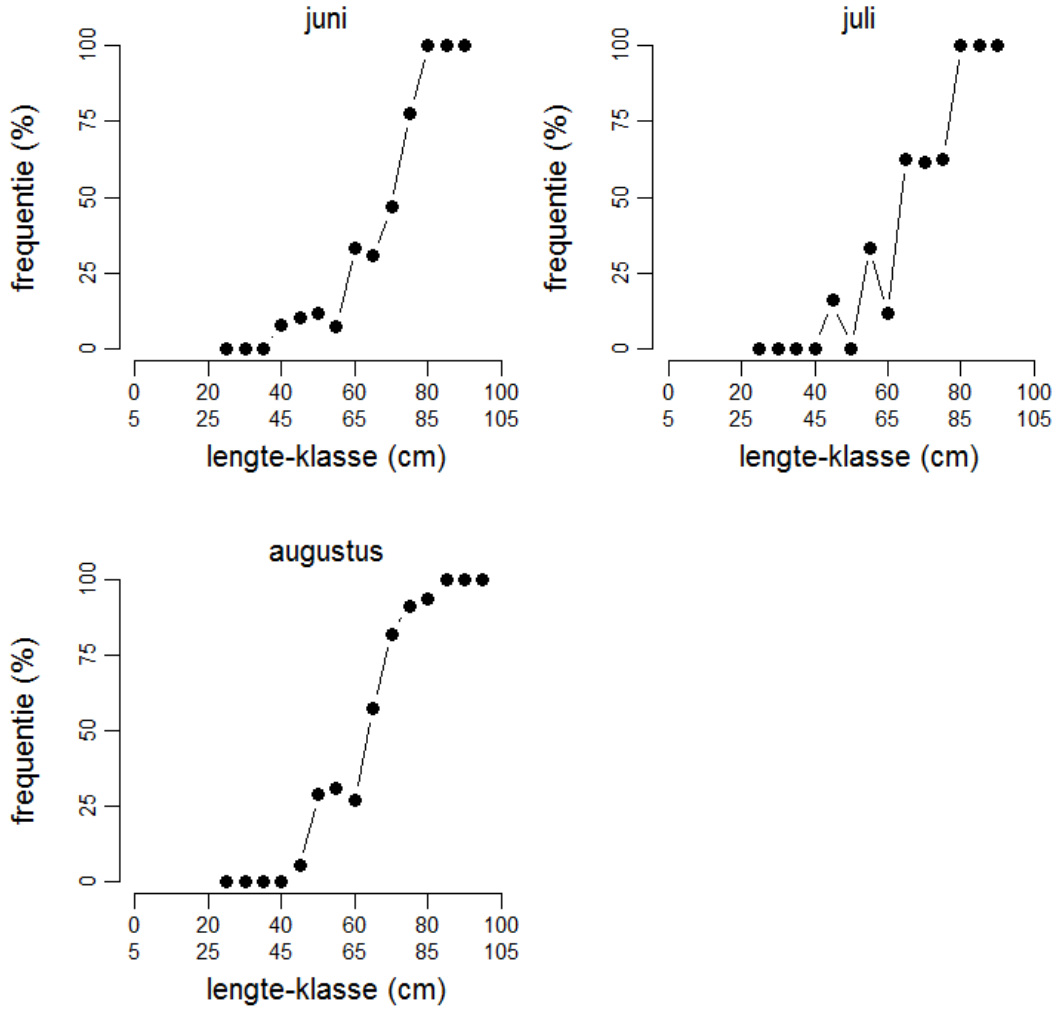
Vangstbemonstering Beroepsvisserij

In 2011 zijn, verspreid door Nederland, vangsten van beroepsvissers bemonsterd. Tijdens een bemonstering worden ~150 alen indien mogelijk uit een ongesorteerde partij doorgemeten. Uit het vangstmonster werden per 10 centimeter klasse (20-29, 30-39 etc.) 2 alen meegenomen naar IMARES voor het verzamelen van biologische gegevens (snijmonsters). Bij deze alen werden de volgende metingen op het instituut uitgevoerd: lengte (cm afgerond naar beneden), gewicht (gram), sexe (visueel vastgesteld; man of vrouw), rijpheidstadium (rode aal of schieraal (groot oog, dikke huid met tekening, witte buik)) en aanwezigheid zwemblaasparasieten. Daarnaast worden de otolieten (gehoorsteentjes) uitgenomen en een aantal wordt gebruikt voor vaststelling van de leeftijden.

In 2011 zijn ongeveer 8500 opgemeten (zie Fig. 10) en zijn van ongeveer 900 alen biologische gegevens verzameld (zie Fig. 11 & Tabel 5).



Figuur 10. *Relatieve lengte-frequentie verdeling per gebied. Op de horizontale as staan de lengte-klassen met intervallen van 5 cm per punt in de grafiek, op de verticale as het percentage van de alen in een lengteklasse. Als alle percentages bij elkaar worden opgeteld in een grafiek geeft dit 100%.*



Figuur 11. *Percentage vrouwelijke schieralen tov vrouwelijke rode alen per maand over alle gebieden samen. Elk punt in de grafiek geeft een percentage aan per lengte-klasse van 5 cm.*

Trend Aalvangsten Recreatieve Visserij

In 2009 in het Recreatieve Visserij onderzoeksproject van start gegaan. In december 2009 zijn 50000 huishoudens benaderd tijdens de Screening Survey om vast te stellen hoeveel recreatieve vissers er zijn in Nederland (1,69 miljoen). In 2010 zijn 2000 recreatieve vissers geselecteerd om deel te nemen aan een logboekprogramma voor een periode van 12 maanden (maa 2010 – feb 2011) om inzicht te krijgen in hoeveelheden gevangen vis. In Nederland worden ongeveer 1.5 miljoen alen gevangen door recreatieve vissers waarvan er ongeveer 500000 mee naar huis worden genomen (Tabel 1). Gezien het ontbreken van betrouwbare gegevens over de lengteverdeling van meegenomen alen, blijft het lastig om een schatting te maken van de biomassa aan meegenomen alen (van der Hammen & de Graaf, 2012). Voor de evaluatie van het aalbeheerplan is uitgegaan van 100 t onttrokken aal door recreatieve vissers.

***Tabel 1**. Overzicht van de aalvangsten door recreatieve vissers in de Nederlandse binnenwateren en kustwateren.*

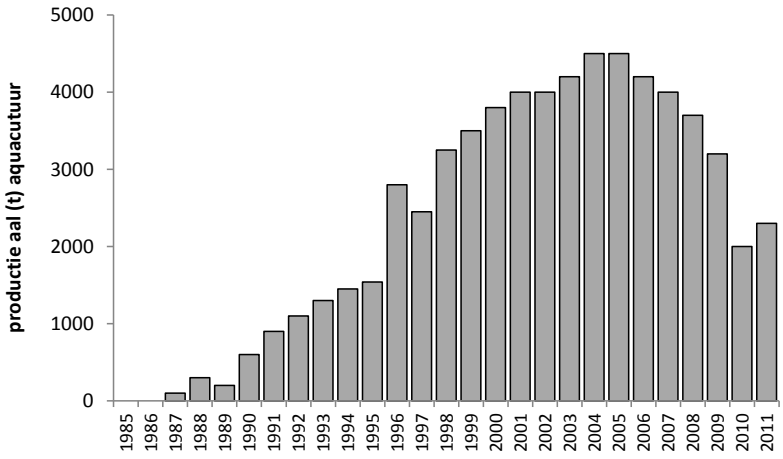
	Aantallen			Ongecorrigeerde gewicht (kg)			Gecorrigeerde gewicht (kg)		
	zeewater	binnenwater	som	zeewater	binnenwater	som	zeewater	binnenwater	som
onttrokken	174215	340536	514751	36287	78259	114546	17161	37374	54535
teruggezet	108462	872570	981032	23834	137186	161020	26253	149917	176170
som	282677	1213106	1495783	60121	215445	275566	43414	187291	230705
% onttrokken	62%	28%	34%	60%	36%	42%	40%	20%	24%

Trend Aquacultuur

De grootste hoeveelheid aal (~90%) in Nederland wordt geproduceerd in intensieve kwekerijen. Hierin wordt in het wild gevangen, geïmporteerde glasaal uit voornamelijk Frankrijk en Spanje (Tabel 2), opgekweekt onder gecontroleerde omstandigheden. De totale productie sinds 1985 is gestegen tot meer dan 4000 t, maar sinds 2005 neemt de productie weer af. In 2011 is ongeveer 2300 t aal geproduceerd. Buiten Nederland, is de intensieve kweek vooral van belang in Denemarken, waar ook sprake is van een sterk dalende productie, en een meer extensieve vorm in Italië. Kunstmatige voortplanting van de aal voor commerciële doeleinden is tot op heden niet mogelijk.

***Tabel 2.** Herkomst van de geïmporteerde, wild gevangen glasaal in de Nederlandse aquacultuur sector. (Bron: DUPAN).*

Seizoen	Frankrijk	Spanje	Engeland	Totaal (kg)
2010/2011	4725	1890	135	6750
2011/2012	5325	1350	100	6775



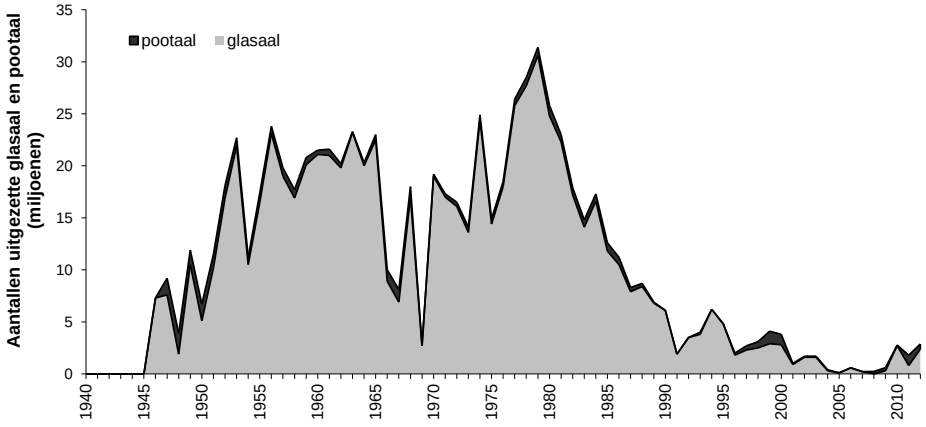
***Figuur 12.** Trend in de hoeveelheden aal die worden geproduceerd door de aquacultuur sector.*

Trend Uitzet Glasaal en Pootaal

Sinds de jaren 1950 is er op grote schaal glasaal uit de omgeving van de Golf van Biskaje aangekocht en uitgezet in de binnenwateren. Daarnaast is jonge rode aal (pootaal) uitgezet. Deze pootaal werd voornamelijk gevangen in de kustzone en/of de benedenloop van de rivieren. In recente jaren heeft de uitzet van gekweekte aal (opgekweekt uit glasaal van Frankrijk/Engeland) de overhand. De uitzet van glasaal heeft min of meer gelijke tred gehouden met de natuurlijke intrek; in 2009 werd nog maar ca. 0.3 miljoen glasalen uitgezet. Voorheen was het aantal uitgezette pootaal verwaarloosbaar klein ten opzichte van de glasaal. Deze hoeveelheid is in tegenstelling tot de glasaal echter maar weinig afgenomen, waardoor de hoeveelheden uitgezette glasaal en pootaal de laatste paar jaren ongeveer even grootwaren. Sinds de opheffing van de OVB in 2005, wordt de aanvoer van glasaal en pootaal voor uitzet niet meer centraal geregistreerd. De latere cijfers zijn gebaseerd op opgave van de belangrijkste initiatiefnemers, maar mogelijk zijn kleinere partijen gemist.

In 2010 en 2011 heeft de Combinatie van Beroepsvissers de uitzet gecoördineerd van de door het Ministerie van EZ aangekochte glasaal ter bevordering van het herstel van de aalstand. Er is echter (internationaal) verdeeldheid over het nut van de uitzet van geïmporteerde, in het wild gevangen glasaal als maatregel voor het herstel van de aalstand. In het 2010 advies van ICES ten aanzien van het beheer van aal staat: *"Given the current record-low abundance of glass eels, ICES reiterates its concern that glass eel stocking programs are unlikely to contribute to the recovery of the European eel stock. This is because (a) there is no surplus anywhere of glass eel to be redistributed to other areas and (b) there is evidence that stocked/translocated eels experience impairment of their navigational abilities."*

In 2011 is naar schatting 10% van alle door Nederland geïmporteerde glasaal uitgezet in binnenwateren (Tabel 3 en 4). Het merendeel van de uitzetting heeft plaatsgevonden in wateren waar bevissing plaatsvindt.



