Report on the eel stock and eel fishery in the Netherlands in 2012.

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Rapport C048.14

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(IMARES - Institute for Marine Resources & Ecosystem Studies)

Opdrachtgever: Ministerie van EZ
Postbus 20401
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WOT-05-406-006

Publicatiedatum: 26 maart 2014

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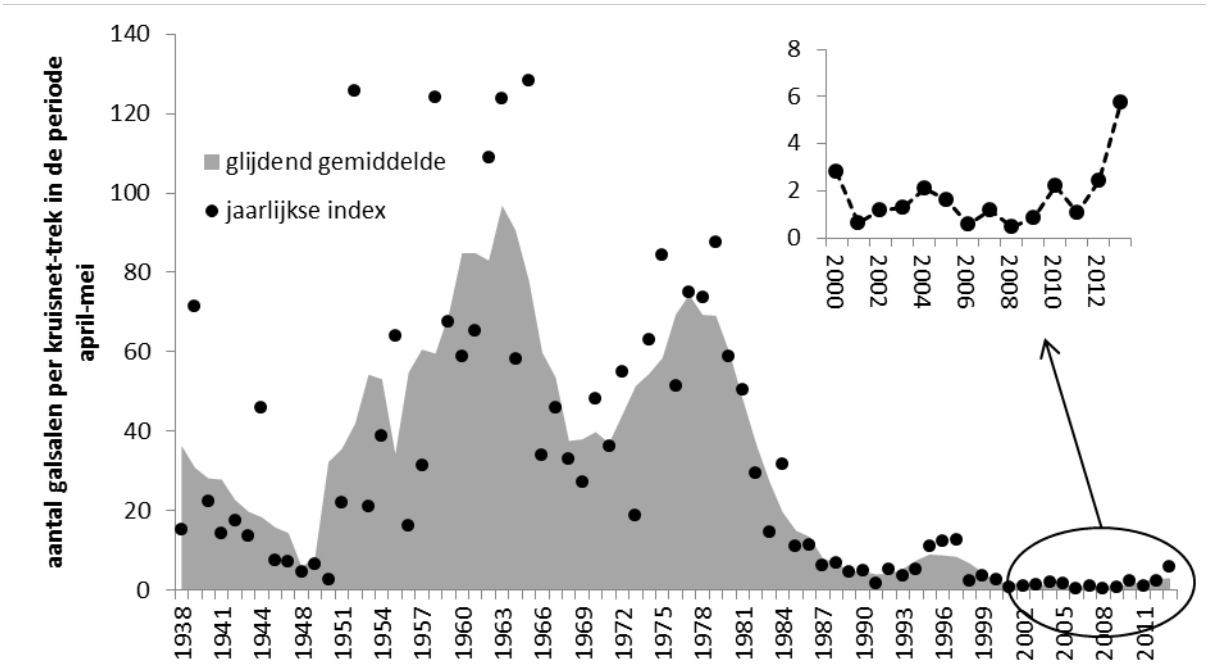
1 Nederlandse samenvatting

In de Nederlands samenvatting wordt een overzicht gepresenteerd van de belangrijkste trends in aal en de aalvisserij in 2012 zoals deze zijn gerapporteerd in het Country Report aan de International Council of Exploration of the Sea Working Group on Eel (ICES WGEEL) in september 2013. In deze samenvatting wordt een verkorte presentatie van de inhoud gegeven, met de nadruk op de meest recente gegevens. Het Engelstalige overzicht beoogt compleet en gedetailleerd te zijn, hier staat de leesbaarheid en toegankelijkheid voorop.

1.1 Trend glasaal

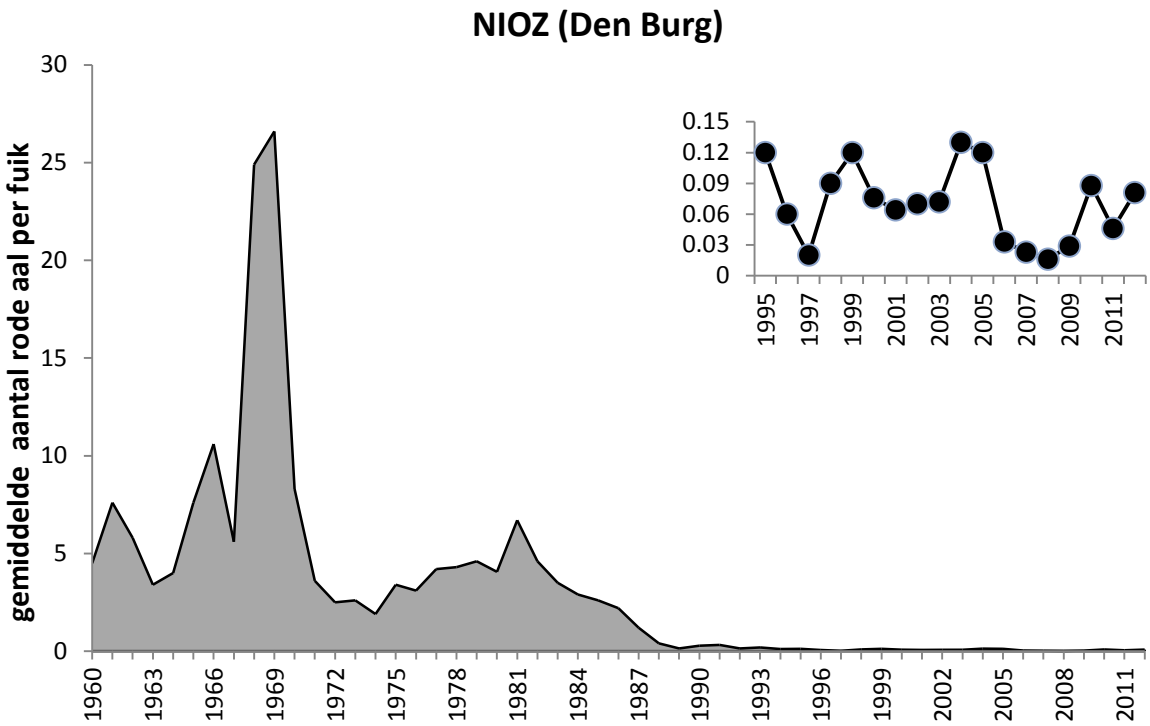
De intrek van jonge aal (glasaal) uit zee naar onze binnenwateren wordt bemonsterd op 12 plaatsen langs de kust. Bij Den Oever wordt sinds 1938 een intensieve bemonstering uitgevoerd. De resultaten van de intrekbemonstering tonen een sterke afname sinds 1980 en het glasaal niveau is de laatste 15 jaar minder dan 5 % van het vroegere niveau. Tussen 1998 en 2012 is de intrek van een vergelijkbaar laag niveau, schommelend rond de 2-3% in vergelijking tot het niveau van voor 1980. in 2013 is een verdubbeling van de index t.o.v 2012 waargenomen in Den Oever evenals op de meeste andere glasaal plaatsen langs de kust. Een stijging van de glasaalintrek is ook internationaal waargenomen. Het is echter onduidelijk of deze stijging zich de komende jaren zal voortzetten of dat slechts sprake is van een tijdelijke stijging zoals is waargenomen in de periode 1995-1997.



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

1.2 Trend (rode) aal Waddenzee

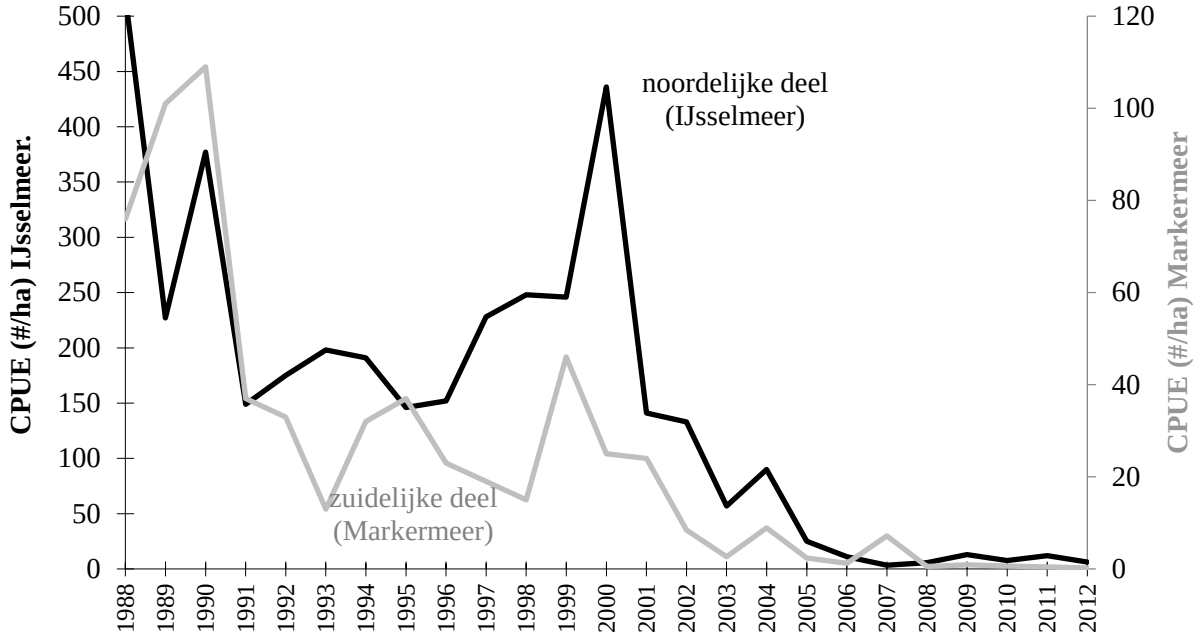
Sinds 1960 worden met een fuikbemonstering de vangsten rode aal in de haven bij het Hornt je door medewerkers van het NIOZ nauwkeurig bijgehouden. Deze unieke tijdsserie (Fig. 2) is in 2010 toegevoegd aan het jaarlijkse aalrapport. Deze nieuwe dataset toont ook een duidelijk afname van de rode aal populatie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



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

1.3 Trend (rode) aal IJsselmeer/Markermeer

De bestandsopname met de electrostramienkor toont zowel in het IJsselmeer sinds 2000 als het Markermeer sinds 1990 een scherpe afname aan (rode) aal.



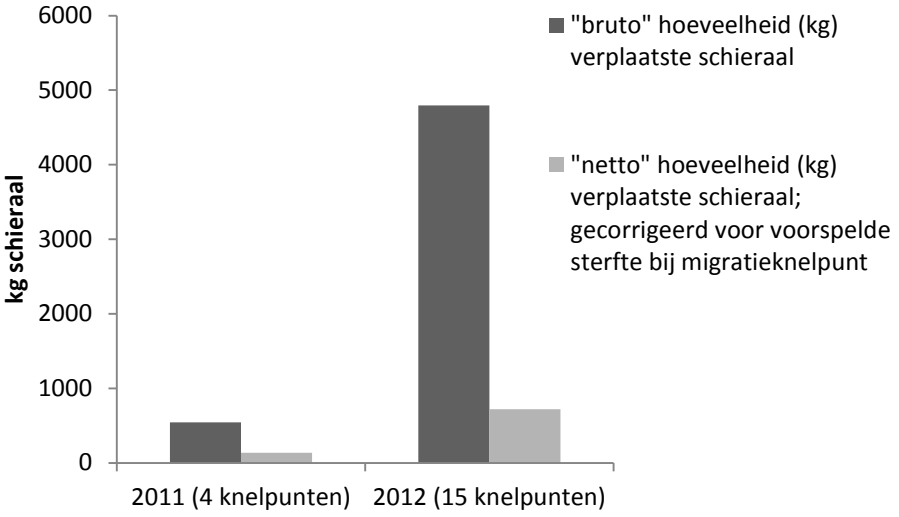
Figuur 3. *Trend in de hoeveelheid (aantallen per ha) (rode) aal in het IJsselmeer en Markermeer op basis van de vangst met de electrostramienkor*.

1.4 Trend schieraal

Schieraal over de dijk

Sinds 2011 worden bij een aantal gemalen in Zeeland, Noord-Holland en Friesland schieralen geassisteerd bij het passeren van de migratieknelpunten (DUPAN "schieraal over de dijk" initiatieven). In 2011 en 2012 werd respectievelijk "bruto" 0.5 ton en 5 ton schieraal over de geselecteerde knelpunten gezet. Echter een deel van de schieraal had volgens Winter et al (2013) mogelijk ook zonder assistentie het migratieknelpunt kunnen passeren. Gebruikmakend van de verwachte sterfte (Bierman et al. 2012; Winter et al. 2013) tijdens het passeren van de geselecteerde migratieknelpunten kan een "netto" hoeveelheid aal worden berekend. De hoeveelheid extra schieraal die met succes heeft kunnen uittrekken als gevolg van de geleverde inspanning binnen "Schieraal over de dijk" initiatieven wordt geschat op 0.1 ton in 2011 en 0.5 ton in 2012.

In 2013 is een vernieuwde lijst opgesteld van de belangrijkste migratieknelpunten voor schieraal in Nederland (Winter et al. 2013). In het najaar van 2013 is deze rapportage gebruikt om de efficiëntie van "schieraal over de dijk" initiatieven te bevorderen.



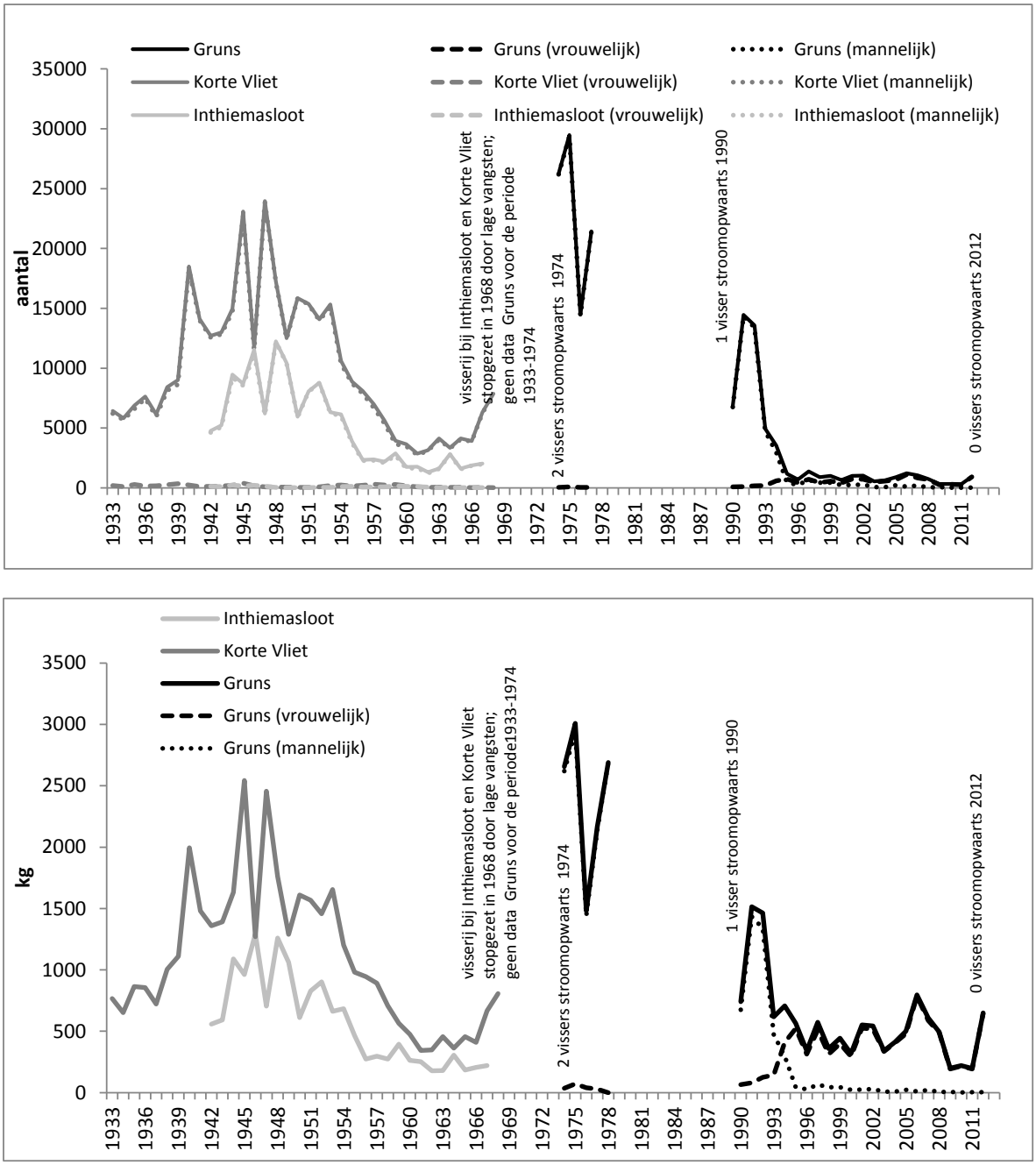
Figuur 4. *Overzicht van de "bruto" en "netto" hoeveelheden aal die in 2011 en 2012 bij diverse knelpunten "over de dijk" zijn gezet (geassisteerde migratie).*

Schieraalvangsten Friesland

In 2013 is er door de Combinatie van Beroepsvissers een nieuwe dataset beschikbaar gesteld met schieraalvangsten door beroepsvissers op drie locaties in Noord-Nederland. Op twee van de drie locaties is de afname in schieraal (aantallen en kg) al zichtbaar sinds de jaren '50. Eind jaren '60 is de visserij op beide locaties (Inthiemasloot en Korte Vliet) stopgezet door de beroepsvisser wegens een gebrek aan rendabele vangsten. Voor de derde locatie (Gruns) zijn helaas geen gegevens beschikbaar van voor 1974. Een afname van de vangsten wordt mede geïllustreerd door de afname van het aantal vissers bovenstrooms van Gruns; 2 in 1974, 1 in 1990 en 0 sinds 2012. De vangsten bij Gruns liggen de laatste 10 jaar rond 5% (in aantallen) en 20% (in kg) van het niveau in de jaren '70 (Fig. 5). Begin jaren '90 is de sexe-ratio van de gevangen schieraal bij Gruns drastisch veranderd, van bijna 100% man naar 100% vrouwelijk schieraal. Aangezien het gemiddelde gewicht van vrouwelijke schieralen (700gr) aanzienlijk hoger is dat het gemiddelde gewicht van mannelijke schieralen (100 gr), lijkt de afname van de schieraalvangsten in kg minder dramatisch.

Er is geen onbelemmerde migratie van glasaal mogelijk naar deze drie viswateren door de aanwezigheid van barrières op de migratieroute richting de opgroeigebieden. De (afname) in vangsten is dus deels te verklaren uit een verminderde (natuurlijke) intrek en een verminderde uitzet aan glasaal door de

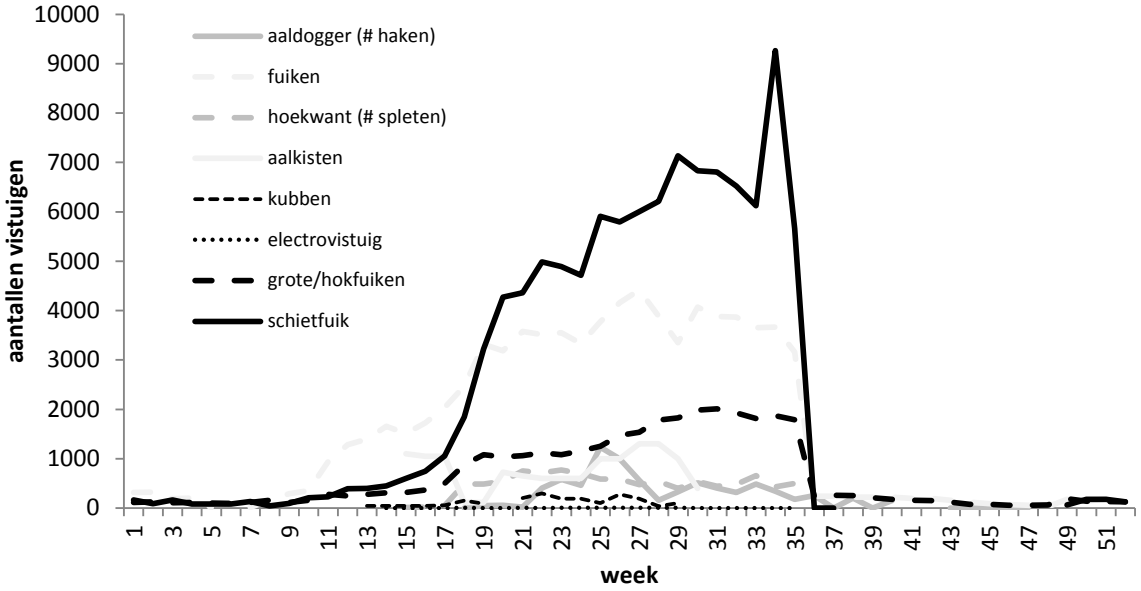
beroepsvissers. Daardoor zijn deze wateren niet ideaal om te gebruiken als indexlocatie voor schieraal. Echter de afname in de uitzet van glasaal heeft waarschijnlijk gelijke tred gehouden met de afname intrekkende glasaal in heel Europa (A. Heinen, pers. comm.). De timing van de neerwaartse patronen in vangsten en veranderingen in sexe-ratio komen echter wel overeen met de afname van glas- en rode aal in andere gebieden in Nederlands (glasaalindex, rode aal Waddenzee en IJsselmeer/Markermeer). De vangstgegevens bieden een belangrijke kijk op historische veranderingen van het aalbestand in Nederland en hopelijk zullen de komende jaren meer historische vangstgegevens beschikbaar worden gesteld.



Figuur 5. *Schieraal vangsten van beroepsvissers (mannelijk, vrouwelijk en totaal) in aantallen (bovenste grafiek) en kg (onderste grafiek) op drie locaties (polderwater) in Noord-Nederland (Bron Combinatie van Beroepsvissers).*

1.5 Trend aalvangsten beroepsvisserij

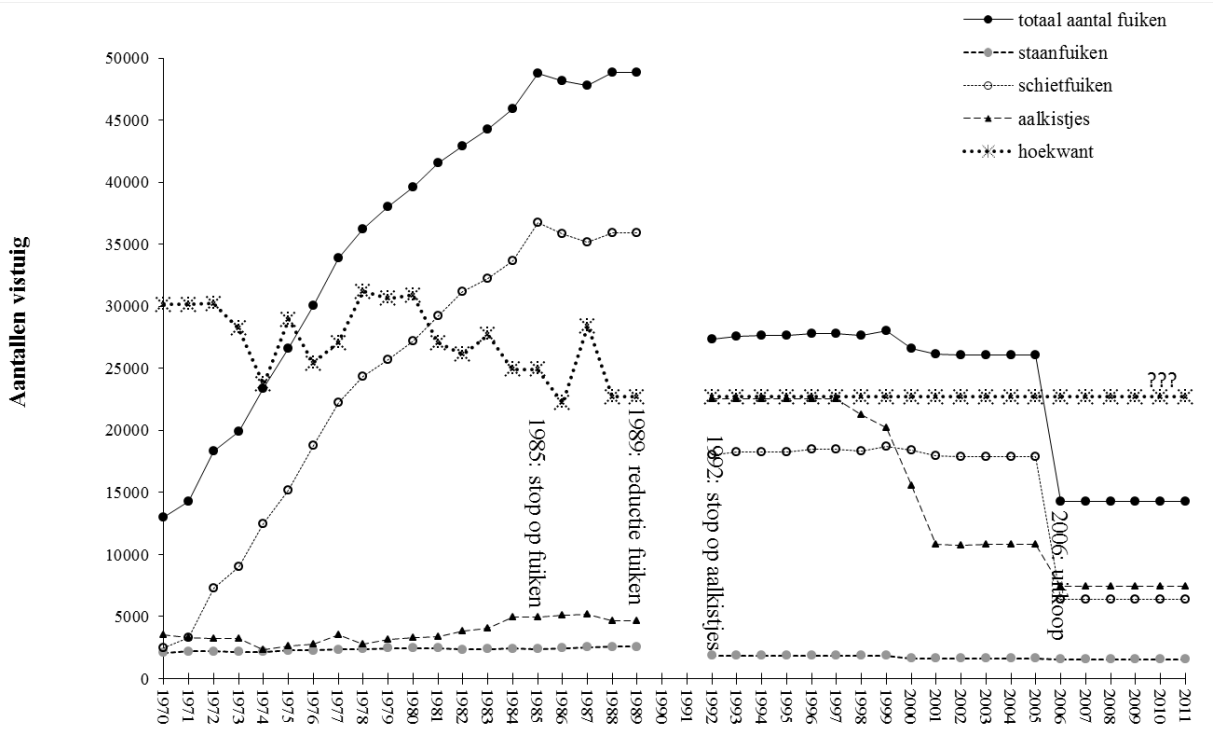
De visserij op aal in Nederland was tot voor kort nauwelijks gedocumenteerd. Invoering van de Europese Aalverordening en het Nederlandse Aal Beheersplan heeft de situatie echter snel verbeterd. De eerste stap is gezet met de invoering van de verplichte vangstregistratie voor aalvissers per 1/1/2010. Een nadeel van deze registratie was dat rode aal en schieraal vangsten gecombineerd worden geregistreerd en dat vistuig en visserijinspanning niet werden gedocumenteerd. EZ heeft per 1/1/2012 de visserijinspanning opgenomen in de verplichte digitale vangstregistratie. Een overzicht van de wekelijkse inspanning die wordt geleverd door beroepsvissers is te zien in Fig. 6.