Figuur 13. *Trend in de hoeveelheden uitgezette glasaal en pootaal.*

Tabel 3. *Overzicht van de in 2011 in Nederland uitgezette glasaal en pootaal (Bron CvB en DUPAN).*

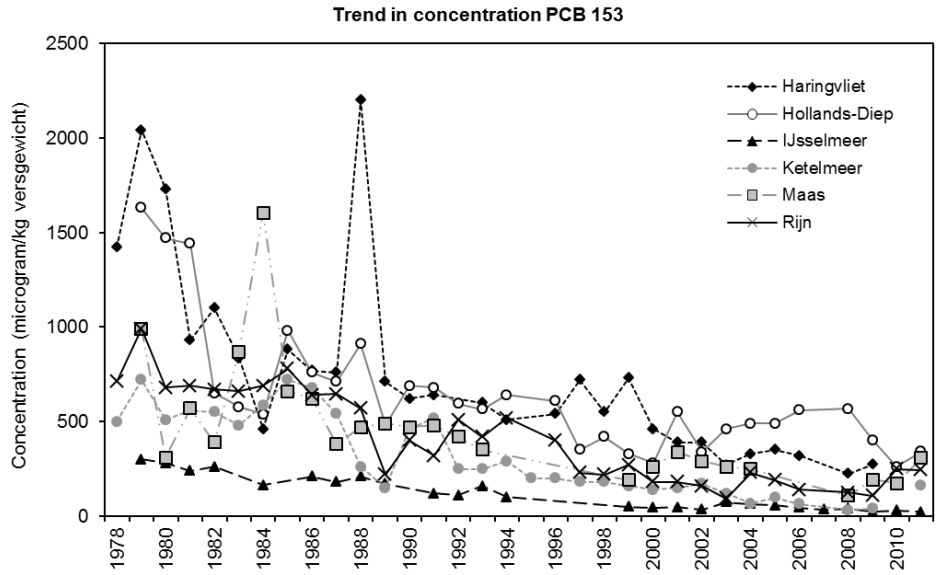
Datum	Lokatie	Type	Herkomst	Quarantaine	kg	#/kg	#
4/2/2012	Veerse Meer	glasaal	Anguilla Anguilla (Fr)	yes	170	3,100	527,000
4/2/2012	Friese Boezemwateren	glasaal	Anguilla Anguilla (Fr)	yes	513	3,100	1,590,300
6/12/2012	Westeinder plassen	glasaal	Anguilla Anguilla (Fr)	yes	7	3,100	21,700
6/12/2012	Wieden (NW overijssel)	glasaal	Anguilla Anguilla (Fr)	yes	21	3,100	65,100
6/12/2012	Kanaal van Steenenhoek en Linge	glasaal	Anguilla Anguilla (Fr)	yes	5	3,100	15,500
6/12/2012	Binnenwater Walcheren	glasaal	Anguilla Anguilla (Fr)	yes	4	3,100	12,400
6/12/2012	Polders N-Holland	glasaal	Anguilla Anguilla (Fr)	yes	9	3,100	27,900
6/12/2012	Wormer en Jisperveld polders in N-Holland	glasaal	Anguilla Anguilla (Fr)	yes	24	3,100	74,400
6/12/2012	Rond Zaandam	glasaal	Anguilla Anguilla (Fr)	yes	3	3,100	9,300
6/12/2012	Friesland	glasaal	Anguilla Anguilla (Fr)	yes	10	3,100	31,000
			TOTAL		*766*		2,374,600
6/12/2012	Tjeukemeer en Slotermeer	pootaal	Anguilla Anguilla (Fr)/Nijvis	?	1200	340	408,000
	Zuid-Holland	pootaal		?	30	200	6,000
5/28/2012	Elburg	pootaal	Aquafarm (Putten, NL)	?	*27.5*	*218*	6,000
5/12/2012	Kampen	pootaal	Aquafarm (Putten, NL)	?	*146.8*	*218*	32,000
6/1/2012	Reeuwijk	pootaal	Kraan	?	70	250	17,500
7/6/2012	Markiezaatsmeer	pootaal	Nijvis	?	100	200	20,000
5/3/2012	Westeinder plassen	pootaal	Kraan	?	100	100	10,000
			TOTAL		*1674*		499,500

Tabel 4. *Overzicht van het gebruik van geïmporteerde, in het wild gevangen glasaal in Nederland.*

KG	2012	2011	2010	2009
Uitzet in Nederlandse wateren*	766	244	904	100
Aquacultuur (consumptie)	6775	6750	?	?
Direct geconsumeerd	0	0	0	0
Sterfte	?	?	?	?

*niet alle glasaal wordt uitgezet voor herstel van de aalpopulatie

Trend Vervuiling en Parasieten



Figuur 14. *Trend in PCB 153 in rode aal (elk punt is het gemiddelde van 25 alen*).

In het kader van de monitoring van voedselkwaliteit, zijn sinds eind jaren 1970 de gehaltes van vervuilende stoffen in aal bepaald. Na de sterke vervuiling in de jaren daarvoor, is een gestage daling in de gehaltes van PCBs en dioxines in aal waargenomen. In Figuur 12 wordt een enkel voorbeeld (PCB 153) getoond; PCB 153 is een goede indicator voor de andere PCBs.

De percentages alen met minimaal één zwemblaasparasiet verschilden tussen 0% en 70.7% voor vrouwtjes (Tabel 5) en 0% en 100% voor mannetjes (Tabel 6). Tussen gebieden en zelfs tussen perioden in een zelfde gebied bestaat redelijke variatie in het percentage.

Tabel 5. *Percentage vrouwelijke alen voor de alen onderzocht op biologische gegevens met zwemblaasparasieten. 50% geeft weer dat van alle vrouwelijke alen de helft minimaal één zwemblaasparasiet had, 100% dat alle vrouwelijke alen minimaal één zwemblaasparasiet had.*

Gebied	***juni***	***juli***	***augustus***	***september***
IJsselmeer	40.9	44.4	39.1	-
Markermeer	57.9	-	19.6	-
Noord-Holland	21.9	7.7	40.4	-
Noord-Nederland	26.2	37.5	32.5	0
Randmeren	39.4	-	70.7	-
Zeeland	26.5	0	63.6	-
Zuid-Holland	37.0	51.5	52.4	-

Tabel 6. *Percentage mannelijke alen voor de alen onderzocht op biologische gegevens met zwemblaasparasiet. 50% geeft weer dat van alle mannelijke alen de helft minimaal één zwemblaasparasiet had, 100% dat alle mannelijke alen minimaal één zwemblaasparasiet had.*

Gebied	***juni***	***juli***	*augustus*	***september***
IJsselmeer	37.0	38.5	45.0	-
Markermeer	27.3	-	42.9	-
Noord-Holland	50.0	66.7	38.5	-
Noord-Nederland	40.0	33.3	50.0	0
Randmeren	50.0	-	-	-
Zeeland	100	0	36.4	-
Zuid-Holland	55.6	75.0	0	-

Evaluatie Nederlandse aalbeheerplan

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. Deze situatie is zeer zorgwekkend en wordt door de aalwerkgroep van de International Council for the Exploration of the Sea (ICES) als volgt omschreven: “Indications are that the eel stock remains at an historical minimum, continues to decline and is outside safe biological limits. Recruitment of both glass eel and young yellow eel continues to decline and shows no sign of recovery. Current levels of anthropogenic mortality, thought to be high on juvenile (glass eel) and older eel (yellow and silver eel), are not sustainable and there is an urgent need to reduce these until there is clear evidence that the stock is increasing.”
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 waren verplicht om over de voortgang van de nationale aalbeheerplannen voor het eerst te rapporteren aan de Europese Commissie, voor 1 juli 2012. De Europese Commissie zal met deze informatie een verslag opstellen over deze aalbeheerplannen. Dit verslag zal uiterlijk 31 december 2013 door de Europese Commissie worden ingediend bij het Europees Parlement en Raad. Tegen deze achtergrond heeft Nederland een eigen aalbeheerplan opgesteld en geïmplementeerd in juli 2009.

Aalbeheerplan Nederland
Het aalbeheerplan van Nederland omvat de volgende maatregelen:

No	Maatregel	Planperiode	Realisatie
1	Verminderen aalsterfte bij gemalen en andere waterwerken; van de 1800 belangrijkste migratie barrières zullen 900 worden opgelost voor 2015, de andere 900 voor 2027	2015-2027	Uitgesteld vanwege bezuinigingen bij de overheid
2	Verminderen aalsterfte bij waterkrachtcentrales met minstens 35%	2009	november 2011*
3	Instellen van visserij vrije zones in gebieden die van belang zijn voor de trek van aal	2010	1 april 2011
4	Sportvissers zetten gevangen aal levend terug (kustzone en binnenwater)	2009	1 oktober 2009
5	Verbod op recreatieve visserij met beroepstuigen in kustwateren	2011	1 januari 2011
6	Gesloten seizoen: van 1 september tot 1 december	2009	1 oktober 2009
7	Stopzetten van peurvergunningen door de overheid in staatswateren	2009	1 mei 2009
8	Uitzetten van glasaal en kleine aal uit aquacultuur	2009	begin 2010
9	Onderzoek naar kunstmatige voortplanting van aal	lopend	EU-project

* Om technische redenen blijkt een effect van 24% maximaal mogelijk.

Verder zijn per 1 april 2011 grote gebieden gesloten (vooral de grote rivieren) voor de aalvisserij omdat de aldaar gevangen aal niet voldeed aan eisen rond voedselveiligheid door te hoge gehalten aan PCB’s en dioxines. Deze maatregel was geen onderdeel van het oorspronkelijke aalbeheerplan, maar is later toegevoegd.

Evaluatie van het Nederlandse aalbeheerplan

Het aalbeheerplan is geëvalueerd in het licht van de voornoemde “beheersdoelen” uit de Aalverordening. De methodiek (ICES aangepast voorzorgsdiagram) die bij deze evaluatie daarbij is gehanteerd komt voort uit de ICES “werkgroep aal”, maar is niet beoordeeld door de Advisory Committee van ICES (ICES-ACOM, met vertegenwoordigers van alle 20 ICES landen) die verantwoordelijk is voor alle formele “ICES” adviezen.
Dit betekent dat in deze evaluatie alleen wordt ingegaan op de effectiviteit van maatregelen in relatie tot beheersdoelen opgesteld door de Raad van de Europese Unie. In hoeverre deze beheersdoelen ook in lijn zijn met het voorzorgprincipe of duurzaam beheer volgens ICES-ACOM is niet aan de orde.
De evaluatie is uitgevoerd door middel van modellen, vangstgegevens, veldwaarnemingen en statistische analyses, uitvoerig beschreven in Bierman et al. (2012). 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 (excl. kustwateren).
- De doelstelling Aalverordening voor Nederland: 4160 ton (40% van de pristine biomassa).
- De uittrek van schieraal t.o.v. 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.

Deze schattingen zijn ruw, en de daarmee gepaard gaande onzekerheid is in Bierman et al. (2012) omschreven.

Report on the eel stock and fishery in: The Netherlands 2011/2012

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Reporting Period: This report was completed in August 2012, and contains data up to 2011 and glass eel recruitment data for 2012.

Contributors to the report: Contributions: The following persons and institutions provided information for this report: Nicola Tien (ACTMON and PASMON data analysis), Arjan Heinen (Combinatie van Beroepsvissers; stocking data), Jaap van der Meer (NIOZ; yellow eel data NIOZ fyke), Michiel Kotterman (IMARES; eel contaminants), William Swinkels (DUPAN, glass eel data and eel aquaculture production).

2.1 Introduction:

2.1.1 General overview fisheries

Eel fisheries in the Netherlands occur in coastal waters, estuaries, larger and smaller lakes, rivers, polders, etc. Management of eel stock and fisheries has been an integral part of the long tradition in manipulating water courses (polder construction, river straightening, ditches and canals, etc.). Governmental control of the fishery is restricted to on the one hand a set of general rules (gear restrictions, size restrictions, for course fish: closed seasons), and on the other hand site-specific licensing. Within the licensed fishing area, and obeying the general rules, fishermen are currently free to execute the fishery in whatever way they want. Since 1/1/2010 there is a general registration of landings, a general registration of fishing efforts has not been implemented yet. In recent years, licensees in state-owned waters are obliged to participate in so-called Fish Stock Management Committees ['Visstand Beheer Commissies' VBC,], in which commercial fisheries, sports fisheries and water managers are represented. The VBC is responsible for the development of a regional Fish Stock Management Plans. The Management Plans are currently not subject to general objectives or quality criteria. The future of VBC and their role in fish stock management is under debate.

Until April 2011 the total fishery involves approx. 200 companies, with an estimated total catch of nearly 442 tonnes in 2010. However, on 1 April 2011 a large part of the fishery was closed due to high PCB-levels in the eel (Fig. 1). This closure has affected ~50 fishing companies catching 170 tonnes of eel in 2010, roughly a third of the annual landings of inland waters in the Netherlands. For details on the closure , visit the following website;
http://www.rijksoverheid.nl/ministeries/eleni/nieuws/2011/03/31/vangstverbod-paling-en-wolhandkrab-vanaf-1-april-van-kracht.html.

Fig NL. 1. *Overview of the areas closed for eel and Chinese mitten crab fishery as of 1 April 2011 (Source Ministry of Economic Affairs, Agriculture & Innovation).*

2.1.2 Spatial subdivision of the territory

The fishing areas can be categorised into 5 groups:

1. The Waddensea; 53ºN 5ºE; 2591 km^2. This is an estuarine-like area, shielded from the North Sea by a series of islands. The inflow of sea water at the western side mainly consists of the outflow of the river Rhine, which explains the estuarine character of the Waddensea. The fishery in the Waddensea is permitted to license holders and assigns specific fishing sites to individual licensees. Fishing gears include fyke nets and pound nets; the traditional use of eel pots is in rapid decline. The fishery in the Waddensea is obliged to apply standard EU fishing logbooks. Landings statistics are therefore available from 1995 onwards; <50 tons per year. There are 21 companies having a commercial license for fishing eel, and the total number of fyke nets is estimated at 400.

2. Lake IJsselmeer; 52º40'N 5º25'E; now 1820 km^2. Lake IJsselmeer is a shallow, eutrophic freshwater lake, which was reclaimed from the Waddensea in 1932 by a dike (Afsluitdijk), substituting the estuarine area known before as the Zuiderzee. The surface of the lake was stepwise reduced by land reclamation, from an original 3 470 km^2 in 1932, to just 1 820 km^2 since 1967. In preparation for further land reclamation, a dam was built in 1976, dividing the lake into two compartments of 1200 and 620 km^2, respectively, but no further reclamation has actually taken place. In managing the fisheries, the two lake compartments have been treated as a single management unit. The discharge of the river IJssel into the larger compartment (at 52º35'N 5º50'E, average 7 km^3 per annum, coming from the River Rhine) is sluiced through the Afsluitdijk into the Waddensea at low tide, by passive fall. Fishing gears include standard and summer fyke nets, eel boxes and long lines; trawling was banned in 1970. Licensed fishermen are not spatially restricted within the lake, but the number of gears is controlled by a gear-tagging system. The registered landings at the auctions are assumed to cover some the actual total. There are, however, differences in estimated landings reported by PO IJsselmeer, PVIS and catch registration system of the Min EZ. There are 70 fishing licenses, owned by ca. 30 companies. The total number of gears allowed in 2010 was: fixed fykes 1579, train fykes 6386, eel boxes 7415 and unknown numbers of longlines.

3. Main rivers; 180 km^2 of water surface. The Rivers Rhine and Meuse flow from Germany and Belgium respectively, and constitute a network of dividing and joining river branches in the Netherlands. Traditional eel fisheries in the rivers have declined tremendously during the 20th century, but following water rehabilitation measures in the last decades, is now slowly increasing. The traditional fishery used stow nets for silver eel, but fyke net fisheries for yellow and silver eel now dominates. Individual fishermen are licensed for specific river stretches,

where they execute the sole fishing right. No registration of efforts is required. There are 28 fishing companies, using an estimated number of 318 fixed fykes, 2433 train fykes, 551 eel boxes, and unknown quantities of other gears (electric dipnet, longlines, etc). This fishery has been almost completely stopped due to the introduction 1/4/2011 of a total fishing ban on eel and Chinese mitten crab in rivers polluted with dioxins. Since 1 April 2011 the eel fishery on the main rivers has been closed due to high levels of pollutants in eel (Fig. 1).

4. Zeeland; 965 km^2. In the Southwest, the Rivers Rhine, Meuse and Scheldt (Belgium) discharge into the North Sea in a complicated network of river branches, lagoon-like waters and estuaries. Following a major storm catastrophe in 1953, most of these waters have been (partially) closed off from the North Sea, sometimes turning them into fresh water. Fishing is licensed to individual fishermen, mostly spatially restricted. Fishing gears are dominated by fyke nets. Management is partially based on marine, partly on fresh water legislation. There are 27 companies, using an estimated number of 174 fixed fykes, 233 train fykes, and unknown numbers of eel pots. This area has also been affected by the ban of eel and Chinese mitten crab fishery in the closed (dioxine)areas.

5. Remaining waters; inland 1340 km^2. This comprises 636 km^2 of lakes (average surface: 12.5 km^2); 386 km^2 of canals (> 6 m wide, 27,590 km total length); 289 km^2 of ditches (< 6 m wide, 144,605 km total length); and 28 km^2 of smaller rivers (all estimates based on areas less than 1 m above sea level, 55% of the total surface; see Tien and Dekker 2004 for details). Traditional fisheries are based on fyke netting and hook and line. Individual licenses permit fisheries in spatially restricted areas, usually comprising a few lakes or canal sections, and the joining ditches. Only the spatial limitation is registered. Eight small companies operating scattered along the North Sea coast have been added to this category. There are approx 100 companies, using unknown quantities of gears of all types.

The Water Framework Directive subdivides the Netherlands into 4 separate River Basin District, all of which extend beyond our borders. These are:

a. the River Ems (Eems), 53º20'N 7º10'E (=river mouth), shared with Germany. This RBD includes the north-eastern Province Groningen, and the eastern part of Province Drente. Drainage area: 18,000 km^2, of which 2,400 km^2 in the Netherlands.

b. the River Rhine (Rijn), 52º00'N 4º10'E, shared with Germany, Luxemburg, France, Switzerland, Austria, Liechtenstein. Drainage area: 185,000 km^2, of which 25,000 km^2 in the Netherlands, which is the major part of the country.

c. the River Meuse (Maas), 51º55'N 4º00'E, shared with Belgium, Luxemburg, France and Germany. Drainage area: 35,000 km^2 , of which 8,000 km^2 in the Netherlands.

d. the River Scheldt (Schelde), 51º30'N 3º25'E, shared with Belgium and France. Most of the south-western Province Zeeland used to belong to this RBD, but water reclamation has changed the situation dramatically. Drainage area: 22,000 km^2, of which 1,860 km^2 in the Netherlands.

Within the Netherlands, all rivers tend to intertwine and confluent. Rivers Rhine and Meuse have a complete anastomosis at several places, while a large part of the outflow of the River Meuse is now redirected through former outlets of the River Scheldt. Additionally, the coastal areas in front of the different RBDs constitute a confluent zone. Consequently, sharp boundaries between the RBDs cannot be made - neither on a practical nor on a juridical basis. This report will subdivide the national data on a pragmatic basis.

In the following, we will subdivide the national data on eel stock and fisheries by drainage area on a preliminary assumption that water surfaces and fishing companies are approximately equally distributed over the total surface, and thus, totals can be split up over RBDs proportionally to surface areas.

2.2 Dutch Eel Management Plan

The Ministry of Economic Affairs, Agriculture and Innovation (responsible for fisheries) has submitted an Eel Management Plan (MinLNV 2008); the initial version (December 2008) has been replaced by a second version (April 2009), which in turn has been replaced by a new decision in July 2009 (decision published 14 July 2009, approved by EU on 20 October 2010). Major elements of this plan are:

1. One single Eel Management Plan for the whole territory, including coastal areas.
2. Target escapement for Lake IJsselmeer estimated at 3080 t (length structured model, auction statistics), for the whole country at 4000-6000 t (historical landings per surface area, 1950s data, recent surfaces). Following the initial version of the EMP, the calculations have been reviewed by a committee, and targets are now set at 2600-8100 t, "most probably lower than the previous" calculations.
3. Current escapement is estimated at 400 t, half of which is silver eels from upstream, only passing through Dutch territory.
4. Fisheries for yellow and silver eel currently occurs in almost all waters, see previous section. Relative impact on the stock is unknown.
5. Other mortalities are omnipresent, but unquantified. Minimum estimates (including fishing) are: 1000 t for yellow eel, and 345 t for silver eel.
6. Restocking of approx 0.2 million individuals (mostly bootlace); future restocking of 1 – 1.6 t of glass eel is foreseen.
7. Management measures planned as follows:
    a. Reduction of mortality at pumping stations. Within the framework of the WFD, a budget of 200 M€ is available.
    b. The hydropower industry will be asked to reduce mortality by 35%. On new installations, a migration passage is obligatory.
    c. Fishery-free zones near barriers and sluices, presumably extending 500 m up- and downstream.
    d. Release of angler catches; this is a voluntary measure by the recreational fisheries.
    e. Ban on recreational fishing (a few fyke nets per person) in coastal areas from 2011.
    f. Stop on sniggle licenses in state owned waters.
    g. For the fishery, version 1 of the EMP set a closed season in Sept+Oct (yellow & silver eel, total ca. 50% of the annual catch).; version 2 decided to trap and transport 157 t of silver eels (of which 50 t from unpolluted waters) for release into the sea, but no closed season; and the July 2009 decision returns to a closed season (2009: Oct+Nov; 2010 onwards: Sept+Oct+Nov).
    h. The time until recovery depends very much on the immigration of glass eels in the years to come. Assuming that glass eel recruitment will have recovered by 2027, the targets set for silver eel escapement will be met.

2.3 Time-series data

2.3.1 Recruitment-series and associated effort

Glass eel

Commercial

Glass eel fisheries is forbidden, NO AVAILABLE DATA

Recreational

Glass eel fisheries is forbidden, NO AVAILABLE DATA

Fishery independent

Recruitment of glass eel in Dutch waters is monitored at Den Oever and 11 other sites along the coast (Fig. NL. 2; see Dekker 2002 for a full description). In Den Oever (Figure NL.3), 2012 recruitment was higher than 2011 but remainded similar to levels observed during the first part of the decade. The data at the other sites (Figure NL.2) confirm the overall trend, though individual series may deviate. Note that in contrast to previous years the glass eel data are presented simply as the average number of glass eels per haul in the months April and May.

Fig NL. 2. *Locations of glass eel monitoring in the Netherlands.*

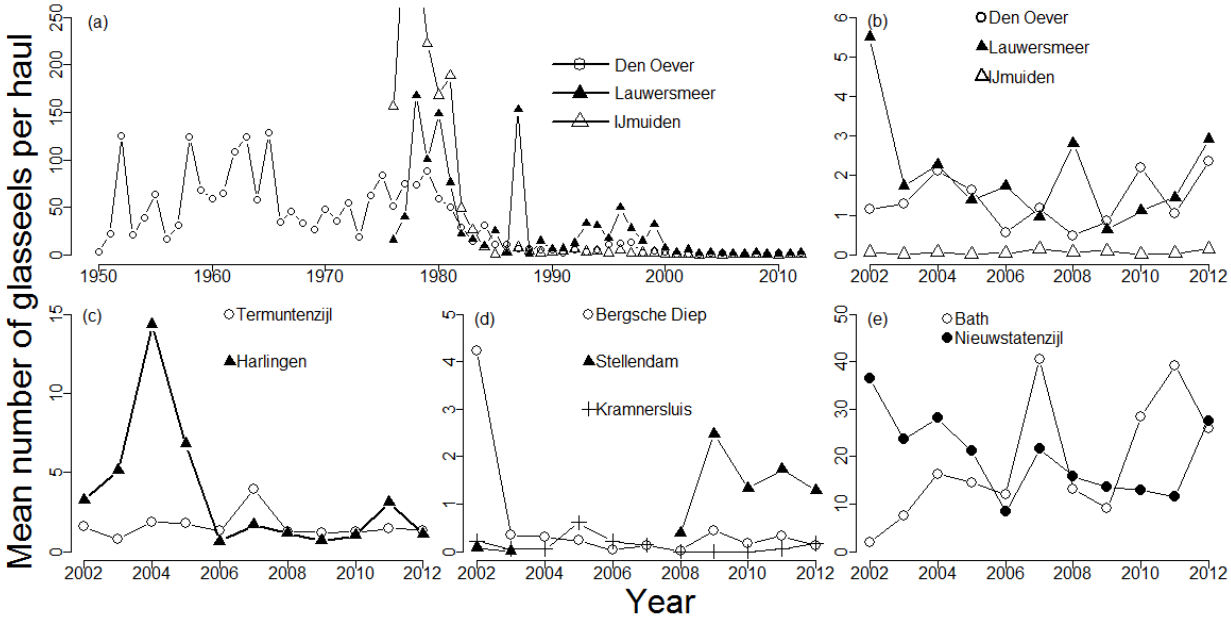

Fig NL.3. *Trend indices (mean number per haul in April and May) of glass eel recruitment at different locations along the coast of the Netherlands.*

Table NL.A. *Average number of glass eel caught per lift net haul at the sluices in Den Oever in de period April-May.*

DECADE YEAR	1930	1940	1950	1960	1970	1980	1990	2000	2010
0		22.4	2.7	58.9	48.1	59.0	4.9	2.8	2.2
1		14.3	21.9	65.2	36.1	50.4	1.8	0.6	1.1
2		17.5	125.6	108.9	55.0	29.4	5.2	1.2	2.4
3		13.7	21.1	123.7	18.8	14.7	3.5	1.3	
4		46.1	38.8	58.1	63.0	31.6	5.4	2.1	
5		NA	64.1	128.3	84.3	11.2	11.1	1.6	
6		7.5	16.1	34.0	51.4	11.4	12.5	0.6	
7		7.2	31.3	45.8	75.0	6.2	12.6	1.2	
8	15.3	4.8	124.0	32.9	73.6	7.0	2.4	0.5	
9	71.5	6.6	67.6	27.1	87.7	4.8	3.7	0.9	

Table NL.B. *Average number of glass eel caught per lift net haul in the period April-May at 12 sites in the Netherlands. If 5 or less hauls were conducted it was recorded as NA. * = very early season (warm spring), sampling stopped early (start of May), low number of empty samples. ** = sampling took place in part of the season.*