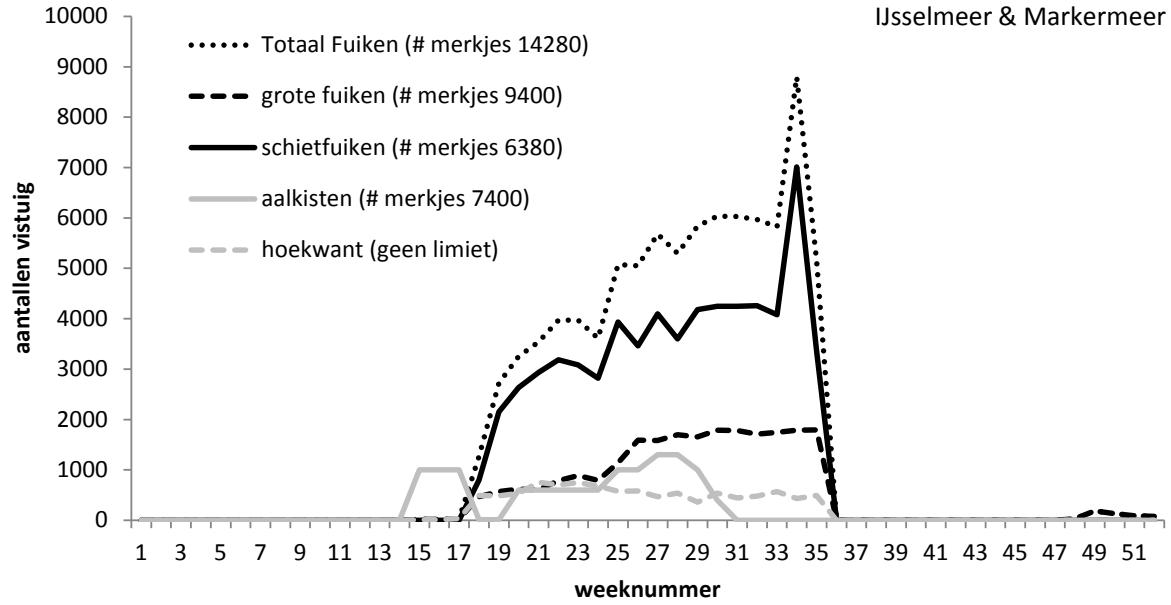
Figuur 6. *Overzicht van de wekelijkse inzet van verschillende vistuigen door beroepsvissers in 2012 (Bron: EZ*).

Op het IJsselmeer is het aantal te gebruiken vistuigen gelimiteerd door merkjes (Fig. 7), 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 staande fuiken 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. Voor de visserij met hoekwant ligt alleen het maximum aantal hoekwantvissers vast, maar omdat iedere visser zelf mag bepalen met hoeveel “spleten” (een hoekwant met 250 haken) wordt gevist is de daadwerkelijke inspanning niet duidelijk.

Voor alle tuigen geldt dat het tot 2012 onduidelijk was welk deel van de “merkjes” ook daadwerkelijk wekelijks werd ingezet door de beroepsvissers in het IJsselmeer en Markermeer. Figuur 8 laat zien dat in 2012 slechts een beperkt aantal van toegestane grote fuiken (max. ~19% in week 35) en aalkisten (max ~18% in week 28) daadwerkelijk werden ingezet in de visserij. De wekelijkse inzet van schietfuiken lag relatief hoger dan bij de aalkisten, het merendeel van het seizoen werd ~50% van de toegestane tuigen ingezet met een piek van 110% in week 34.

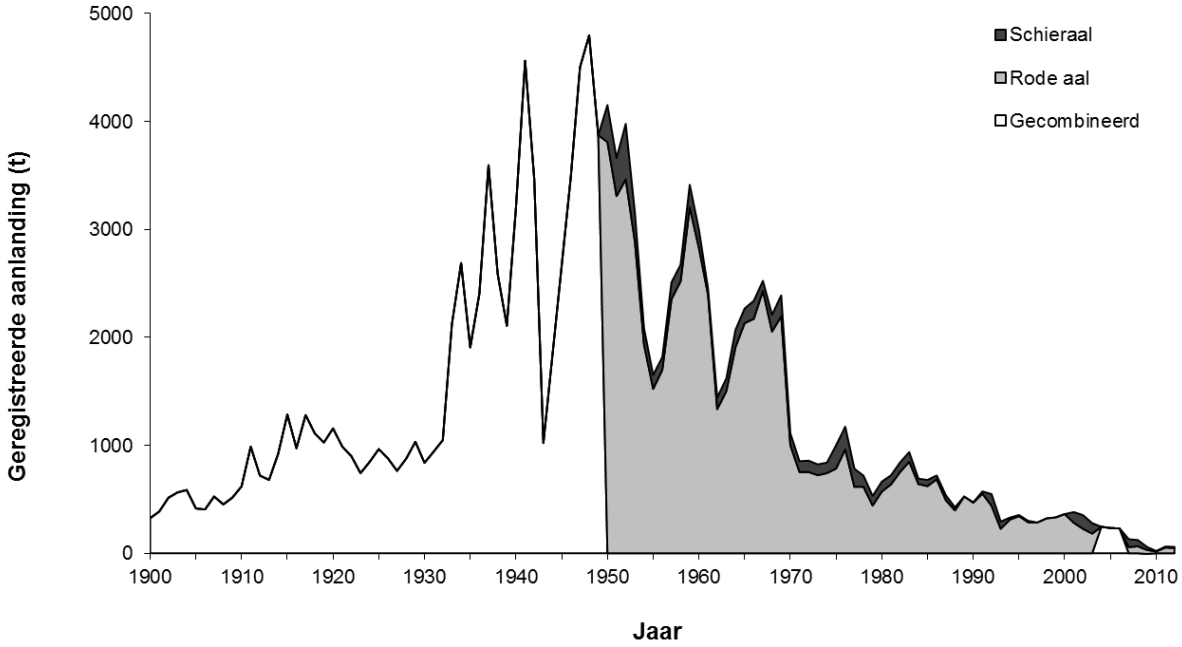


Figuur 7. *Trend in de nominale hoeveelheden vistuig binnen de aalvisserij op het IJsselmeer/Markermeer (Bron: de Leeuw et al., 2006 en PO IJsselmeer).*



Figuur 8. *Overzicht van de wekelijkse inzet van de verschillende vistuigen in het IJsselmeer/Markermeer in relatie tot hoeveelheid de hoeveelheden nominale vistuigen ("merkjes" per tuig) (Bron: EZ).*

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 stijging van 300 naar 1000 ton. Bij de afsluiting van het IJsselmeer namen de aanlandingen toe tot ca. 2500 ton, om daarna verder te stijgen tot rond 3500 ton in de jaren 1940-1955. Sinds 1950 heeft de aanvoer sterk gefluctueerd, maar is wel een gestage daling opgetreden tot minder dan 400 ton sinds 2000, en nog maar 168 ton in 2012.



Figuur 9. *Trend in de geregistreerde aanlanding van aal op alle IJsselmeerafslagen (Bron PVIS). In 2009 was 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 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 EZ (Tabel 1).

Tabel 1. *Aanlanding (ton) beroepsvisserij in Nederland (Bron: EZ).*

JAAR	
2010	452
2011	367
2012	350

Van de 452 ton die in 2010 werd gevangen kwam ongeveer 170 ton aal uit de gebieden die per 1 april 2011 zijn gesloten voor de aal- en wolhandkrabvisserij vanwege de PCB- en dioxine gehaltes (“gesloten gebieden”). De resterende 282 ton werd gevangen in de overgebleven “open gebieden”. In 2011 en 2012 is de vangst (respectievelijk 367 en 350 ton) in de “open gebieden” hoger dan in 2010 (282 ton). Door het gebrek aan een robuuste inspanningsregistratie voor 2012 is niet mogelijk om te zien of deze stijging in aanlanding veroorzaakt is door een toename aan aal of een toename in visserijinspanning.

1.6 Trend aalvangsten recreatieve visserij

In 2009 is het Recreatieve Visserij onderzoeksproject van start gegaan. In december 2009, 2011 en 2013 zijn 50.000 huishoudens benaderd tijdens de Screening Survey om vast te stellen hoeveel recreatieve vissers er zijn in Nederland (1.69 miljoen in 2009 en 1.4 miljoen in 2011, van der Hammen en de Graaf, 2013). In 2010 zijn 2000 recreatieve vissers geselecteerd om deel te nemen aan een logboekprogramma voor een periode van 12 maanden (maart 2010 – februari 2011) om inzicht te krijgen in hoeveelheden gevangen vis. De resultaten van de eerste survey laten zien dat in Nederland ongeveer 1.5 miljoen alen gevangen worden door recreatieve vissers waarvan er ongeveer 500.000 mee naar huis worden genomen (Tabel 2). Gezien het ontbreken van betrouwbare gegevens over de lengteverdeling van meegenomen alen, blijft het lastig om een schatting te maken van het gewicht aan meegenomen alen (van der Hammen & de Graaf, 2012). Voor de evaluatie van het aalbeheerplan in juli 2012 is uitgegaan van 100 ton onttrokken aal door recreatieve vissers. De hoeveelheid onttrokken aal door de recreatieve visserij kwam overeen met grofweg een kwart van de hoeveelheid aal die door de beroepsvisserij wordt onttrokken. De resultaten van het tweede logboekprogramma (maart 2012 – februari 2013) worden halverwege 2014 gerapporteerd.

***Tabel 2**. Overzicht van de aalvangsten door recreatieve vissers in de Nederlandse binnenwateren en kustwateren (van der Hammen & de Graaf 2012).*

	Aantallen			Ongecorrigeerde gewicht (kg)			Gecorrigeerde gewicht (kg)		
	zeewater	binnenwater	som	zeewater	binnenwater	som	zeewater	binnenwater	som
onttrokken	174.215	340.536	514.751	36.287	78.259	114.546	17.161	37.374	54.535
teruggezet	108.462	872.570	981.032	23.834	137.186	161.020	26.253	149.917	176.170
som	282.677	1.213.106	1.495.783	60.121	215.445	275.566	43.414	187.291	230.705
% onttrokken	62%	28%	34%	60%	36%	42%	40%	20%	24%

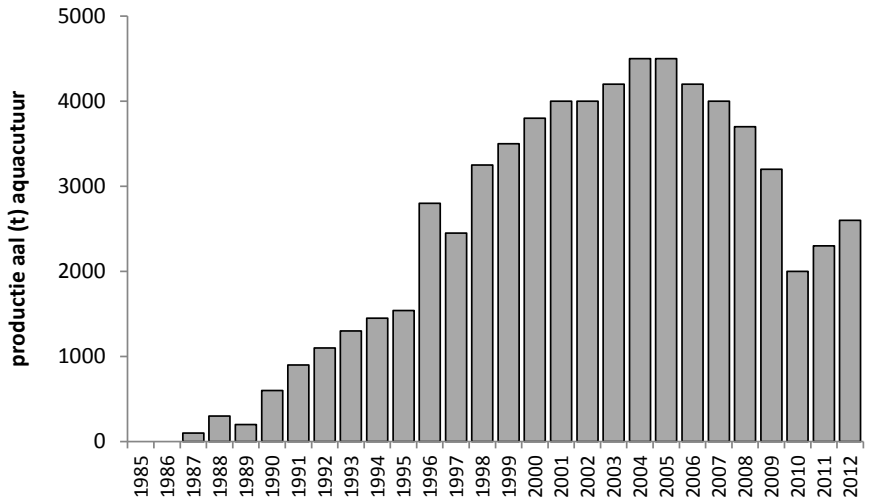
1.7 Trend aquacultuur

De grootste hoeveelheid aal (~90%) in Nederland voor consumptie wordt geproduceerd in intensieve kwekerijen. Hierin wordt in het wild gevangen, geïmporteerde glasaal uit voornamelijk Frankrijk en Spanje (Tabel 3), opgekweekt onder gecontroleerde omstandigheden. De totale productie sinds de start in 1985 is gestegen tot meer dan 4000 ton in 2005. Tussen 2005 en 2010 is de productie gedaald tot 2000 ton maar de laatste jaren neemt de productie weer toe. In 2011 is ongeveer 2600 ton aal geproduceerd.

Kunstmatige voortplanting van de aal voor commerciële doeleinden is tot op heden niet mogelijk.