	Otheense Kreek	Bath	Krammersluis	Bergsche Diep	Stellendam	Katwijk	Ijmuiden	Den Oever (schiplock)	Harlingen	Lauwersmeer	Nieuwstaten-zijl	Termunten-zijl
RBD	Scheldt	Scheldt	Meuse	Meuse	Meuse	Rhine	Rhine	Rhine	Rhine	Rhine	Ems	Ems
1969							50.79					
1970							28.00					
1971					18.45							
1972					5.58							
1973							30.67					
1974												
1975												
1976										15.42		
1977												
1978												
1979							222.33			100.43		
1980												
1981							188.71			75.92		
1982										21.62		
1983										15.77		
1984							8.14			9.55		
1985							0.58			25.17		
1986							3.33			1.30		
1987							7.73					
1988					13.78		4.00			1.00		
1989					4.37		1.52			14.33		
1990	0.29		0.28		10.86		3.20			6.00		
1991	0.00		0.19	1.31	3.08	5.13	3.60			6.63		0.52
1992	0.00	14.50	0.44	2.22	16.93	8.15	5.75		16.70	12.07		0.61
1993	0.00	22.67	0.42		10.13	13.53	3.33			33.19		1.17
1994	0.00	14.20	0.49		4.01	15.12	4.00		16.04	31.00		2.77
1995	0.53	17.81	0.43		3.26	29.67	2.00	34.66	6.57	16.85		3.69
1996	1.21	35.33	0.71		0.48	25.35	4.54	11.02	34.17	49.37	27.48	7.69
1997		41.56	0.59		2.80	12.25	1.78	11.37	14.00	27.76	30.00	15.56
1998	0.67	28.19	0.62		0.99	38.82	2.00	6.46	18.33	14.38	21.83	1.38
1999	1.38	29.74	0.47		1.18	122.67	1.90	7.22	19.10	31.69	13.50	10.14
2000	0.85	10.15	1.00	3.75	7.11	11.60	0.70	5.04	2.94	7.21	38.81	8.74
2001	0.37		0.06	0.08	0.95	14.08	0.53	1.67	2.30	2.38	39.73	1.13
2002		1.93	0.22		4.23	12.32	0.07	1.43	3.22	5.50	36.42	1.56
2003		7.54	0.06		0.34	12.70	0.00	4.73	5.13	1.72	23.61	0.80
2004	0.00	16.38	0.05		0.31	4.48	0.06		14.33	2.26	28.07	1.87
2005	0.00	14.58	0.61		0.23	5.63	0.00		6.79	1.37	21.14	1.76
2006	0.00	11.99	0.21		0.03	1.42	0.04	0.28	0.63	1.74	8.33	1.29
2007	0.00	40.48	0.14	0.39	0.13	24.81	0.13		1.67	0.96	21.67	3.95
2008	0.00	13.15	0.00	2.47	0.02	4.13	0.07	0.76	1.15	2.81	15.89	1.25
2009	0.00	9.08	0.00	1.33	0.45	3.53	0.10		0.67	0.63	13.56	1.21
2010		28.44	0.00	1.73	0.17		0.00	1.19	1.00	1.11	12.97	1.22
2011		39.17	0.05	1.29	0.33		0.04		3.08	1.44	11.58	1.44
2012		25.81	0.17	0.77	0.13	1.58	0.13		1.09	2.91	27.59	1.33

Yellow eel recruitment

Commercial

NO AVAILABLE DATA

Recreational

NO AVAILABLE DATA

Fishery independent

At various places in the Netherlands, facilities have been built to allow glass eel and yellow eel to migrate through or over dykes and sluices. Some of these places monitor the quantities of eel being caught and transported, but these data series are currently too short to be used as time series. There is one noticeable exception: for the eel trap at pumping station Stroink in Vollenhove (52º42'16N 5º28'22E), records have been kept since the late 1950s, but unfortunately, the data prior to 1976 have been lost. Unfortunately no data are available for 2011, check WGEEL 2010 Country Report The Netherlands for further information .

One of the few long time series for yellow eel is the fyke monitoring at NIOZ (Den Burg, Texel; van der Meer et. al. 2011). This data set shows a familiar pattern of a steep decline in abundance since the 1980s.

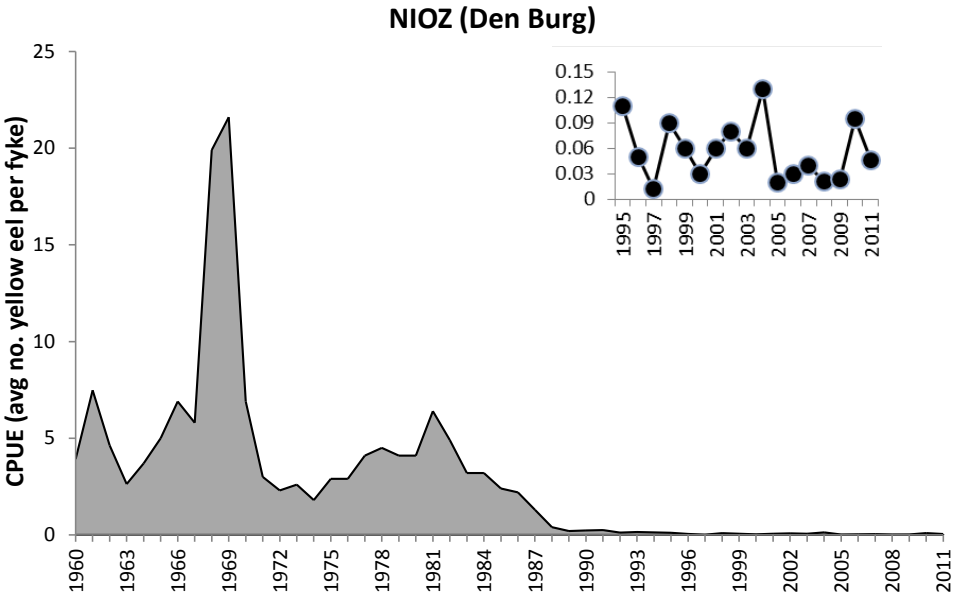

Fig. NL.4. *Time series of the mean catch per fyke (numbers) of yellow eel at NIOZ (data NIOZ and van der Meer et al.,2011.).*

2.3.2 Yellow eel landings

Commercial

No reliable long term time series of yellow eel landing exist; total landings of yellow and silver eel combined, have been reported. However, data from auctions around Lake IJsselmeer did report yellow and silver eel separately, but information in recent years (early 1990s onwards) is unreliable: yellow eel from eel boxes and silver eel from all gears have been combined; see section NL.6.2.1 for details. An obligatory catch registration system was introduced in the Netherlands in January 2010 by the Ministry of Agriculture, Nature and Food Quality. However, weekly catches of eel are reported but yellow eel and silver eel catches are combined in this program and no information on effort and gears is reported.

Recreational

NO AVAILABLE DATA.

Fishery independent

NO AVAILABLE DATA.

2.3.3 Silver eel landings

Commercial

No reliable long term time series of yellow eel landing exist; total landings of yellow and silver eel combined, have been reported. However, data from auctions around Lake IJsselmeer did report yellow and silver eel separately, but information in recent years (early 1990s onwards) is unreliable: yellow eel from eel boxes and silver eel from all gears have been combined; see section NL.6.2.1 for details. An obligatory catch registration system was introduced in the Netherlands in January 2010 by the Ministry of Agriculture, Nature and Food Quality. However, weekly catches of eel are reported but yellow eel and silver eel catches are combined in this program and no information on effort and gears is reported.

Recreational

NO AVAILABLE DATA

Fishery independent

NO AVAILABLE DATA.

2.3.4 Aquaculture production

Seed supply

Table NL.C. *Origin of glass eel used for aquaculture in the Netherlands in 2011 (Source DUPAN).*

SEASON	FRANCE	SPAIN	ENGLAND	TOTAL (KG)
2010/2011	4725	1890	135	6750
2011/2012	5325	1350	100	6775

Production

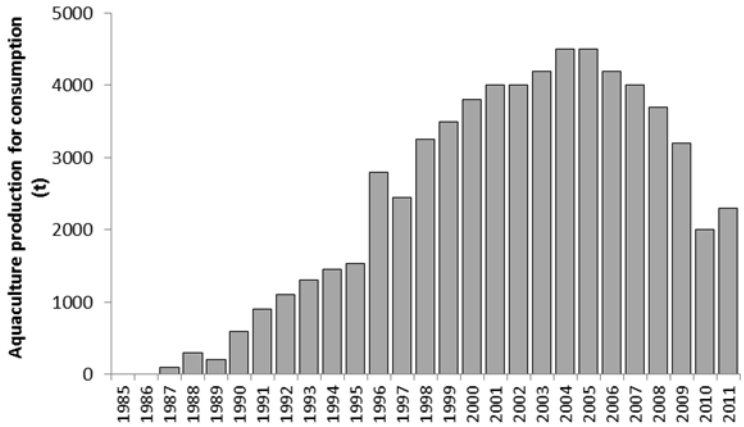

Fig. NL.5 *Trend in aquaculture production for consumption in the Netherlands (Source DUPAN).*

2.3.5 Stocking

Amount stocked

Table NL.D *Overview of glass eel and young yellow eel stocked in the Netherlands in 2012 (Source CvB, DUPAN). Note that all young yellow eel stocked in 2012 originated from glass eel caught in France in 2011 and 2012.*

Date	Location	Type	Origin	Quarantine	kg	#/kg	#
4/2/2012	Veerse Meer	glass eel	Anguilla Anguilla (Fr)	yes	170	3,100	527,000
4/2/2012	Friese Boezemwateren	glass eel	Anguilla Anguilla (Fr)	yes	513	3,100	1,590,300
6/12/2012	Westeinder plassen	glass eel	Anguilla Anguilla (Fr)	yes	7	3,100	21,700
6/12/2012	Wieden (NW overijssel)	glass eel	Anguilla Anguilla (Fr)	yes	21	3,100	65,100
6/12/2012	Kanaal van Steenenhoek en Linge	glass eel	Anguilla Anguilla (Fr)	yes	5	3,100	15,500
6/12/2012	Binnenwater Walcheren	glass eel	Anguilla Anguilla (Fr)	yes	4	3,100	12,400
6/12/2012	Polders N-Holland	glass eel	Anguilla Anguilla (Fr)	yes	9	3,100	27,900
6/12/2012	Wormer en Jisperveld polders in N-Holland	glass eel	Anguilla Anguilla (Fr)	yes	24	3,100	74,400
6/12/2012	Rond Zaandam	glass eel	Anguilla Anguilla (Fr)	yes	3	3,100	9,300
6/12/2012	Friesland	glass eel	Anguilla Anguilla (Fr)	yes	10	3,100	31,000
			TOTAL		*766*		2,374,600
6/12/2012	Tjeukemeer en Slotermeer	bootlace*	Anguilla Anguilla (Fr)/Nijvis	?	1200	340	408,000
	Zuid-Holland	bootlace		?	30	200	6,000
5/28/2012	Elburg	bootlace	Aquafarm (Putten, NL)	?	*27.5*	*218*	6,000
5/12/2012	Kampen	bootlace	Aquafarm (Putten, NL)	?	*146.8*	*218*	32,000
6/1/2012	Reeuwijk	bootlace	Kraan	?	70	250	17,500
7/6/2012	Markiezaatsmeer	bootlace	Nijvis	?	100	200	20,000
5/3/2012	Westeinder plassen	bootlace	Kraan	?	100	100	10,000
			TOTAL		*1674*		499,500

*all stocked bootlace is ongrown cultured eel

Catch of eel <12 cm and proportion retained for restocking

Catch and retain of eels < 28 cm is illegal. There is no organised trap and transport of undersized eels.

Reconstructed Time Series on Stocking

Table NL.E

	Local Source				Foreign Source			
Year	Glass Eel	Quarantined Glass Eel	Wild Bootlace	On-grown cultured	Glass Eel	Quarantined Glass Eel	Wild Bootlace	On-grown cultured

No (historical) data available with regards to origin and whether or not stocked eels were quarantined, overall all stocked of glass eel (see FIG.NL.6) is sourced outside the Netherlands.

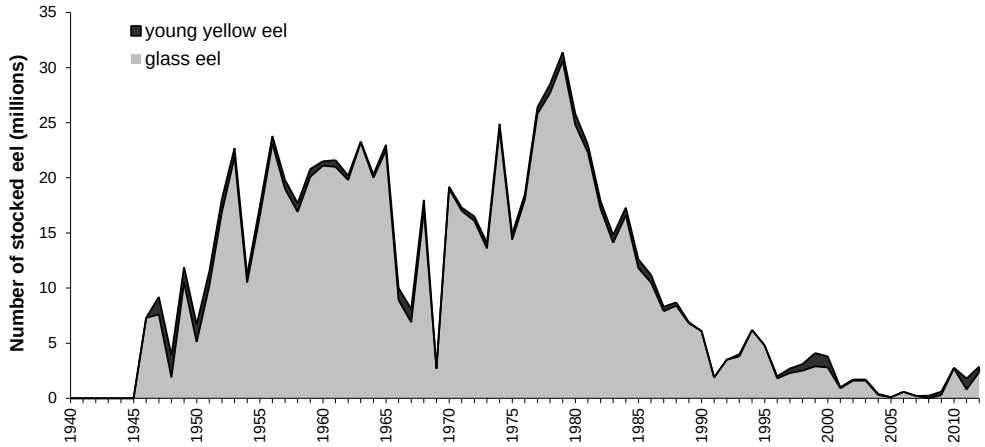

Fig. NL. 6. *Overview of glass eel and young yellow eel stocking in the Netherlands.*

2.4 Fishing capacity:

For marine waters and Lake IJsselmeer, a register of ships is kept, but for the other waters, no central registration of the ships being used is available. Registration of the number of gears owned or employed is lacking. For Lake IJsselmeer, a maximum number of gears per company is enforced (authenticated tags are attached to individual gears), but the actual usage is often much lower, amongst others since restrictions apply on the combinations of types of fishing gears (e.g. no fyke nets and gill nets should be operated concurrently, since perch and pikeperch are the target species of the gill netting, while landing perch and pikeperch from fyke nets is prohibited).

2.5 Fishing effort:

For most of the country, fishing capacity is unknown. In areas where fishing capacity is known, no record is kept of the actual usage of fishing gears. Consequently, no information is available on fishing effort. For Lake IJsselmeer, an estimate of the number of gears actually used is available for the years 1970-1988 (Dekker 1991).
In the mid 1980s, the number of fyke nets was capped, and reduced by 40 % in 1989.
In 1992, the number of eel boxes was counted, and capped. Subsequently, the caps have been lowered further in several steps, the latest being a buy-out in 2006. Since the number of companies has reduced at the same time, the nominal fishing effort per company has not reduced at the same rate, and underutilisation of the nominal effort probably still exists. The effort in the longline fishery is not restricted, other than by the number of licenses.