***Tabel 3.** Herkomst van de geïmporteerde, wild gevangen glasaal in de Nederlandse aquacultuur sector (Bron: DUPAN).*

SEIZOEN	FRANKRIJK	SPANJE	ENGELAND	TOTAL (KG)
2010/2011	4725	1890	135	6750
2011/2012	5325	1350	100	6775
2012/2013	5500	650	550	6700



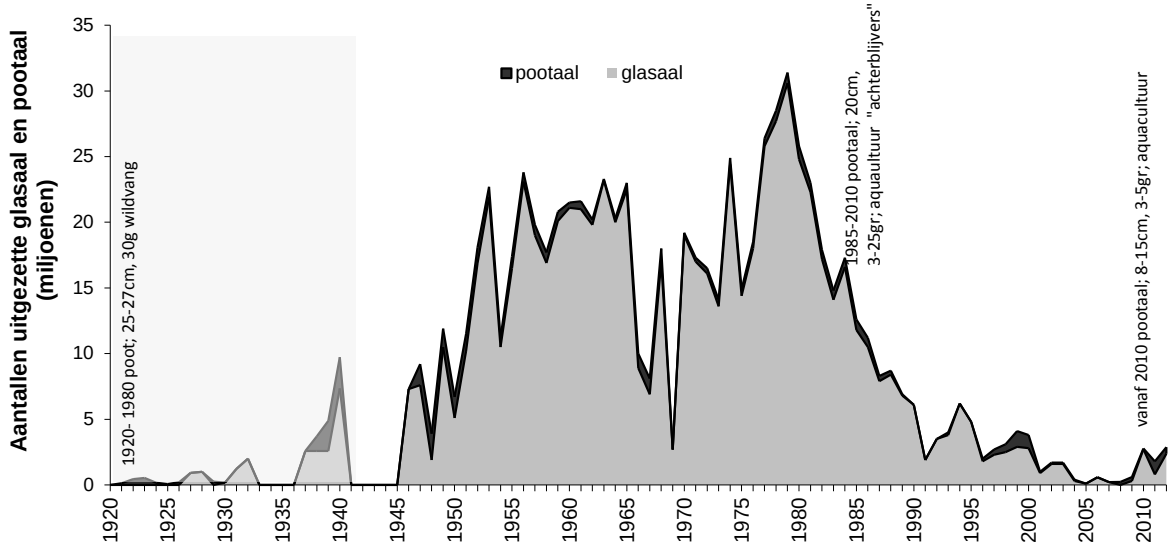
Figuur 10. *Trend in de hoeveelheden aal die worden geproduceerd door de aquacultuur sector*.

1.8 Trend uitzet glasaal en pootaal

Sinds de jaren ‘20 is er glasaal uit de omgeving van de Golf van Biskaje aangekocht en uitgezet in de Nederlandse binnenwateren (Fig. 11). De uitzet van glasaal heeft waarschijnlijk min of meer gelijke tred gehouden met de natuurlijke intrek, zoals te zien is aan de scherpe daling in de jaren ’80. In 2009 werd nog maar ca. 0.3 miljoen glasalen uitgezet. Daarnaast is jonge rode aal (pootaal) uitgezet. Deze pootaal werd tot begin jaren ’80 voornamelijk gevangen in de Nederlandse kustzone en/of de benedenloop van de rivieren. In recente jaren heeft de uitzet van gekweekte aal (opgekweekt uit glasaal van Frankrijk en Engeland) de overhand.
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 2013 is naar schatting 10% van alle door Nederland geïmporteerde glasaal uitgezet in binnenwateren (Tabel 4 en 5). Tussen 2010 en 2013 heeft de Combinatie van Beroepsvissers de uitzet van de door EZ aangekochte glasaal gecoördineerd ter bevordering van het herstel van de aalstand. Net als in voorgaande jaren is de door EZ aangekochte glasaal in 2013 vooral uitgezet in gebieden waar weliswaar vrije uittrek mogelijkheden zijn voor schieraal maar waar ook de beroepsvisserij actief is. Er is (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 advies van ICES uit 2010 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 het 2013 advies van ICES staat ten aanzien van het uitzetten van glasaal: “*Internationally coordinated research is required to judge the net benefit of restocking for the overall population, including carrying capacity estimates of glass eel source estuaries as well as detailed mortality estimates at each step of the stocking process.”*Met andere woorden; het uitzetten van glasaal ten behoeve van het herstel van de aalstand heeft alleen nut als de productie schieraal per glasaal hoger is in het gebied van uitzet dan in het gebied van herkomst. Het is op dit moment onduidelijk of het uitzetten van glasaal in Nederland een netto positief effect heeft op de aalstand.

Het merken van alle uitgezette glasaal, zoals in sommige andere landen gebruikelijk is, is een goede manier om beter inzicht te krijgen in het lot van de uitgezette glasaal en om mogelijk beter inzicht te krijgen in de vraag of de huidige uitzet van glasaal een netto positieve of negatieve bijdrage levert aan het herstel van de Europese aalstand. Daarnaast geeft het mogelijk een indruk van de natuurlijke intrek van glasaal.



Figuur 11. *Overzicht van de Nederlandse uitzet van glasaal en pootaal in miljoenen stuks. De gegevens van voor 1940 zijn slechts een indicatie. Het gewicht van de gemiddelde uitgezette pootaal is afgenomen van 30 gram (1920), 15 gram (1985) tot 5 gram (2010).*

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

Datum	Locatie	Type	Herkomst	Quarantaine	kg	# / kg	#
4/18/2013	Gooi en Eem meer en Veluwe Randmeer	glasaal	*Anguilla anguilla* (UK) river Parrot	yes	630	2,906	1,830,780
			TOTAL		*630*		*1,830,780*
5/11/2013	Veluwe Randmeren	pootaal	*Anguilla anguilla* (from French glass eel) Nijvis	?	1,170	340	397,959
5/17/2013	Monding van de Overijsselse Vecht	pootaal	*Anguilla anguilla* (from French glass eel) Nijvis	?	350	287	100,575
			TOTAL		*1520*		*498,534*

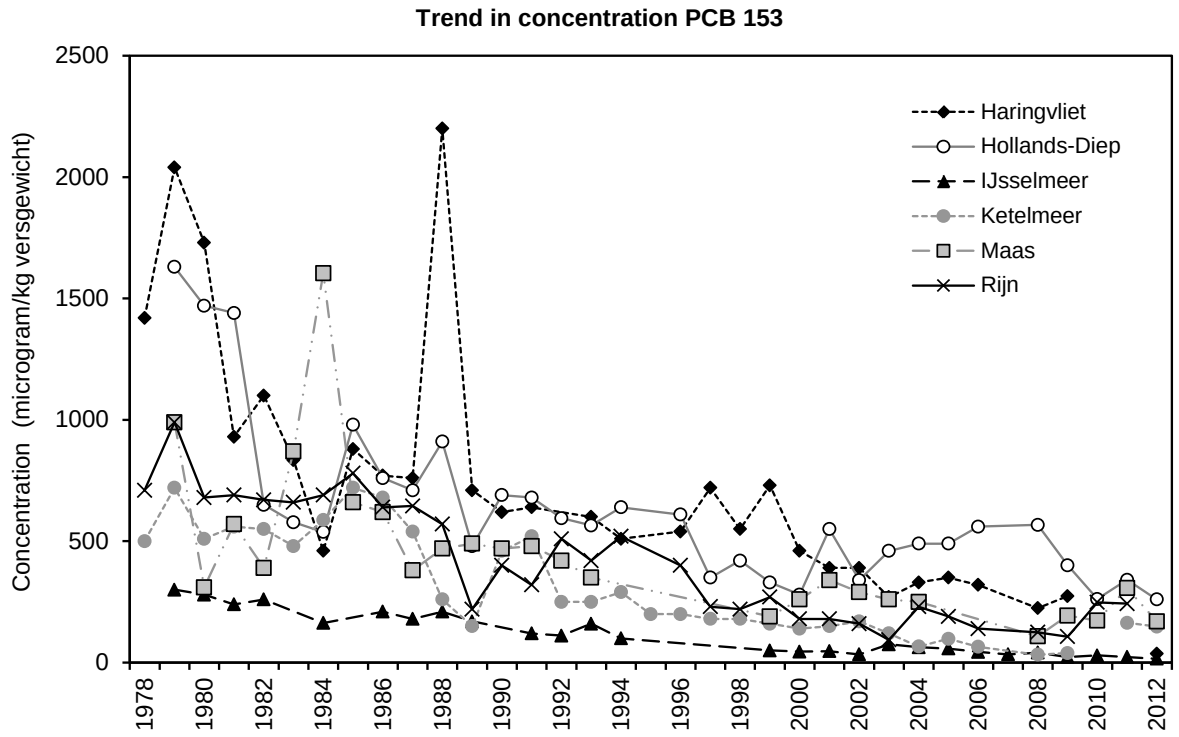
Tabel 5. *Overzicht van de in 2011 in Nederland uitgezette glasaal en pootaal (Bron CvB en DUPAN).*

	2013	2012	2011	2010	2009
Uitzet in Nederlandse wateren*	630	766	244	904	100
Aquacultuur (consumptie)	6700	6775	6750	?	?
Direct geconsumeerd	0	0	0	0	0
Sterfte (transport)	?	?	?	?	?

*niet alle glasaal wordt uitgezet voor herstel van de aalpopulatie

1.9 Trend vervuiling

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 PCB's en dioxines in aal waargenomen. In Figuur 12 wordt een enkel voorbeeld (PCB 153) getoond; PCB 153 is een goede indicator voor de andere PCB's.



Figuur 12. *Trend in PCB 153 in rode aal (elk punt is het gemiddelde van 25 alen van 20 tot 30 cm [of minder alen dan 25 als er minder aal beschikbaar was op die locatie]*).

2 Report on the eel stock and fishery in Netherlands 2012-2013

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Reporting Period: This report was completed in August 2013, and contains data up to 2012 and glass eel recruitment data for 2013.

Contributors to the report: Contributions: The following persons and institutions provided information for this report: Ben Griffioen (glass eel index; silver eel index); Arjan Heinen (Combinatie van Beroepsvissers; stocking data; silver eel fisheries 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).

Introduction:

2.1 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 involved 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.

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).

2.2 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 Ministry of Economic Affairs. There are 70 fishing licenses, owned by ca. 30 companies. The total number of gears allowed in 2012 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). 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 (RBD), 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.

3 Time-series data

3.1 Recruitment-series and associated effort

3.1.1 *Glass eel*

3.1.2 *Commercial*

Glass eel fisheries is forbidden, NO AVAILABLE DATA

3.1.3 *Recreational*

Glass eel fisheries is forbidden, NO AVAILABLE DATA

3.1.4 *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), 2013 recruitment roughly "doubled" and was at the highest level since the mid-'90s. 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, between 18:00-8:00 and only years with >5 hauls are included.

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

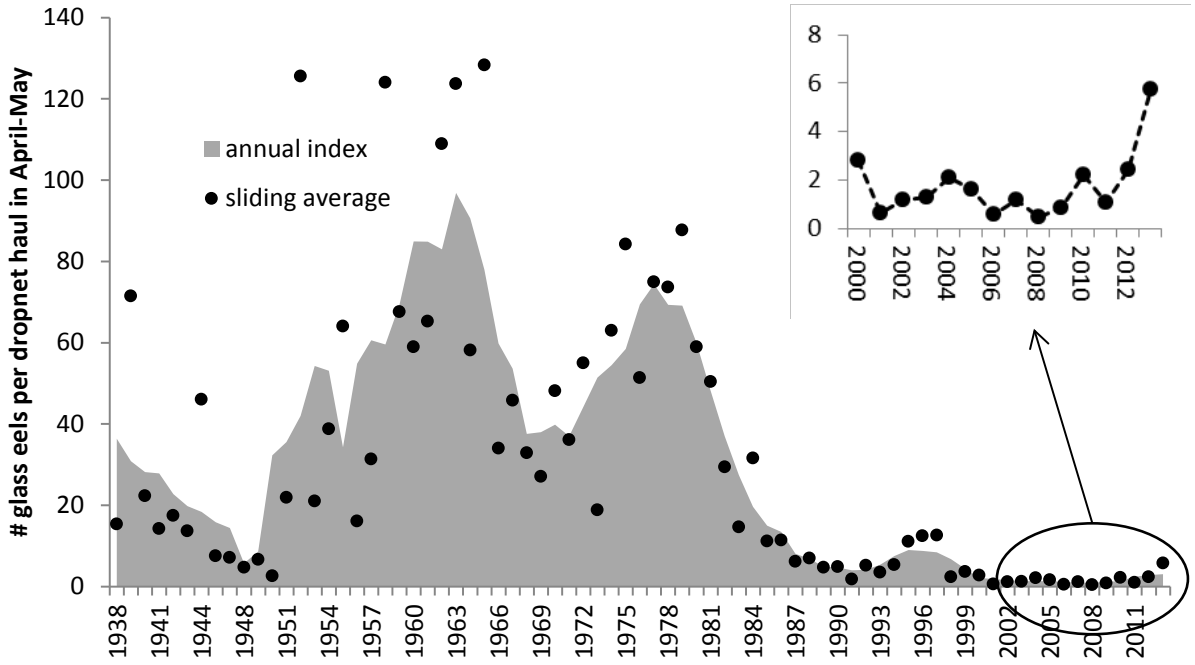


Fig NL.3. *Trend indices (mean number per haul in April and May) of glass eel recruitment at Den Oever.*

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	1930	1940	1950	1960	1970	1980	1990	2000	2010
YEAR									
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	5.8
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 between 18:00 and 8:00 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												
1970							28.0					
1971												
1972												
1973												
1974												
1975												
1976										15.4		
1977												
1978												
1979										100.4		
1980												
1981										75.9		
1982										21.6		
1983										15.8		
1984										9.6		
1985							0.6			25.2		
1986							3.3			1.3		
1987							7.7					
1988					13.8					1.0		
1989					4.4					14.3		
1990	0.3		0.3		10.9					6.0		
1991	0.0		0.2	1.3	3.1	5.1				6.6		0.5
1992	0.0	6.6	0.4		16.9	9.1			16.7	12.1		0.6
1993	0.0	22.7	0.4		10.1	13.5				33.2		1.2
1994	0.0	14.2	0.5		4.0				16.0	31.0		2.8
1995	0.5		0.4		3.3	29.7	2.0	34.7	6.6	16.9		3.7
1996	1.3	22	0.7		0.5	25.3		11.0	34.2	49.4	27.5	7.7
1997			0.6		2.8	12.9		11.4	11.2	27.8	30.0	15.6
1998	0.7		0.6		1.0	38.8	2.0	6.5	18.3	14.4	21.8	1.4
1999	1.4		0.5		1.2	140.1		7.2		31.7	12	10.2
2000	0.9	10.15	1.0	3.8	7.1	11.6		5.0		7.2	38.8	8.7
2001	0.4		0.1		1.0			1.7		2.4	39.7	1.1
2002		1.9	0.2		4.2	13.2	0.1	1.4	3.2	5.5	36.4	1.6
2003		7.5	0.1		0.3	12.7		4.8		1.7	23.6	0.8
2004	0.0	16.4**	0.1		0.3	4.5			14.3**	2.3	28.1	1.9
2005	0.0	15.3	0.6		0.2	5.6				1.4	21.1	1.8
2006	0.0	12.4	0.2		0.0	1.4		0.3	0.6	1.7	8.3	1.3
2007*	0.0	43.9	0.1	0.4	0.1	27.9	0.1		1.7	1.0	21.7	4.0
2008	0.0	13.2	0.0	2.5	0.0	4.5	0.1	0.8	1.1	2.8	15.6	1.3
2009	0.0	9.1	0.0	1.3	0.5	3.5	0.1		0.7	0.6	13.6	1.2

2010	28.4	0.0	1.7	0.2		0.0	1.2	1.0	1.1	13.0	1.2
2011	39.2	0.1	1.3	0.3		0.0		3.1	1.4	11.6	1.4
2012	25.8	0.2	0.8	0.1	1.6	0.2		1.1	2.9	27.6	1.3
2013	**73.8**	**0.0**	**16.7**	**0.2**	**1.6**	**0.0**		**5.2**	**9.1**	**60.5**	**1.9**

3.1.5 *Yellow eel recruitment*

3.1.6 *Commercial*

NO AVAILABLE DATA.

3.1.6.1 Recreational

NO AVAILABLE DATA.

3.1.6.2 Fishery independent

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.

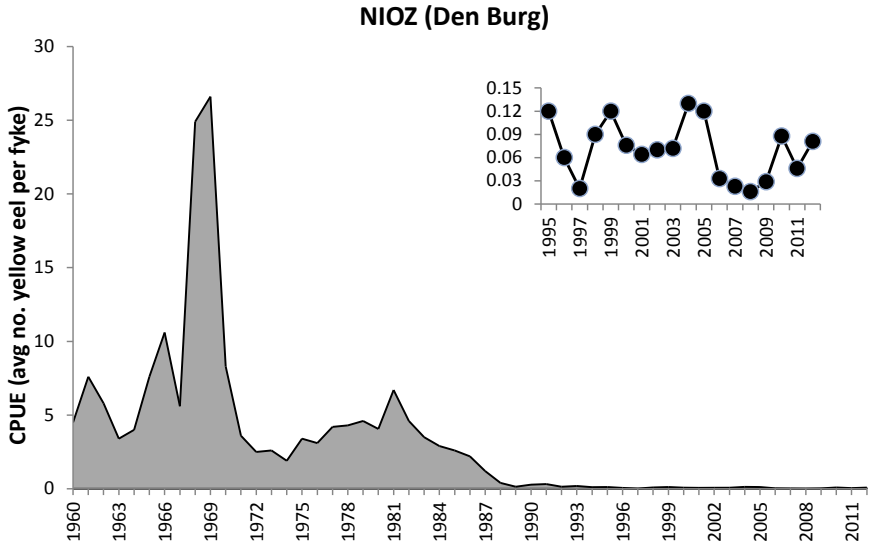


Fig. NL.4. *Time series of the mean catch per fyke (numbers) of yellow eel at NIOZ (data NIOZ and van der Meer et al., 2011.).*

3.2 Yellow eel landings

3.2.1 *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. for details. An obligatory catch registration system was introduced in the Netherlands in January 2010 by the Ministry of Economic Affairs. 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.

3.2.2 *Recreational*

NO AVAILABLE DATA.

3.3 Silver eel landings

3.3.1 *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.for details. An obligatory catch registration system was introduced in the Netherlands in January 2010 by the Ministry of Economic Affairs. 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.

3.3.2 *Recreational*

NO AVAILABLE DATA.

3.4 Aquaculture production

3.4.1 *Seed supply*

Table NL.C. *Origin of glass eel used for aquaculture in the Netherlands in 2013 (Source DUPAN).*

SEASON	FRANCE	SPAIN	ENGLAND	TOTAL (KG)
2010/2011	4725	1890	135	6750
2011/2012	5325	1350	100	6775
2012/2013	5500	650	550	6700

3.4.2 *Production*

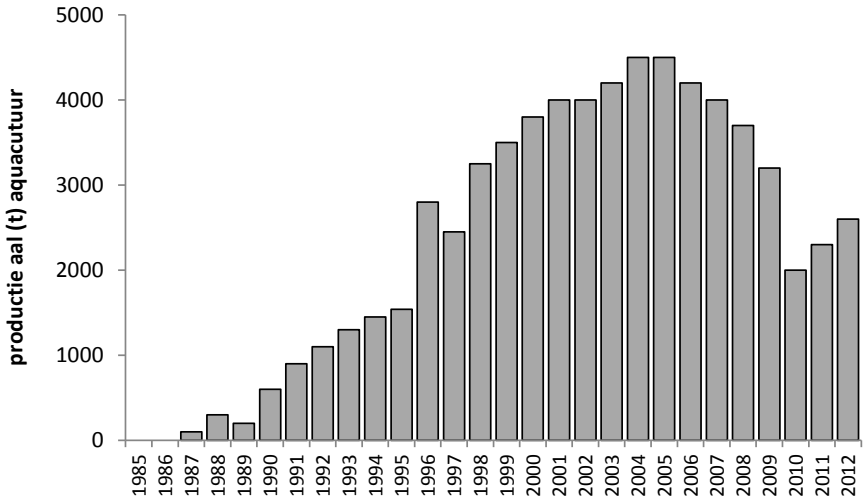


Fig. NL.5 *Trend in aquaculture production for consumption in the Netherlands (Source DUPAN).*

3.5 Stocking

3.5.1 *Amount stocked*

Table NL.D *Overview of glass eel and young yellow eel stocked in the Netherlands in 2013 (Source CvB, DUPAN).*

Date	Stocking Location	Type	Origin	Quarantined	kg	# / kg	#
4/18/2013	Gooi en Eem meer en Veluwe Randmeer	Glass eel	*Anguilla anguilla* (UK) river Parrot	yes	630	2,906	1,830,780
			TOTAL		***630***		**1,830,780**
5/11/2013	Veluwe Randmeren	Young yellow eel	*Anguilla anguilla* (from French glass eel) Nijvis	?	1,170	340	397,959
5/17/2013	Monding van de Overijsselse Vecht	Young yellow eel	*Anguilla anguilla* (from French glass eel) Nijvis	?	350	287	100,575
			TOTAL		***1520***		***498,534***

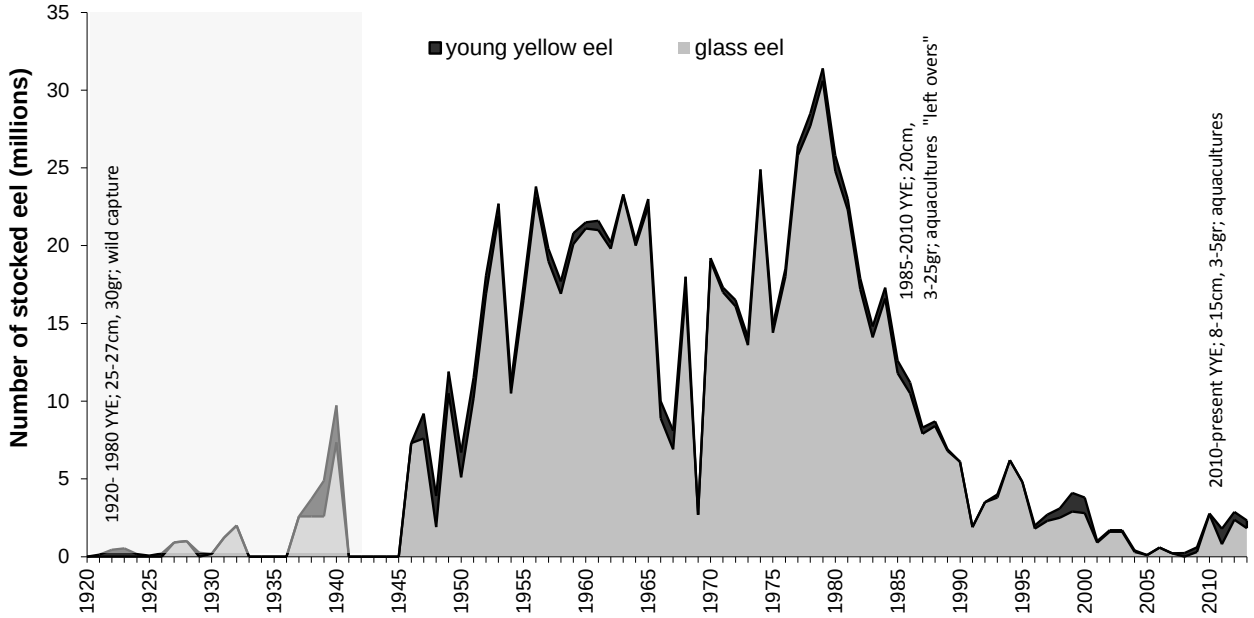


Fig. NL. 6. *Overview of glass eel and young yellow eel stocking in the Netherlands. Note that the average weight of stocked young yellow eel decreased from ~30g to ~3 g between 1920 and 2010.*

3.5.2 *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.

3.5.3 *Reconstructed Time Series on Stocking*

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.

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 was until recently 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). However, since 1/1/2012 eel fishers are obliged to record the type of gear and number of gear used as part of the national catch registration system that was introduced by Ministry of Economic Affairs on 1/1/2010 (see Chapter 5).

5 Fishing effort:

For most of the country, fishing capacity was until 2012 unknown. In areas where fishing capacity was known (IJsselmeer/Markermeer, Fig NL. 7), no record is kept of the actual usage of fishing gears. Consequently, no information was 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.

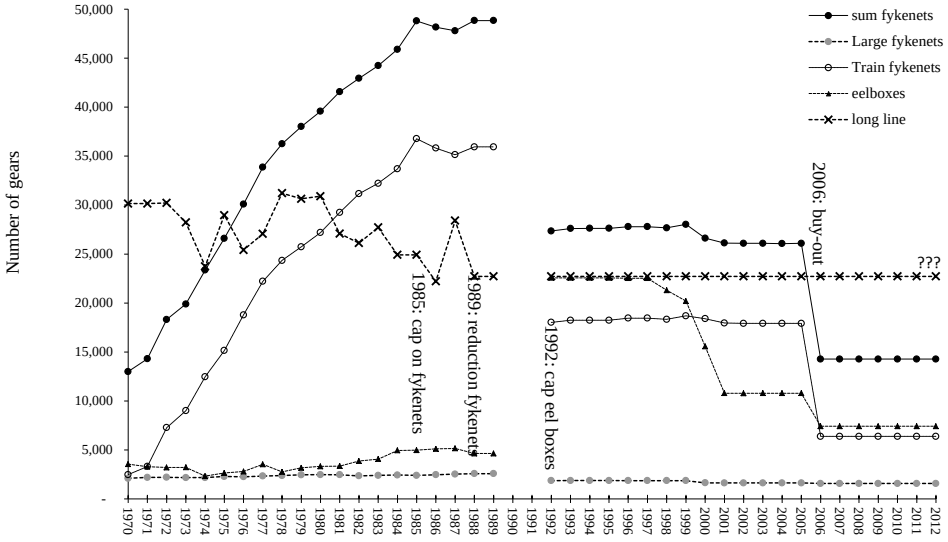


Fig. NL.7 *Trends in the nominal number of fishing gear employed in the eel fishery on Lake IJsselmeer/Markermeer. Information before 1989 is based on a voluntary inquiry in 1989 (Dekker 1991); after 1992, the licensed number of gear is shown. Note that long line fishery is only restricted by the number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