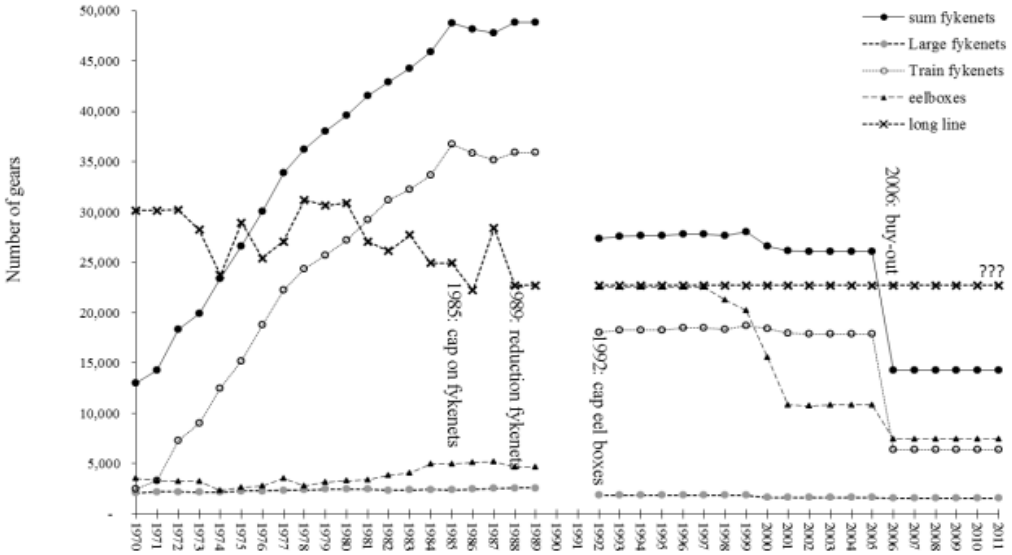

Figure NL.7 *Trends in the nominal number of fishing gear employed in the eel fishery on Lake IJsselmeer. Information before 1989 is based on a voluntary inquiry in 1989 (Dekker 1991); after 1992, the licensed number of gear is shown. Note that long line fishery is only restricted by the number of licences, the number of long lines per licence is not regulated. The number of long lines since 1992 is unknown.*

The Ministry of Economic Affairs, Agriculture and Innovation conducted a survey of eel fishing gears used outside IJsselmeer/Markermeer in 2010 and 2011 (Fig. NL 8). In 2012 information on fishing effort has been added to the obligatory catch registration system of the Ministry.

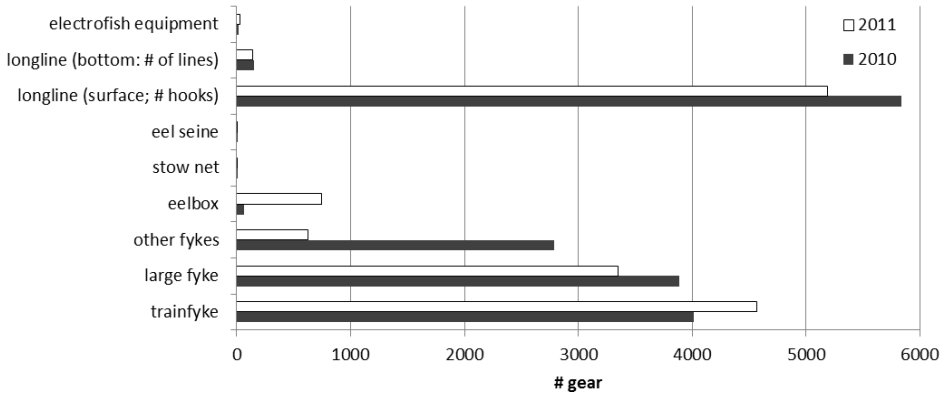

Figure NL.8 *Number of fishing gear employed in the eel fishery outside Lake IJsselmeer/Markermeer in 2010 and 2011 (source Min EZ).*

2.6 Catches and landings

2.6.1 Glass eel

Glass eel fishing is forbidden, no available data.

2.6.2 Yellow eel

Catches and landings from lake IJsselmeer

For Lake IJsselmeer, statistics from the auctions around Lake IJsselmeer are now kept by the Fish Board (Table NL.e); before 1994, the government kept statistics. These statistics are broken down by species, month, harbour and main fishing gear; the quality of this information has deteriorated considerably over the past decade, due to misclassification of gears, and the trading of eel from other areas at IJsselmeer auctions. For example, the estimates for the total number of eel caught in Lake IJsselmeer in 2010 vary from 117 t (registration Min EZ), 79 t (PO IJsslmeer) to 65 t (Fish Board). Starting in 2011 the estimates of the obligatory registration of the Min EZ will be used.

Table NL.F *Landings in tons per year, from the auctions around Lake IJsselmeer, Rhine RBD. Only landings recorded at the auctions are included; other landings are assumed to represent a minor and constant fraction. Figures in italics are suspect, due to misclassification of catches and trade from areas outside Lake IJsselmeer at the IJsselmeer auctions. Source 2011 data is Min of EZ.*

DECADE YEAR	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990	2000	2010
0	324	620	1157	838	3205	4152	2999	1112	641	472	*368*	65
1	387	988	989	941	4563	3661	2460	853	701	573	*381*	**179**
2	514	720	900	1048	3464	3979	1443	857	820	548	*353*	
3	564	679	742	2125	1021	3107	1618	823	914	293	*279*	
4	586	921	846	2688	1845	2085	2068	841	681	330	*245*	
5	415	1285	965	1907	2668	1651	2309	1000	666	*354*	*234*	
6	406	973	879	2405	3492	1817	2339	1172	729	*301*	*230*	
7	526	1280	763	3595	4502	2510	2484	783	512	*285*	*130*	
8	453	1111	877	2588	4750	2677	2222	719	437	*323*	*122*	
9	516	1026	1033	2108	3873	3412	2241	510	525	*332*	*42*	

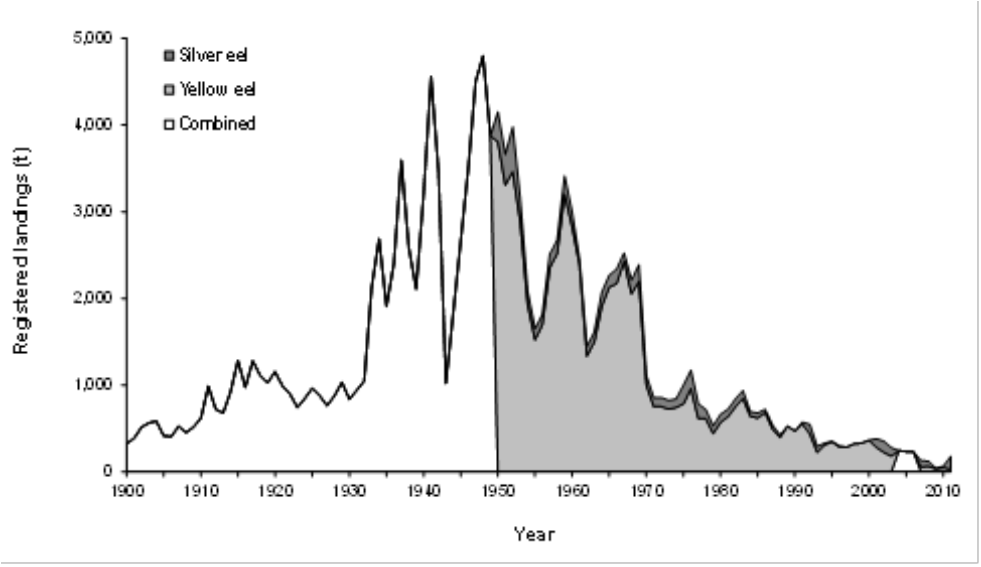

Figure NL.8 *Time Trend in the landings from Lake IJsselmeer*

Catches and Landings inland waters

For the inland areas outside Lake IJsselmeer, no detailed records of catches and landings were available until 2010. In January 2010 the Ministry of Economic Affairs, Agriculture and Innovation introduced an obligatory catch recording system for inland eel fishers (IJsselmeer and Rivers). Fishermen are required to report their weekly eel catches for each of the 43 so-called Fish Stock Management Committees ['Visstand Beheer Commissies' VBC].

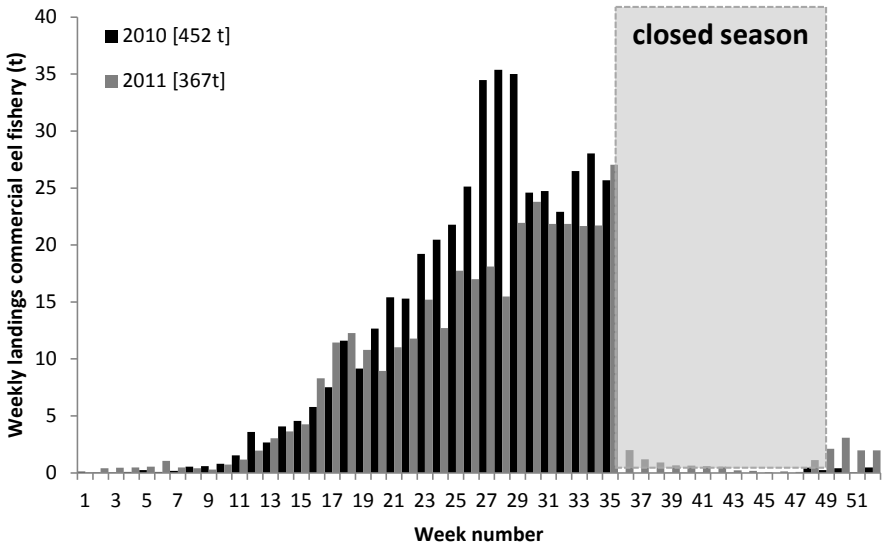

Figure NL.9 *Weekly catches in tons of eel (yellow + silver eel combined) by inland fishermen*

Recreational fisheries

In 2009 an extensive Recreation Fisheries Program was started in the Netherland. In December 2009 50.000 households were approached during the screening survey to determine the number of recreational fishermen in the Netherlands (result 1.69 million recreational fishermen). In 2010, 2000 recreational fishermen were selected for a 12-month logbook programme (Mar 2010 – Feb 2011). in the Netherlands around ~1.500.000 eels are caught while ~500.000 eels are retained by recreational fishermen. Due to the lack of reliable length frequency data of the caught eel, up-scaling the number of caught eel to a biomass of caught eel remains difficult (van der Hammen & de Graaf, 2012).

Table NL.G *Overview of eel catches (retained and released) by the recreational fishery in the Netherlands in 2010 (Source van der Hammen & de Graaf, 2012).*

	numbers			uncorrected weight (kg)			corrected weight (kg)		
	marine	fresh	sum	marine	fresh	sum	marine	fresh	sum
retained	174215	340536	514751	36287	78259	114546	17161	37374	54535
released	108462	872570	981032	23834	137186	161020	26253	149917	176170
sum	282677	1213106	1495783	60121	215445	275566	43414	187291	230705
% etained	62%	28%	34%	60%	36%	42%	40%	20%	24%

2.6.3 Silver eel

See 6.2 Yellow Eel.

2.6.4 Marine fishery

Catches and landings in marine waters are registered in EU logbooks, but these do not allow for a break down by RBD. Registrations are available for the years since 1995; data prior to 1984 are presented in the 2009 Country Report. Until 2001, vessels with a total length (LOA) ≥ 15 m were obliged to report all their eel catches. This obligations did not apply top smaller vessels. From 2001 onwards, vessels with a total length ≥ 10 m are obliged to report their eel catches, if their landings per day exceeded 50 kg. That is: in 2001 the number of ships potentially reporting rose, but the actual reporting per ship potentially declined. This change in the regulations was partly driven by changing practices, and vice versa. Since 2001 the number of ships, total landings and the landings per ship have been declining.

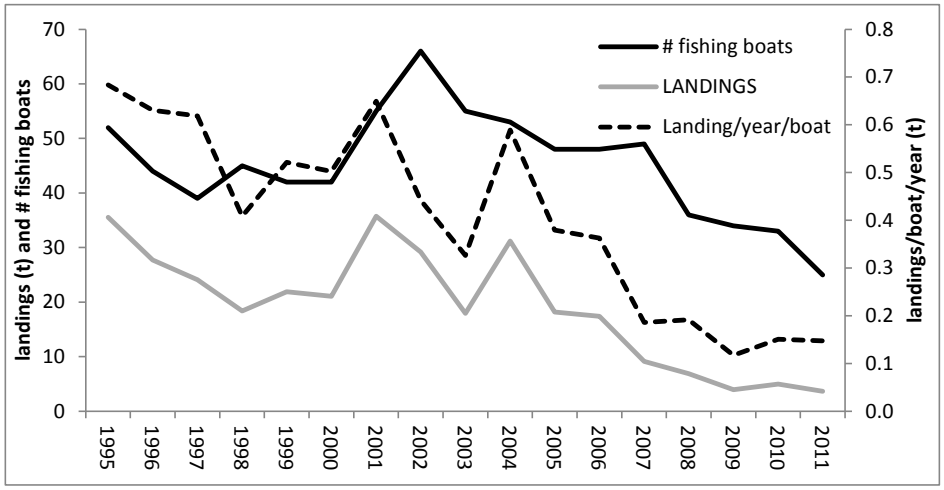

***Figure NL**.10 Time trend in the total registered landings from marine waters in Dutch harbours.*

2.7 Catch per unit of effort

No data on CPUE are available in the Netherlands.

2.8 Other anthropogenic impacts

See 2.13.

2.9 Scientific surveys of the stock

2.9.1 Recruitment surveys, glass eel

See 2.3.1.

2.9.2 Stock surveys, (yellow) eel

Lake IJsselmeer (active gear)

Figure NL.11 presents the trends in CPUE for the annual (yellow) eel surveys in Lake IJsselmeer (25 sites) and Lake Markermeer (15 sites), using the electrified trawl.