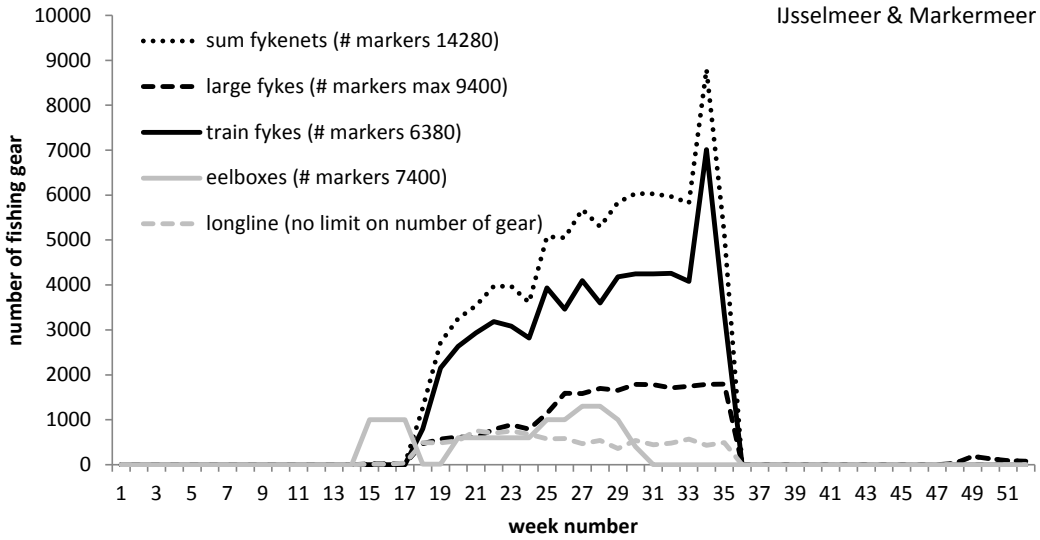
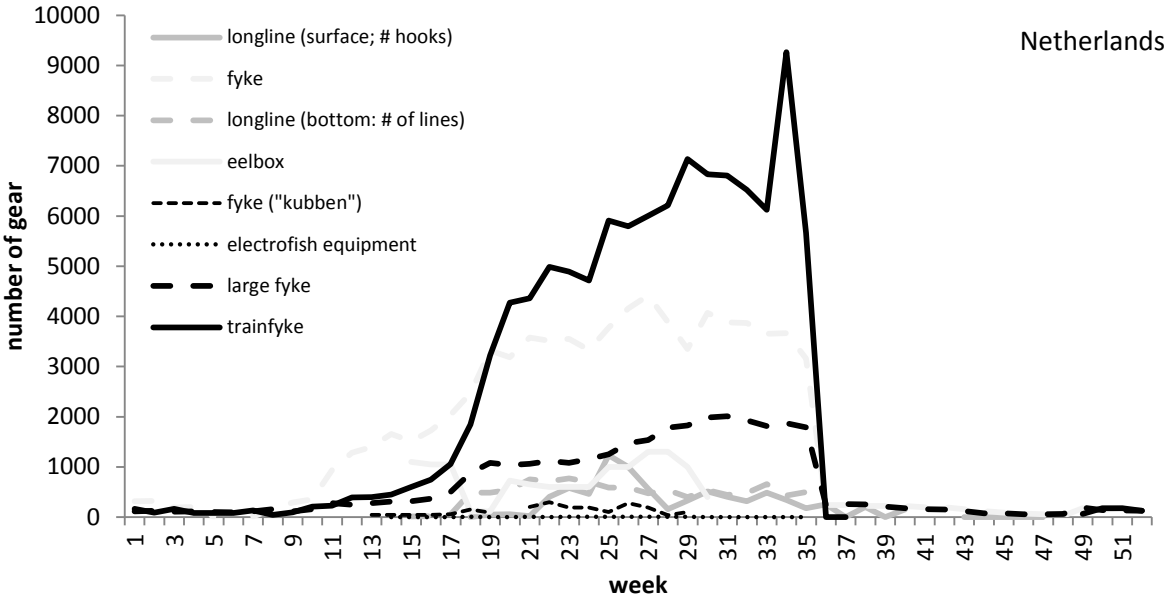


Fig. NL.8 *Trend in the number of fishing gear employed weekly in the eel fishery on Lake IJsselmeer/Markermeer (Source EZ).*

In 2012 all eel fishers were obliged for the first time to record every week their catches and effort (type of gear and number of gear) to the Ministry of Economic Affairs. The weekly deployment of eel fishing gear (Fig. NL.8) in Lake IJsselmeer/Marker demonstrates that for most gears there was a “overcapacity” of fishing gears. Except for train fykes, the number of actually used fishing gears was considerably lower that the number of legal, available gears.

An overview of the number and type of gear deployed weekly throughout 2012 is presented in Fig NL. 9. In general effort increases during the season, peaking in August.

Fig. NL.9 *Number of weekly fishing gear employed in the Dutch eel fishery 2012 (source EZ).*



6 Catches and landings

6.1 Glass eel

Glass eel fishing is forbidden, no available data.

6.2 Yellow eel

6.2.1 *Catches and landings from Lake IJsselmeer/Markermeer*

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 EZ), 79 t (PO IJsslmeer) to 65 t (Fish Board) and continued to differ in 2011 and 2012.

Table NL.E *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 Produktschap Vis (PVIS). Data source in brackets EZ.*

DECADE	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990	2000	2010
YEAR												
0	324	620	1157	838	3205	4152	2999	1112	641	472	*368*	*21*
1	387	988	989	941	4563	3661	2460	853	701	573	*381*	*62* (179)
2	514	720	900	1048	3464	3979	1443	857	820	548	*353*	***59 (169)***
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*	*58*	

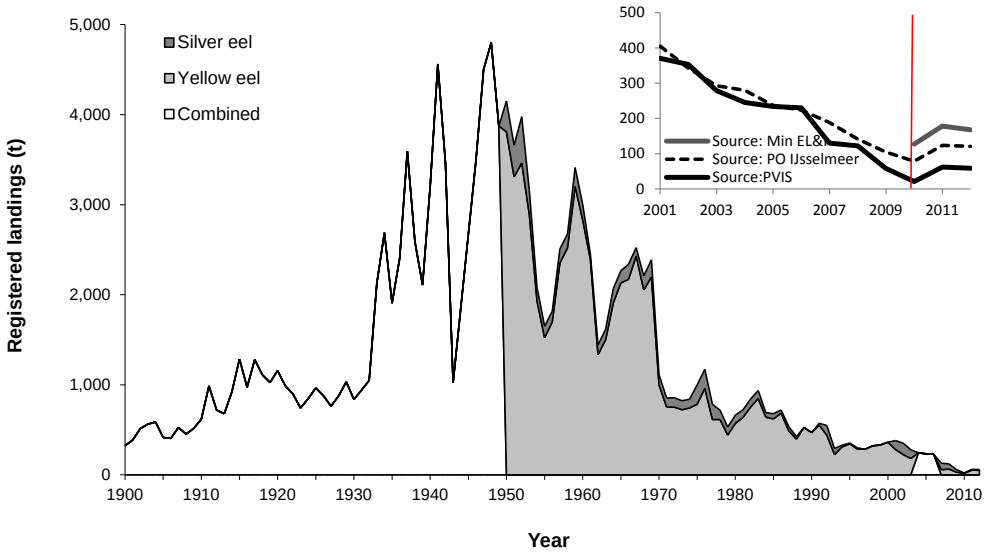


Fig. NL.10 *Time trend in the landings from Lake IJsselmeer/Markermeer. Source data main graph Produktschap Vis. Smaller graph illustrated the differences in landings recorded by PVIS, PO and EZ.*

6.2.2 *Catches and landings inland waters*

An estimate of the total annual catch of the commercial eel fishery in the Netherlands is given in Table NL.F.

Table NL.F *Landings in tons per year in the Netherlands (Source: EZ).*

DECADE	2010
YEAR	
0	452
1	367
2	350

6.3 Silver eel

Most of the landed silver eel is reported under eel in section 6.2, no distinction is made between yellow and silver eel in the national catch registration system by EZ. This year a fisheries time series of silver eel catch data from Friesland was made available.

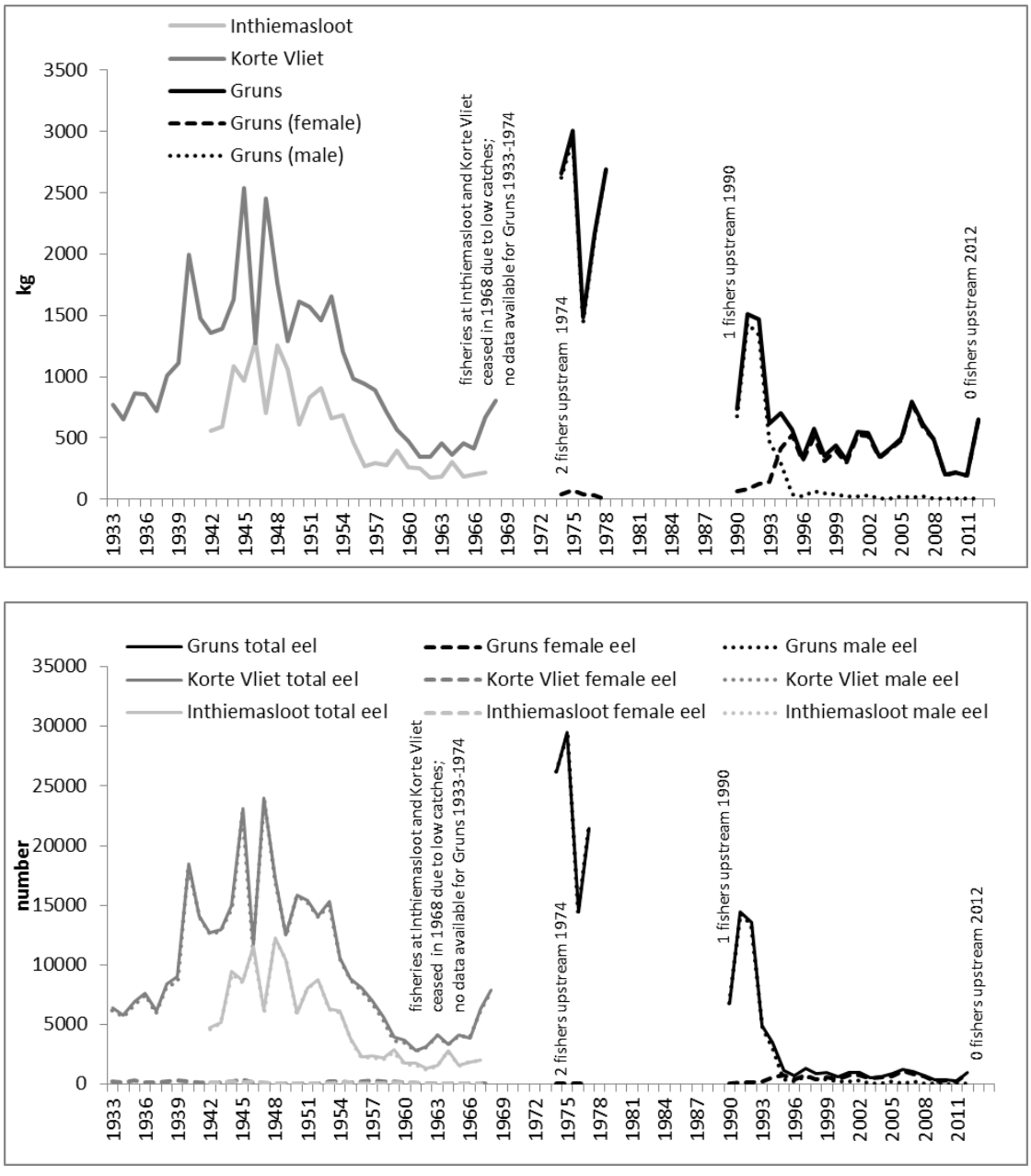


Fig. NL. 11 *Silver eel (male and female) catches in kg (top) and number (bottom) at three closely related sites in Friesland between 1993 and 2012.*

Silver eel catches decreased already in 1960 as two of the three sites ceased fishing in 1968 due to reduced catches. The third site (Gruns) show a sharp decline in the 1980s and early 1990s. Not only the number of silver eel decreased sharply, also the sex ration changed from a male dominated population to a female dominated population. These change in sex ratio “masks” the decline in kg as the average female (700 gr) weighs significantly more than the average male (100 gr) silver eel.

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.

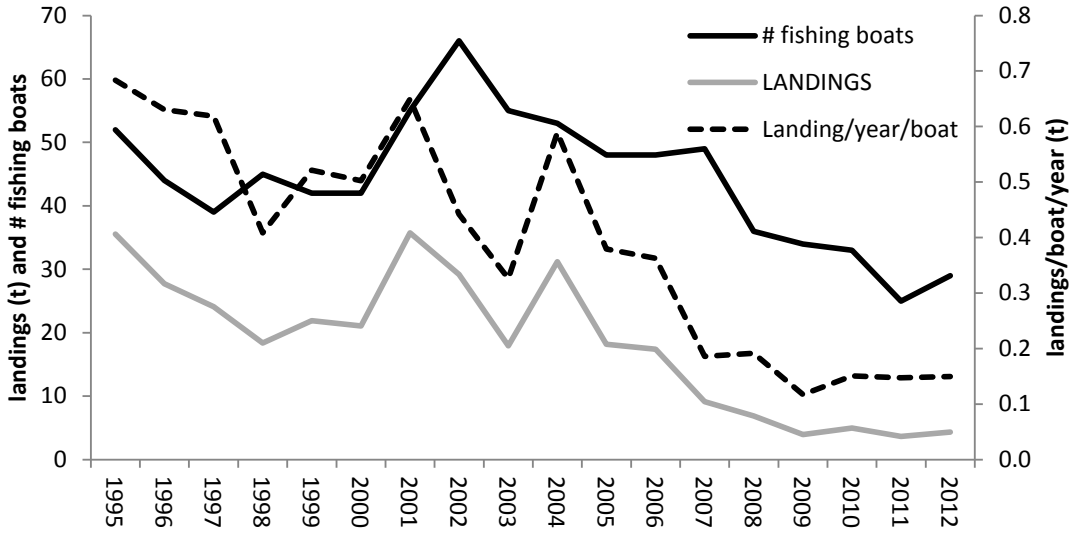


Fig. NL.12 *Time trend in the total registered landings from marine waters in Dutch harbours.*

6.5 Recreational Fishery

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). The programme was repeated in 2012/2013, analysis is currently in progress.