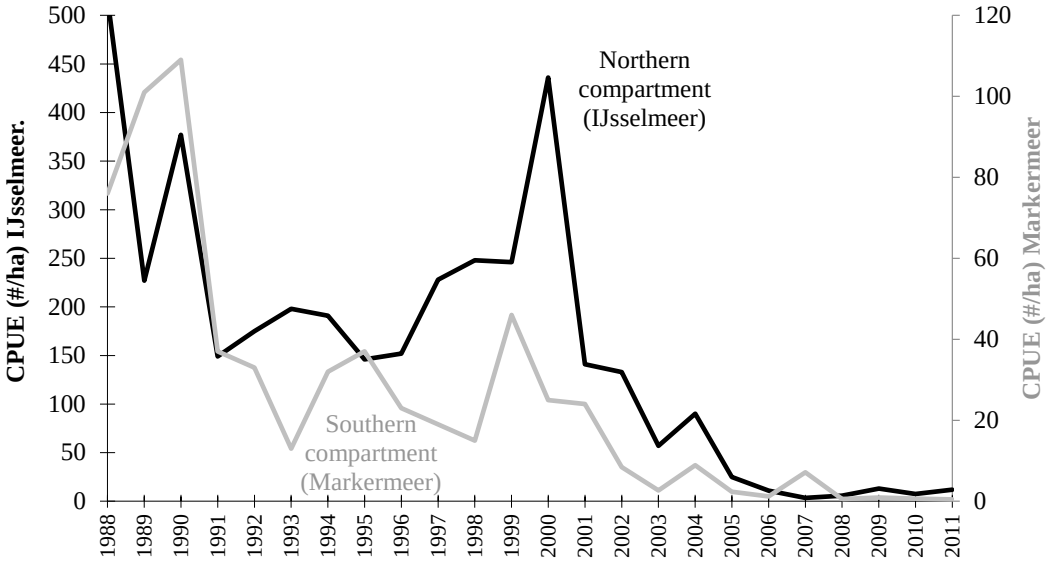

Figure NL.11 *CPUE trends in Lake IJsselmeer stock surveys, in number per hectare swept area, using the electrified trawl. Note: The northern and southern compartments are separated by a dyke.*

Main Rivers (active gears)

Eel stocks in the main rivers are surveyed yearly since 1998. Within a river, the main stream is sampled with a beam trawl and the river banks are sampled with an electric dipnet. Data is collected annually in eleven river systems, which are clustered in six regions. In Fig. NL. 12, data is presented for three regions, namely Downstream (consisting of Hollands Diep, Nieuwe Merwede and Oude Maas), Gelderse Poort (consisting of the upstream section of the Rhine, Waal, Nederrijn and Gelderse IJssel, near the German border) and the Grensmaas (a shallow, upstream section of the Maas, near the Belgian border). Downstream is surveyed in September/October (i.e., during the migratory period of the silver eel), Gelderse Poort in March/April, and Grensmaas in May.

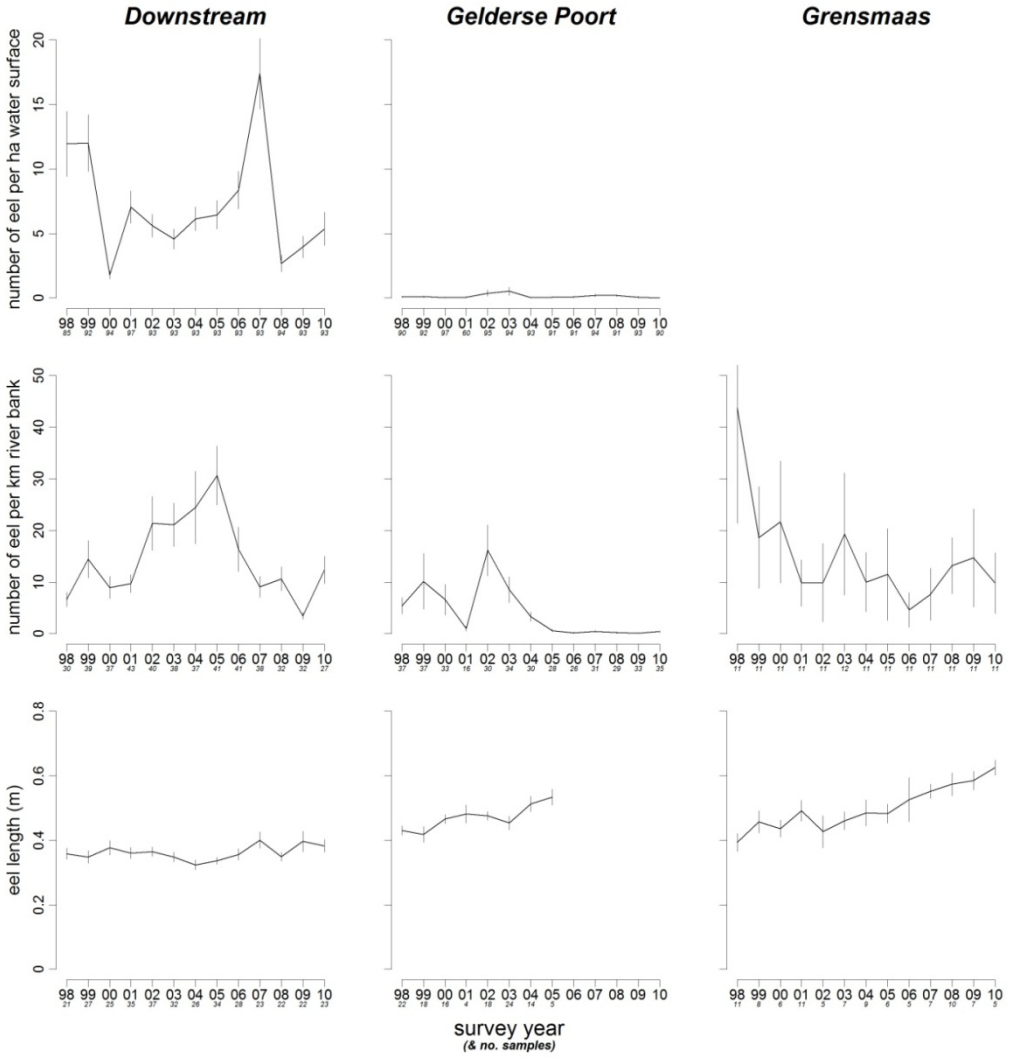

Figure NL.12 *Eel stock survey in downstream and upstream (Gelderse Poort; Grensmaas) the main rivers; densities with beam trawl (top graphs), densities with electrofishing (middle graphs) and average length (bottom graphs).*

For the downstream region, Figure NL.12 shows high densities of eel, both in the main stream and the river bank. In this region, no trend seems present through the years, in either abundance or length. The upstream location of the Gelderse Poort has very low densities of eel in the main stream, and strongly declining densities in the river banks, with almost no eel detected in the last four years. Also, the average length in the Gelderse Poort seems to increase, for the years in which enough data are available. The trend in the Grensmaas seems to be similar to that in the Gelderse Poort, with decreasing densities and increasing average length.

These data suggest that in the upstream regions the abundance of eel is decreasing while the average length is increasing, which could imply a declining recruitment of young eel in the upstream regions.

Main rivers (passive gear)

Starting in 1993, the fish assemblage in the main rivers and linked waters has been monitored, by means of logbook registration of commercial catch and by-catch, in a restricted number of fyke nets (4 large fyke nets or 2 pairs of summer fyke nets per location), mostly on a weekly basis. For eel, the number of yellow eels and silver eels caught is recorded. Results show a slowly declining trend over the years in the main rivers, but the year-to-year and site-to-site variation is considerable. The closed season (Aug-Oct) since 2009 and especially the closing of the fishery in the dioxine areas (indicated blue in Fig) caused an interruption of this time series.

Figure NL.13 *Sampling sites for ACTMON and PASMON (4-fyke monitoring of commercial catches and by-catch).*

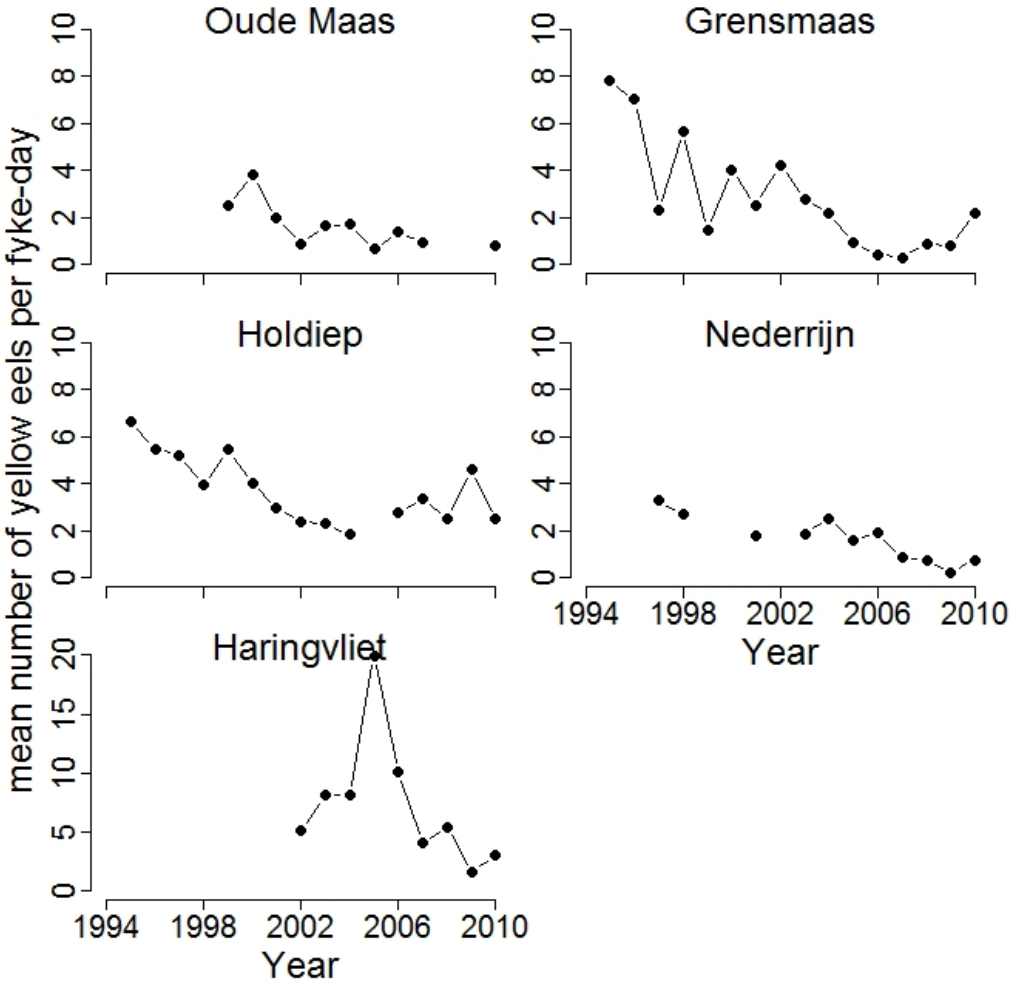

Figure NL.14 *Mean number of yellow eel per fyke day in the lower and upper reaches of the rivers Meuse and Rhine in the Netherland.*

Coastal waters

The number of eels caught in coastal surveys (Dutch Young Fish Survey) is presented in Figure NL.15. Until the mid-1980s, considerable catches of eel were observed. Since that time, a gradual decrease is observed.

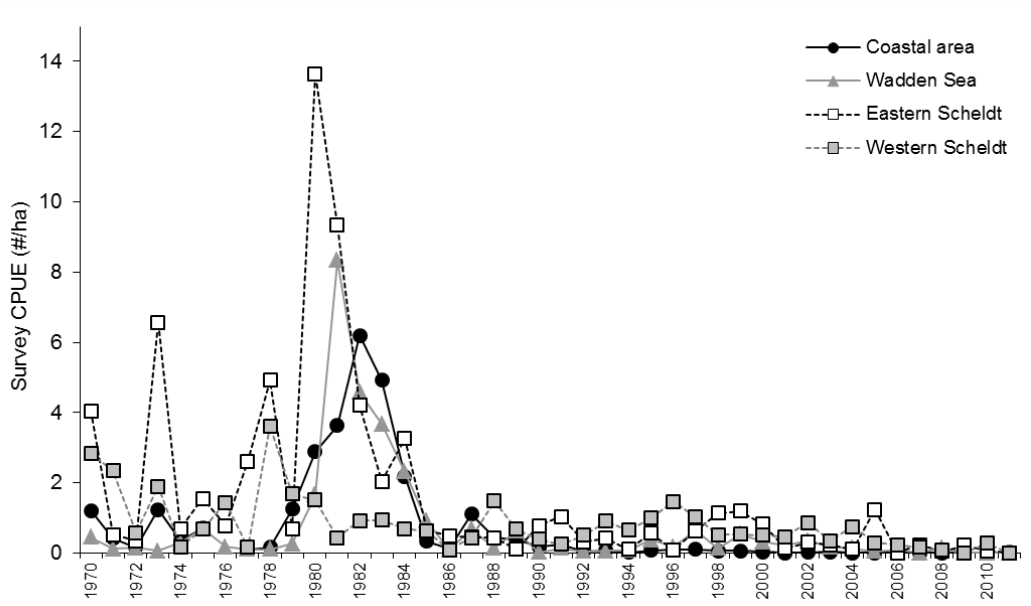

Figure NL. 15 *Trends in coastal survey CPUE. Most of the Wadden Sea belongs to RBD Rhine; Eastern Scheldt is mixed Scheldt and Meuse; Western Scheldt belongs to RBD Scheldt (with an extra inflow from Meuse), Coastal area belongs to RBD Rhine.*

A more elaborate statistical analysis of the abundance and length composition of the eel stock in coastal waters is presented in Dekker (2009b).