Table NL.G *Recreational Fisheries: Retained and Released Catches of eel (in numbers) in the Netherlands.*

	RETAINED				**RELEASED**			
	Inland		Marine		Inland		Marine	
Year	Angling	Passive Gears	Angling	Passive gears	Angling	Passive gears	Angling	Passive gears
2010	340536*		174215*		872570*		108462*	

*Angling and Passive gears are combined

Table NL.H *Recreational Fisheries: Catch and Release Mortality for eel in the Netherlands.*

	RELEASED			
	Inland		Marine	
	Angling	Passive gears	Angling	Passive gears
Year				
2012	0%	0%	0%	0%

7 Catch per unit of effort

No data on CPUE are available in the Netherlands.

8 Other anthropogenic impacts

8.1 Assisted migration silver eel

Since 2011 several (pilot)projects have started at migration barriers (pumping stations) to assist the migration of silver eel. In 2011 ~0.5 t of silver eel was moved passed barriers at four sites. In 2012 this increased almost ten-fold to ~5 t at 12 sites, however the net amount of eels saved by the assisted migration only increase five-fold from 0.1 to 0.5 t. The mortality rates of silver eel passing the selected barriers was moderate to low (Bierman et al. 2012; Winter et al. 2013). In 2013 the barriers for silver eel were prioritised (Winter et al. 2013) to improve the selection and efficiency of assisted migration initiatives.

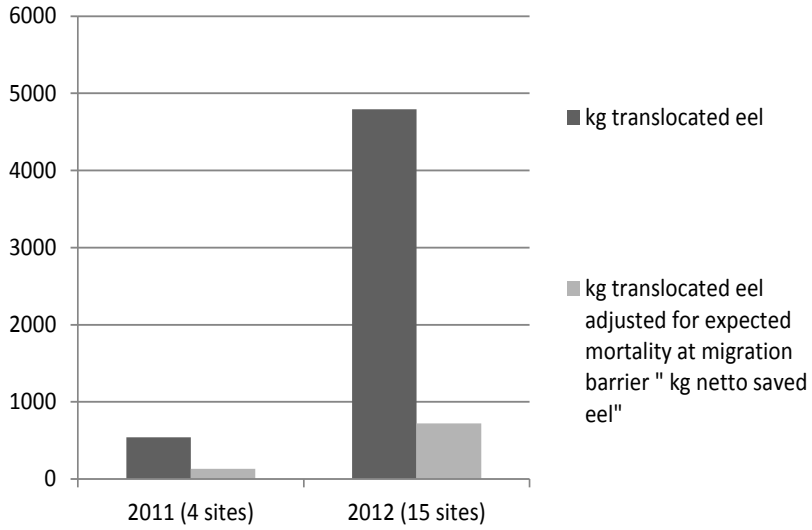


Fig. NL.13 *Overview of the "gross" and " net" amount of silver eel assisted over migration barriers in the Netherlands.*

9 IR.G. Scientific surveys of the stock

9.1 Recruitment surveys, glass eel

See 3.1.1.3

9.2 Stock surveys, (yellow) eel

9.2.1 *Lake IJsselmeer/Markermeer (active gear)*

Figure NL.14 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.

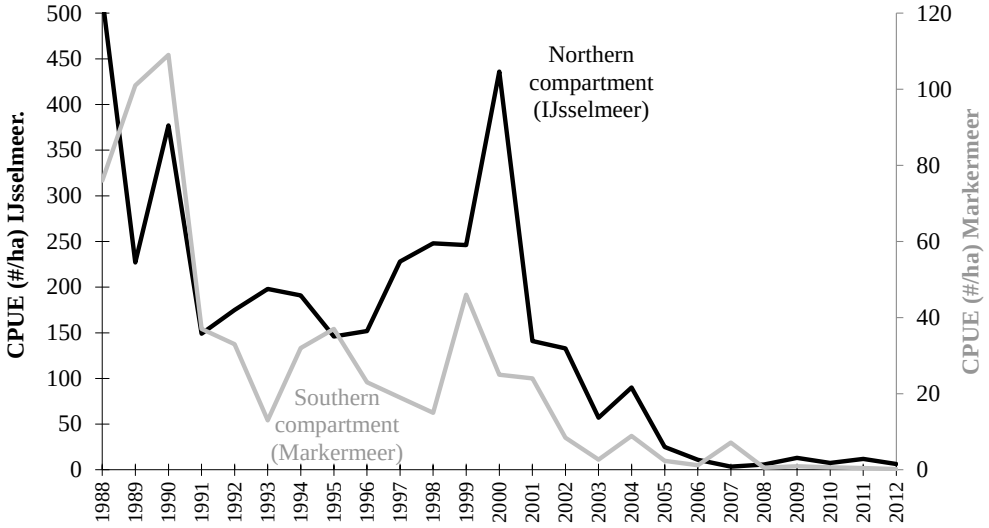


Figure NL.14 *CPUE trends in Lake IJsselmeer stock surveys, in number per hectare swept area, using the electrified trawl. Note: The northern and southern compartments are separated by a dyke since 1976.*

9.2.2 *Main Rivers (active gears)*

No new data

9.2.3 *Main rivers (passive gear)*

No new data.

9.2.4 *Coastal waters*

The number of eels caught in coastal surveys (Dutch Young Fish Survey) is presented in Fig. NL.15. Until the mid-1980s, considerable catches of eel were observed. Since that time, a gradual decrease is observed. A more elaborate statistical analysis of the abundance and length composition of the eel stock in coastal waters is presented in Dekker (2009).

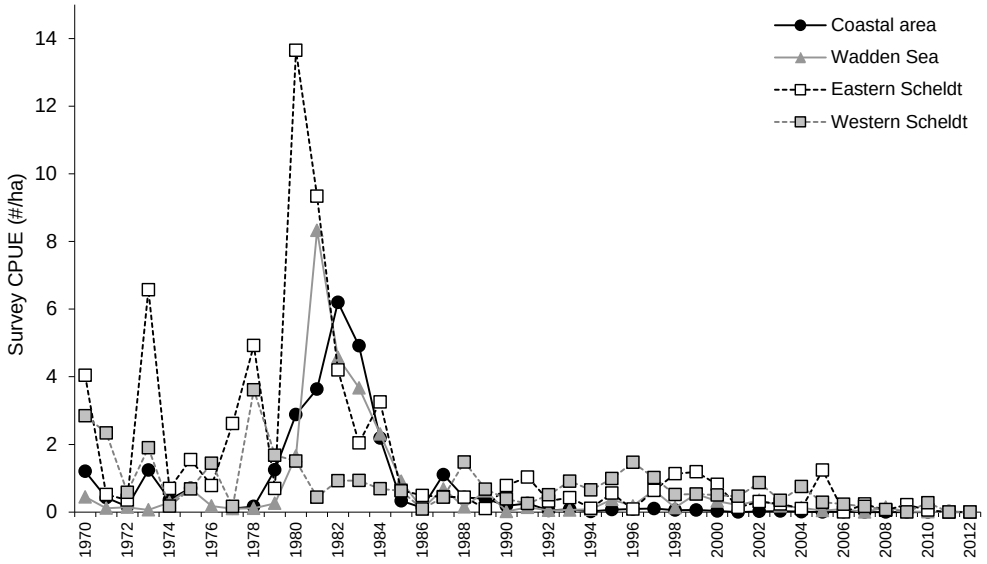


Figure NL. 15 *Trends in coastal survey CPUE. Most of the Wadden Sea belongs to RBD Rhine; Eastern Scheldt is mixed Scheldt and Meuse; Western Scheldt belongs to RBD Scheldt (with an extra inflow from Meuse), Coastal area belongs to RBD Rhine.*

9.3 Silver eel

In 2012 the Silver Eel Index was implemented in the Netherlands. In co-operation with commercial fishermen the abundance of migrating silver eel was monitored on seven locations (main entry and exit points for migratory fish) during the months SEP-NOV. Next year the programme and the results will be presented and discussed.

10 Catch composition by age and length

No new data.

11 IR.I. Other biological sampling

11.1 Length and weight and growth (DCF)

No new data available.

11.2 Parasites and pathogens

No new data available.

11.3 Contaminants

In 2012 seven trend locations have been monitored. As shown in the Figure NL.16 there is not a large change concentration PCB153 compared to the recent years . Historically, a substantial decrease in PCB concentrations has been achieved, but the current rate of decline is low or non-existent. Focussing on the last years of monitoring, it seems that in some locations the PCB levels are dropping. However, this was mainly caused by the catch of a higher number of low fat individuals. On lipid weight the concentrations do not drop compared to the previous years. As these low fat individuals will grow into large fat individuals, PCB levels will raise sharply. Since 2011 the size-class of >45 cm is also measured in some locations; these results clearly show that larger, fatter eels contain higher PCB levels.
Pooled samples of eels (approx. 25 individuals, 30-40 cm length) from in total 29 locations have been monitored (Table NL.I). Due to the new legislation (using TEF of 2005, resulting in an averaged 43% lower sum-TEQ value in eels) the small eels from even the highly polluted locations do not exceed the legal consumption limit. A shown by the levels in the larger and fatter eels, which make up for the bulk of the catch of professional fisherman, the levels are above the legal consumption limit.
As could be expected, the general picture is not changed compared to the previous years. All locations that have eels with concentration of sum-TEQ or sum six ndl-PCBs 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.

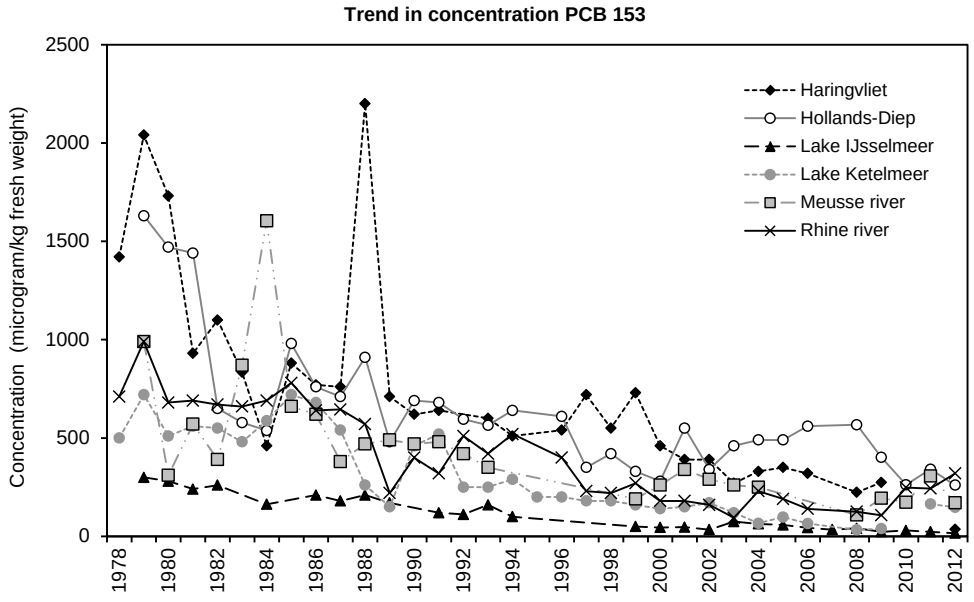


Figure NL. 16 *Temporal trend in PCB153 in 30-40 cm eel (data from IMARES and RIKILT).*

Table NL.I *Monitoring data of 2012 The Netherlands. Shaded numbers are above the regulatory limits of 2011 (12 pg/g sum-EQ and 500 ng/g PCB153, 10% uncertainty included).*