2.9.3 Silver eel

There are no routine surveys for silver eel in the Netherlands. Ad hoc estimates based on tagging and/or transponder experiments are available from

- Klein Breteler, J., Vriese, T., Borcherding, J., Breukelaar, A., Jörgensen, L., Staas, S., de Laak, G., and Ingendahl, D. 2007. Assessment of population size and migration routes of silver eel in the River Rhine based on a 2-year combined mark-recapture and telemetry study. – ICES Journal of Marine Science, 64: 1–7.

- Winter, H. V., Jansen, H. M., and Breukelaar, A. W. 2007. Silver eel mortality during downstream migration in the River Meuse, from a population perspective. – ICES Journal of Marine Science, 64(7):1444-1449.

A Silver Eel Index is currently being designed and is expected to be implemented in the autumn of 2012.

2.10 Catch composition by age and length

No new data available.

2.11 Other biological sampling

2.11.1 Length and weight and growth (DCF)

No new data available.

2.11.2 Parasites and pathogens

The swimbladder nematode *Anguillicoloides crassus* was introduced in wild stocks of European eels in The Netherlands in the start of the 80ies, from SE-Asia. The market sampling for Lake IJsselmeer collects information on the percentage of eels showing *Anguillicoloides crassus* infection based on inspection of the swim bladder by the naked eye. Following the initial break-out in the late 1980s, infection rates have stabilised between 40 and 60%. As part of the extended market sampling program in 2009, data on *Anguillicoloides* infection rates was also collected in two other areas (Friesland and Rivers). In both areas the infection rate was similar to the levels observed in Lake IJsselmeer over the past years. In 2011 the market sampling was conducted in most of the country (Table NL.H).

Table NL.H *Overview of A. crasssus infection rates the Netherlands.*

	IJsselmeer		**Friesland**		**Meuse & Rhine**		**Noord Holland**		**Randmeren**		**Zeeland**		**Zuid Holland**	
year	%	# eels	%	# eels	%	# eels	%	# eels	%	# eels	%	# eels	%	# eels
1986	31	699	44	421	70	30								
1987	93	244												
1988	75	520												
1989	51	423												
1990	60	200												
1991	61	240												
1992	57	165												
1993	65	238												
1994	64	224												
1995	55	225												
1996	67	241												
1997	58	240												
1998	60	240												
1999	60	255												
2000	57	450												
2001	62	240												
2002														
2003														
2004	52	1654												
2005	56	45												
2006	55	1520												
2007	45	1215												
2008	41	1319												
2009			44	991	55.3	262								
2010	46	390	46	589	47	456								
2011	41	345	30	164			32.2	115	57	76	37	153	41	130

2.11.3 Contaminants

In 2011 five trend locations have been monitored. As shown in the Figure NL.16 there is no change compared to the previous years; historically, a substantial decrease in PCB concentrations has been achieved, but the current rate of decline is low or non-existent.

Pooled samples of eels (approx. 25 individuals, 30-40 cm length) from in total 29 locations have been monitored in The Netherlands, see table NL.I. Again the general picture is not changed compared to the previous years. All locations that have eels with concentration of sum-TEQ or PCB153 above the regulatory levels are fed by the river Rhine or Meuse. Only those water ways not influenced by Rhine, Meuse or local industry can be considered low contaminated.

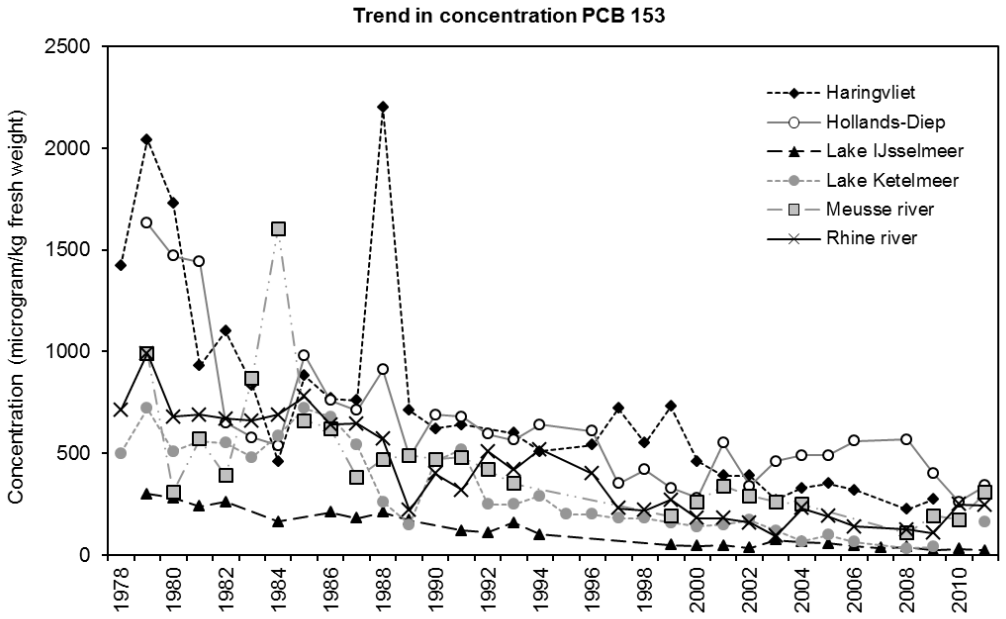

Figure NL. 16 *Temporal trend in PCB in eel (data from IMARES and RIKILT).*

Table NL.I *Monitoring data of 2011 The Netherlands. Shaded numbers are above the regulatory limits of 2011 (12 pg/g sum-EQ and 500 ng/g PCB153, 10% uncertainty included).*

Locatie	Som TEQ [pg TEQ / g product]	PCB 153 [ng/g product]	Locatie	Som TEQ [pg TEQ / g product]	PCB 153 [ng/g product]
Afgedamde Maas - Andelse Maas	13	187	Markiezaatmeer	2.0	12
Amsterdam-Rijnkanaal, Muiden	25	200	Nieuwe Maas, Krimpen a/d Lek	21	224
Bakkerskil (Buitendijkse waterloop Biesbosch)	16	216	Nieuwe Maas, Pernis tot Botlek	17	135
Belterwijde	3.9	14	Noordhollands Kanaal (Akersloot)	4.0	23
Binnenbedijkte Maas (Hoekse Waard) Z-H	9.1	189	Noordzeekanaal, Zijkanaal C	11	145
Dortsche Biesbosch (Koekplaat)	48	595	Oostvoornsemeer	13	180
Hollands Diep	33	341	Rijn (Rijnsburg tussen Leiden en Katwijk)	9.6	73
IJssel, Deventer	11	108	Rijn, Lobith	28	243
IJsselmeer tussen Ketelbrug en Flevocentrale	20	176	Twentekanaal Wiene-Goor	8.6	61
IJsselmeer, Medemblik	3.4	23	Volkerak	15	138
Kanaal Gent-Terneuzen	15	118	Vossemeer, IJssel	9.5	69
Kanaal Wessem-Nederweert	12	184	Waal Tiel	28	233
Ketelmeer, Oostelijk deel	17	164			
Lek, Culemborg	19	214			
Maas, Eijsden	23	307			
Maas, Maasbommel	25	361			
Maasplassen, Roermond	27	474			

2.11.4 Predators

Predation of eel by cormorants (*Phalacrocorax carbo*) is much disputed amongst eel fishermen and bird protectionists. The number of cormorant breeding pairs increased rapidly until the early 1990s, and then stabilised (FIG NL. 17). For Lake IJsselmeer, food consumption has been well quantified (van Rijn & van Eerden 2001; van Rijn 2004); eel constitutes a minor fraction here. In other waters, neither the abundance, nor the food consumption is accurately known, but predation on eel appears to be a bigger issue here.

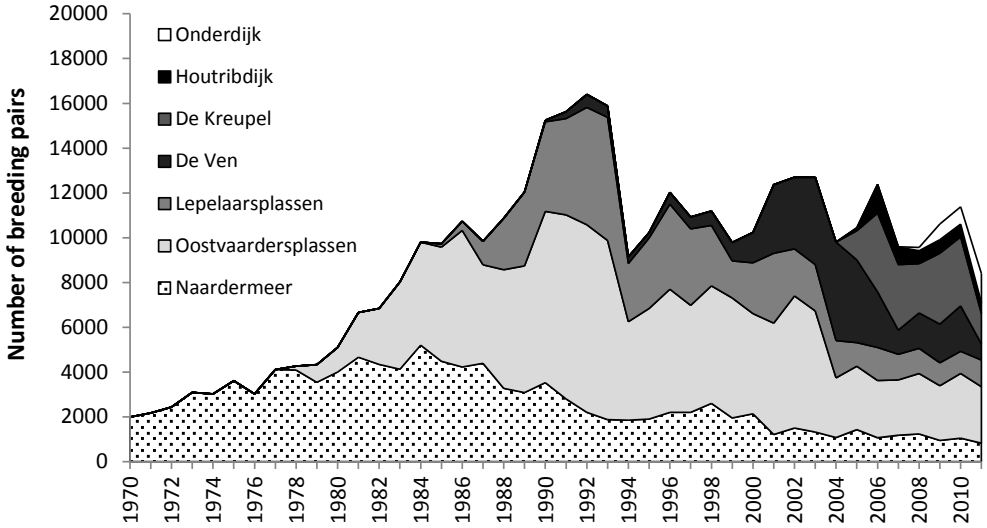

Figure NL. 17 *Trends in the number of breeding pairs of cormorants (Phalacrocorax carbo) in and around Lake IJsselmeer (Source van Eerden, Waterdienst RWS).*

2.12 Other sampling

Nothing to report under this heading.

2.13 Stock assessment

2.13.1 Local stock assessment

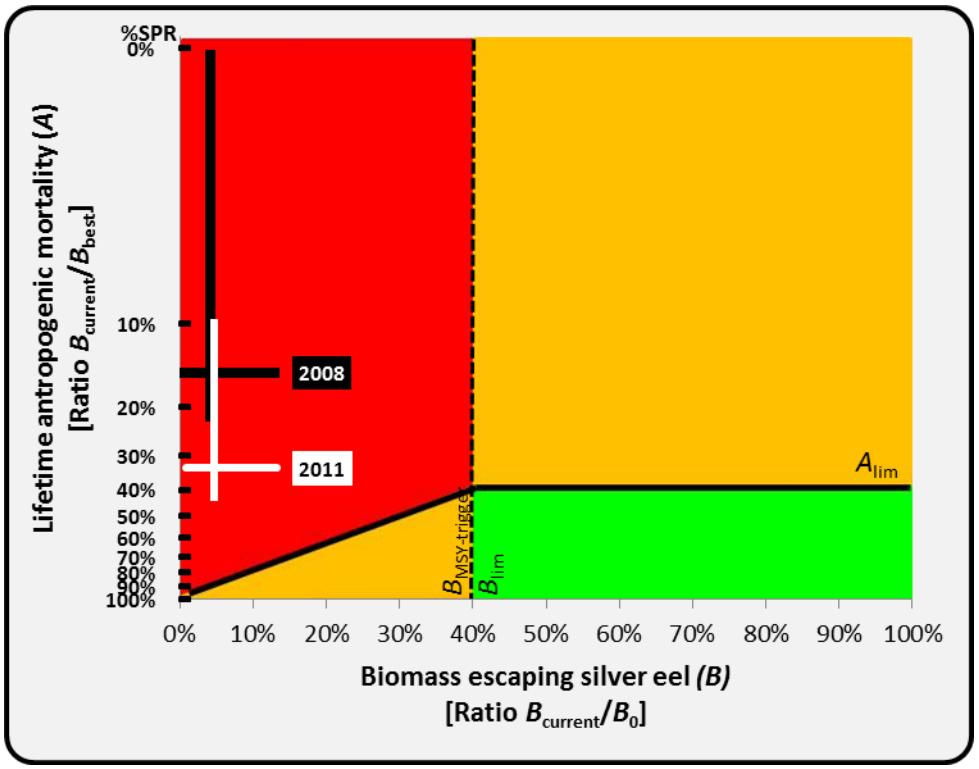

Figure NL.18 *ICES modified precautionary diagram illustrating the uncertainties around the biomass estimates of escaping silver eel (range B_0; Eijsackers 2009) and estimates of anthropogenic morality (scenarios 1-3; catch efficiency, densities eel in open water) in The Netherlands in 2008 and 2011 with respect to* ***management*** *targets. 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.*

2.13.2 International stock assessment

Habitat

An overview of habitats available is presented by Dekker et al. (2008), based on the information in Tien & Dekker (2004), complemented with data from various sources. The summarising table is reproduced here in ***Table NL.J.***

PROVINCE	DITCHES †	CANALS †	LAKES ‡	RIVERS	COASTAL WATERS	SUM
Friesland	5,345	7,057	9,454		-	21,856
Groningen	2,003	2,040	6,905		3,843	14,791
Drenthe	657	503	-		-	1,160
Overijssel	1,516	1,985	1,872		-	5,372
Gelderland	831	733	-		-	1,564
Flevoland	3,115	4,959	-		-	8,074
Utrecht	1,699	2,349	2,699		-	6,747
Noord-Holland	5,227	7,938	1,243		-	14,408
Zuid-Holland	4,843	6,935	7,454		-	19,232
Zeeland	2,421	2,873	17,871		95,745	118,909
Noord-Brabant	1,247	1,241	-		-	2,488
Limburg	-	-	-		-	-
Larger water bodies						
Randmeer			16,110		-	16,110
IJsselmeer/Markermeer			169,150		-	169,150
Rijn & Maas				18,067	-	18,067
kleinere rivieren				2,800	-	2,800
Waddenzee, incl Eems			-		259,214	259,214
Zeeuwse Delta			17,871		95,745	113,616
sum	28,905	38,610	232,758	20,867	358,802	679,942

† For ditches and canals, only the areas less than 1 m above sea level have been considered.

‡ Fresh water areas in the south-western delta have been included under Lakes, the saline waters under Coastal Waters.

Silver eel production

Historic production

B_0 = 13.000 t (coastal + inland waters) or B_0 = 10.400 t (only inland waters)

Current production

$B_{best\ (2011)}$ = 1443 t (only inland waters)

$B_{best(2008)}$ = 2927 t (only inland waters)

Current escapement

B_{2011} = 482 t (only inland waters)

B_{2008} = 439 t (only inland waters)

Production values e.g. kg/ha

Table NL.K *Eel standing stock biomass, total effective surface area, biomass and biomass corrected for catch efficiency presented per water body type. Biomasses are provided in metric tonnes using scenario 2 (see Bierman et al. 2012 for details). For those water types that were not sampled the overall average production of 7.1 kg/ha was used, presented at the end of the table. Data from Bierman et al. (2012).*

Water Type	Biomass (kg/ha)	Total Area (ha)	Biomass (tonnes)	Biomass, efficiency corrected (tonnes)
M10	6.9	979.1	6.76	33.80
M14	10.2	18848.2	193.04	965.19
M1a	1.6	132.3	0.21	1.06
M2	5.3	8.8	0.05	0.23
M20	11.9	2255.1	26.78	133.89
M23	0.0	48.9	0.00	0.00
M27	7.3	11444.9	83.16	415.81
M3	4.8	2089.3	9.99	49.97
M6a	5.3	357.8	1.89	9.43
M6b	11.8	1037.0	12.26	61.32
M7b	7.0	1866.4	13.02	65.10
M8	0.9	647.9	0.58	2.89
R12	3.0	47.2	0.14	0.70
R14	0.0	11.5	0.00	0.00
R18	8.7	38.0	0.33	1.66
R4	2.0	73.0	0.15	0.74
R5	3.9	892.2	3.45	17.24
R6	7.9	1804.3	14.32	71.60
R7	39.3	1151.7	45.28	226.40
R8	3.9	12.2	0.05	0.24
M1b	7.1	0.1	0.00	0.00
M30	7.1	1188.5	8.42	42.09
M7a	7.1	7.7	0.05	0.27
R13	7.1	4.4	0.03	0.16
R15	7.1	22.0	0.16	0.78
R17	7.1	7.3	0.05	0.26
Subtotal		44975.9		2100.82
Ditches	2.0	33000	66	330
TOTAL		77975.9		2430.82

Table NL.L *Silver eel standing stock biomass, total effective surface area, biomass and biomass corrected for catch efficiency presented per water body type. Biomasses are provided in metric tonnes, using scenario 2 (see Bierman et al. 2012 for details). For those water types that were not sampled the overall average production of 1.3 kg/ha was used, presented at the end of the table. Data from Bierman et al. (2012).*

Water Type	Biomass (kg/ha)	Total Area (ha)	Biomass (tonnes)	Biomass, efficiency Corrected (tonnes)
M10	1.1	979.1	1.09	5.44
M14	1.4	18848.2	26.38	131.90
M1a	0.5	132.3	0.07	0.35
M2	1.2	8.8	0.01	0.05
M20	2.1	2255.1	4.81	24.06
M23	0.0	48.9	0.00	0.00
M27	1.2	11444.9	13.19	65.95
M3	1.1	2089.3	2.20	11.01
M6a	1.1	357.8	0.39	1.93
M6b	1.2	1037.0	1.22	6.12
M7b	0.8	1866.4	1.46	7.32
M8	0.4	647.9	0.24	1.22
R12	0.7	47.2	0.03	0.17
R14	0.0	11.5	0.00	0.00
R18	2.4	38.0	0.09	0.46
R4	0.5	73.0	0.03	0.17
R5	0.8	892.2	0.73	3.67
R6	1.2	1804.3	2.22	11.11
R7	7.6	1151.7	8.77	43.83
R8	1.2	12.2	0.01	0.07
M1b	1.3	0.1	0.00	0.00
M30	1.3	1188.5	1.57	7.85
M7a	1.3	7.7	0.01	0.05
R13	1.3	4.4	0.01	0.03
R15	1.3	22.0	0.03	0.15
R17	1.3	7.3	0.01	0.05
Subtotal		44975.9		322.96
Ditches		33000		49.5
TOTAL		77975.9		342.76

Impacts

Table NL.M *Overview of eel stock indicators in 2011.*

	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.

Barrier mortality of silver eel during migration is estimated at 11% of the total amount of silver eel that start their migration (total silver eel biomass – silver eel catch = migrating biomass silver eel).

Stocking requirement eels <20 cm

The Dutch EMP mentions a budget of ~300 k€ annually for a four year period (2009-2013), but additional budget may become available from private sources. It is unclear what quantities of eel will be purchasable for this budget, while a turbulent price development is expected, because of the implementation of CITES restrictions and the impact of restocking programmes on the glass eel market.

Summary data on glass eel

Table NL.N *Overview usage of glass eel.*

KG	2012	2011	2010	2009
Caught in commercial fishery	0	0	0	0
Used in stocking	766*	244	904	100
Used in aquaculture for consumption	6775	6750	?	?
Consumed direct	0	0	0	0
Mortalities	?	?	?	?

*not all translocated glass eel is stocked for recovery purposes

Data quality issues

2.14 Sampling intensity and precision

Nothing new to report, see Country Report WGEEL 2010.

2.15 Standardisation and harmonisation of methodology

2.15.1 Survey techniques

Glass Eel Monitoring

Gear	Location	Frequency	Time	Period
liftnet (1x1m; mesh 1x1mm)	Den Oever	daily	5 hauls every 2 hours between 22:00-5:00	~Mar-May
	10 other locations along the coast	weekly	2 hauls at night time	

Passive Monitoring Program: Main Rivers and Lake IJsselmeer

Gear	Location	Frequency	Period
Summer fykes (4) (stretched mesh 18-20mm) Fykes (4) (stretched mesh 18-20mm)	34 locations in main rivers, estuaries and lakes	continuous	~May-Sep

Due to closure of the eel fishery in polluted areas, this program which started in the 1990s has been interrupted. Almost two thirds of the sampling station ate located in the polluted areas and sampling ceased on 1 April 2011. A alternative program is currently being developed and will hopefully start in 2012.

Active Monitoring Program: Main Rivers

Gear	Location	Frequency	Period
bottom trawl (channel; 3m beam; 15mm stretched mesh)	~50 locations in main rivers	10 min trawl, ~1000m transect	~May-Sep
Electrofishing (shore area)		20 min, 600m transect	

.

2.15.2 Sampling commercial catches

Area	**No. eels for Length-frequency**	**Sampling frequency**	**Locations**	**Biology (sex, life stage, parasites)**	**Period**
Grevelingen	150-200 eels per sample	twice	2	2 eels per 10 cm size class	Apr-Aug
Friesland	150-200 eels per sample	twice	4	2 eels per 10 cm size class	Apr-Aug
Hollands Noorderkwartier	150-200 eels per sample	twice	4	2 eels per 10 cm size class	Apr-Aug
Amsterdam Rijnkanaal	150-200 eels per sample	twice	1	2 eels per 10 cm size class	Apr-Aug
Brabantse Delta	150-200 eels per sample	twice	1	2 eels per 10 cm size class	Apr-Aug
Hunze en Aa's	150-200 eels per sample	twice	1	2 eels per 10 cm size class	Apr-Aug
Stichtse Rijn landen	150-200 eels per sample	twice	1	2 eels per 10 cm size class	Apr-Aug
Veluwe Randmeren	150-200 eels per sample	twice	1	2 eels per 10 cm size class	Apr-Aug
Veerse Meer	150-200 eels per sample	twice	1	2 eels per 10 cm size class	Apr-Aug
Zuiderzeeland	150-200 eels per sample	twice	1	2 eels per 10 cm size class	Apr-Aug
Lake IJsselmeer	150-200 eels per sample	twice	16 (samples collected for each fishing gear: summer fyke, fyke, eelbox, long line)	2 eels per 10 cm size class	Apr-Aug
Lake Markermeer	150-200 eels per sample	twice	16 (samples collected for each fishing gear: summer fyke, fyke, eelbox, long line)	2 eels per 10 cm size class	Apr-Aug

Sampling

Nothing to report.

Age analysis

Since 2010 age readings were obtained annually of ~150 otoliths, which were collected from eels in different areas of the Netherlands. The number of annuli were counted to determine the age of individuals ("crack and burn" method). Furthermore distances between consecutive annuli were measured using image analysis software to determine individual growth curves.

Life stages

Life stages (yellow, silvering, silver) are visually determined based on colouration of body and fins and eye diameter. Criteria for life stages are at present not formally described.

Sex determinations

Sex is determined by macroscopic examination of the gonads.

2.16 Overview, conclusions and recommendations

During the development of the current models for the evaluation of the eel management plan in the Netherlands, the main weaknesses of the current methodology surfaced quickly. Here we list the main recommendations to improve the quality of the assessment before the next evaluation in 2015.

Dynamic Population Model

Key biological parameters: improve the quality of the following key biological parameters

Sex-ratio of cohorts: estimates could be improved by using eels smaller than 30 cm. These eels could be obtained during the WFD fish sampling.

Growth rate: estimates could be improved by including eels smaller than 30 cm. These eels could be obtained during WFD fish sampling. Population models could be improved by including variation in growth curves between individuals and locations.

Maturation-at-age: estimates of the silvering ogive for a given area could be improved by using data collected year round. Furthermore, it is recommended to record the stage of the eel (yellow/silver) during research surveys (e.g. IJsselmeer electro-trawl survey). Quantitative data on maturity stage should be collected such as eye diameter, rather than a purely visual (informal) assessment.
Anthropogenic mortalities: quantify sources of anthropogenic mortalities that are excluded from the current assessments; 1) catch-&-release mortality of recreational fisheries, 2) yellow eel mortality pumping stations and hydropower plants.

Static Spatial Model

WFD survey data: improve the accessibility of WFD fish survey data of regionally managed waters by establishing a central data base for The Netherlands, and ensure that the data is properly checked to ensure the quality of data.

Catch efficiency: conduct experiments to determine efficiencies of electrofishing for eel in different WFD water types in both nationally and regionally managed waters.

Spatial distribution: conduct experiments to determine the spatial distribution of eel in wide rivers and lakes in both nationally and regionally managed waters.

Ditches: conduct elecrofishing surveys for eel in ditches to supplement the existing WFD eel survey data in regionally managed waters

Habitat: correct eel densities for habitat in nationally and regionally managed waters

Electro-beam trawl: develop an electro-beam trawl to provide reliable estimates of eel (>30 cm) densities in large lakes and wide rivers.

Silver Eel Migration Model

Migration routes: finalise the GIS model (Appendix A in Bierman et. al. 2012) to improve the estimate of silver eel mortality during migration. When this proves difficult or too expensive, an alternative is to further refine the simpler model based on hiërarchies of water bodies (Chapter 6 in Bierman et. al. 2012) by creating such a model for various spatially separate parts. For example, such a simple model could be constructed for various water boards. The proportions of silver eels choosing different routes could be set equal to water discharge levels. It is not clear which of the two methods (GIS model, or further refinement of the 'simple' model) would lead to the best results or would be most cost-effective to get up and running. The GIS method would certainly need a lot more investment, but would be generic and work for the whole of The Netherlands and could be adapted for other species too. For the 'simple' model based on hiërarchies of water bodies, information will have to be collected from water boards which will also take a lot of time and the results will apply only to that particular water board.

Silver eels migrating downstream from Belgium and Germany: The mortality caused by hydropower stations on silver eels migrating downstream on the river Meuse from Belgium and the river Rhine from Germany ('foreign' silver eels) have not been taken into account in the estimation of LAM in this report. It is unclear at the time of the writing of this report whether these mortalities have been included in the LAM of silver eels that were produced in German and/or Belgian waters. It is recommended that come to an agreement on how these mortalities should be accounted for.

Furthermore, as many other European countries (France, UK, Ireland) are using similar spatial models to estimate yellow eel standing stock and silver eel production, close international co-operation and collaboration will enhance the quality and uniformity of these models in the years to come.

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Kwaliteitsborging

IMARES beschikt over een ISO 9001:2008 gecertificeerd kwaliteitsmanagementsysteem (certificaatnummer: 57846-2009-AQ-NLD-RvA). Dit certificaat is geldig tot 15 december 2012. De organisatie is gecertificeerd sinds 27 februari 2001. De certificering is uitgevoerd door DNV Certification B.V. Daarnaast beschikt het chemisch laboratorium van de afdeling Vis over een NEN-EN-ISO/IEC 17025:2005 accreditatie voor testlaboratoria met nummer L097. Deze accreditatie is geldig tot 27 maart 2013 en is voor het eerst verleend op 27 maart 1997; deze accreditatie is verleend door de Raad voor Accreditatie.

Verantwoording

Rapport C144/12
Projectnummer: 43.0120.9055

Dit rapport is met grote zorgvuldigheid tot stand gekomen. De wetenschappelijke kwaliteit is intern getoetst door een collega-onderzoeker en het betreffende afdelingshoofd van IMARES.

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