Jaar	HERKOMST	POSITIE	TYPE / size class	TOTAAL DIOXINEN (UB)	TOTAAL DIOXINEN (UB)	TOTAAL DL PCB'S (UB)	TOTAAL DL PCB'S (UB)	TOTAAL DIOXINEN + DL-PCB'S (UB)	TOTAAL DIOXINEN + DL-PCB'S (UB)	TOTAAL INDICATOR PCB'S (LB)	PCB 153 (ng/g)
2012	AMSTERDAM-RIJNKANAAL	MUIDEN	30 - 40 CM	2.0	1.8	12.0	5.8	13.9	7.6	246.8	110
2012	IJSSEL	DEVENTER	30 - 40 CM	0.9	0.8	8.7	4.2	9.6	5.0	218.4	96
2012	HOLLANDS DIEP		30 - 40 CM	2.3	2.1	20.4	9.7	22.7	11.9	595.7	260
2012	LEK	CULEMBORG	30 - 40 CM	1.5	1.3	10.7	4.8	12.2	6.1	315.6	140
2012	MAAS	EIJSDEN	30 - 40 CM	0.5	0.4	15.3	6.7	15.9	7.2	440.7	180
2012	VOLKERAK	SLUIZEN	30 - 40 CM	2.6	2.3	9.4	4.7	12.0	7.0	242.9	110
2012	WAAL		30 - 40 CM	1.1	1.0	11.2	5.5	12.3	6.5	272.5	120
2012	AMSTERDAM-RIJNKANAAL	MUIDEN	>45 CM	3.4	3.1	28.2	13.6	31.6	16.7	662.7	310
2012	IJSSEL	DEVENTER	>45 CM	3.6	3.2	23.8	13.1	27.4	16.3	492.0	210
2012	LEK	CULEMBORG	>45 CM	3.3	3.0	19.6	9.6	22.9	12.6	559.6	250
2012	MAAS	EIJSDEN	>45 CM	0.9	0.7	23.5	11.9	24.5	12.7	622.0	250
2012	RIJN	LOBITH	>45 CM	2.3	2.1	26.3	11.0	28.6	13.1	750.5	320
2012	VOLKERAK	SLUIZEN	>45 CM	5.2	4.5	17.3	9.5	22.5	14.0	428.8	200
2012	WAAL		>45 CM	4.0	3.6	31.2	16.6	35.3	20.2	769.2	330
2012	BINNENBEDIJKTE MAAS	HOEKSE WAARD	30 - 40 CM	0.3	0.2	2.4	0.9	2.6	1.1	117.5	70
2012	BINNENBEDIJKTE MAAS	HOEKSE WAARD	>45 CM	0.6	0.6	3.8	2.2	4.4	2.8	72.5	37.3
2012	IJSSELMEER		30 - 40 CM	0.7	0.6	2.1	1.4	2.8	2.0	32.7	16
2012	IJSSELMEER		>45 CM	1.2	1.0	3.8	2.6	4.9	3.6	53.1	26
2012	KANAAL GENT-TERNEUZEN		30 - 40 CM	0.8	0.7	6.5	2.6	7.3	3.3	195.0	80
2012	KANAAL GENT-TERNEUZEN		>45 CM	2.1	1.5	18.8	8.3	20.9	9.8	483.5	200
2012	KANAAL WESSEM-NEDERWEERT		>45CM	2.0	1.6	35.6	19.7	37.6	21.3	1013.0	470
2012	MAAS	NIEUWE (PERNIS TOT BOTLEK)	30 - 40 CM	2.8	2.5	16.5	8.3	19.3	10.9	369.4	170
2012	MAAS	NIEUWE (PERNIS TOT BOTLEK)	>45 CM	5.8	5.2	24.8	13.5	30.6	18.7	475.0	210
2012	NOORDZEE KANAAL	ZIJKANAAL-C	30 - 40 CM	1.6	1.4	9.2	4.1	10.8	5.4	227.4	100
2012	NOORDZEE KANAAL	ZIJKANAAL-C	>45 CM	5.3	4.5	23.7	11.3	29.0	15.9	528.4	220
2012	HARINGVLIETDAM	ZEEKANT	>45 CM	1.3	1.1	3.9	3.1	5.2	4.2	55.5	36
2012	VOLKERAK	SLUIZEN, ZUID-WEST	30 - 40 CM	2.0	1.6	6.3	3.5	8.3	5.2	129.5	62
2012	VOLKERAK	SLUIZEN, ZUID-WEST	>45 CM	3.6	3.0	11.2	6.7	14.9	9.6	214.5	100
2012	VOSSEMEER	IJSSEL	30 - 40 CM	1.7	1.5	8.6	5.1	10.3	6.6	171.3	78
2012	VOSSEMEER	IJSSEL	>45 CM	4.3	3.9	15.9	9.9	20.2	13.8	295.9	130
2012	DIJK ENKHUIZEN-LELYSTAD		30 - 40 CM	1.6	1.5	5.0	3.3	6.7	4.7	83.9	40
2012	KETELMEER	BRUG ZUIDKANT	30 - 40 CM	3.1	2.9	13.8	7.0	16.9	9.9	369.1	170
2012	KETELMEER	BRUG ZUIDKANT	>45 CM	5.8	5.4	22.9	12.1	28.7	17.6	603.7	270
2012	KETELMEER	NOORDKANT	30 - 40 CM	3.1	2.9	11.8	6.4	14.9	9.3	265.8	120
2012	KETELMEER	NOORDKANT	>45 CM	4.4	4.1	15.6	9.4	20.0	13.5	323.6	140
2012	KETELBRUG	URK NOORDKANT	30 - 40 CM	2.7	2.5	11.4	6.2	14.0	8.7	263.5	120
2012	KETELBRUG	URK NOORDKANT	>45 CM	5.4	5.0	16.7	10.1	22.0	15.0	349.5	150
2012	IJSSELMEER	URK 3 KM VAN KETELBRUG	30 - 40 CM	2.5	2.3	9.7	6.1	12.2	8.3	190.3	87
2012	IJSSELMEER	ONDER URK 3 KM VAN KETELBRUG	>45 CM	4.2	3.8	13.7	8.7	17.9	12.5	271.7	120

11.4 Predators

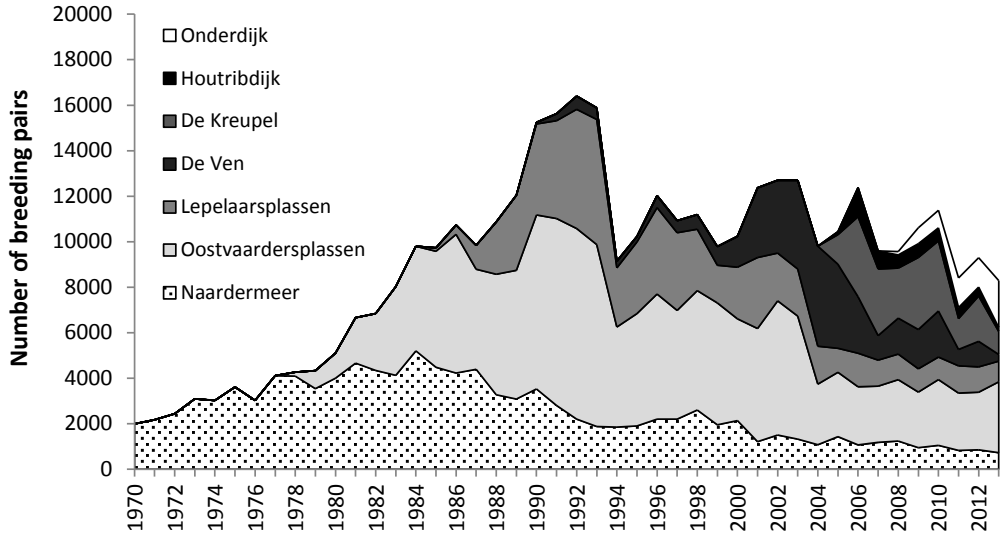


Figure NL. 17 *Trends in the number of breeding pairs of cormorants (Phalacrocorax carbo) in and around Lake IJsselmeer\Markermeer (Source Waterdienst RWS).*

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.

12 Other sampling

Nothing to report under this heading.

13 Stock assessment

13.1 Method summary

Bierman SM, Tien N, van de Wolfshaar KE, , Winter HV, de Graaf M (2012) Evaluation of the Dutch Eel Management Plan 2009-2011. IMARES C067/12, pp. 132.

13.2 Summary data

The summary data in the tables below are from "2011" as presented in Bierman et al. (2012).

13.2.1 *Stock indicators and Targets*

EMU CODE	INDICATOR	BIOMASS (T)		MORTALITY (RATE)			TARGET		
	B0	Bbest	Bcurr	∑A	∑F	∑H	Source	Biomass (t)	∑A (rate)
NL_Neth	10400	1443	482	1.1	1.16	0.04	EMP		
							EU Reg	4160	
							WGEEL		0.106

13.2.2 *Habitat coverage*

EMU CODE	RIVER		LAKE		ESTUARY		LAGOON		COASTAL	
	Area (ha)	A'd Y/N)	Area (ha)	A'd Y/N)	Area (ha)	A'd Y/N)	Area (ha)	A'd Y/N)	Area (ha)	A'd Y/N)
NL_Neth	88391	y	232758	y	na	na	na	na	358802	n

13.2.3 *Impact*

A = assessed, MI = not assessed, minor, MA = not assessed major, AB = impact absent

EMU CODE	HABITAT	FISH COM	FISH REC	HYDRO & PUMPS	BARRIERS	RESTOCKING	PREDATORS	INDIRECT IMPACTS
NL_Neth	Riv	A	A	A	A	MI/MA	MI/MA	MI/MA
	Lak	A	A	A	A	MI/MA	MI/MA	MI/MA
	Est	na	na	na	na	na	na	Na
	Lag	na	na	na	na	na	na	Na
	Coa	MI	A	AB	AB	AB	AB	MI
	All							

EMU CODE	STAGE	FISH COM	FISH REC	HYDRO & PUMPS	BARRIERS	RESTOCKING	PREDATORS	INDIRECT IMPACTS
NL_Neth	Glass	AB	AB	MI/MA	MI/MA	MI	MI/MA	MI/MA
NL_Neth	Yellow	290	100	MI/MA	MI/MA	AB	MI/MA	MI/MA
NL_Neth	Silver	77	AB*	76 (incl 6 t mortality of GER/BE silver eel)	MI/MA	AB	MI/MA	MI/MA
NL_Neth	Silver EQ							

*all recreationally caught eel were assumed to be yellow eel

13.2.4 *Precautionary Diagram*

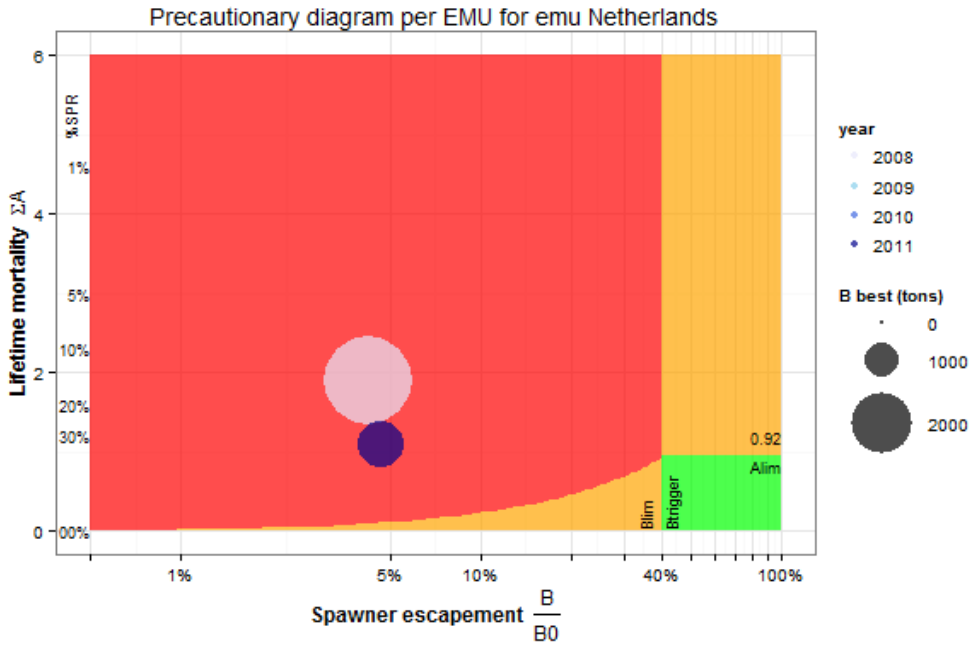


Figure NL. 18 *Modified precautionary diagram for the Netherlands EMU (after WGEEL 2012), see section 1.3.2 of ICES 2013) for more information.*

13.2.5 *Management Measures*

EMU CODE	ACTION TYPE	ACTION	LIFE STAGE	PLANNED	OUTCOME
NL_Neth	Com Fish	Closing fishing season	M	EMP	Fulfilled
NL_Neth	Com Fish	Introducing fishery-free zones	M	EMP	Fulfilled
NL_Neth	Com Fish	Closure of fishery in contaminated areas	M	After EMP	Fulfilled
NL_Neth	Com Fish	Sniggling Ban	M	EMP	Fulfilled
NL_Neth	Rec Fish	Eel releasing by anglers	M	EMP	Fulfilled
NL_Neth	Rec Fish	Ban on recreational fishery using professional gears	M	EMP	Fulfilled
NL_Neth	Rec Fish	Closing fishing season	M	EMP	Fulfilled
NL_Neth	Rec Fish	Sniggling ban	M	EMP	Fulfilled
NL_Neth	Hydropower & Pumps	Barriers reduction from 2015	M	EMP	Partially
NL_Neth	Hydropower & Pumps	Hydroelectric stations barriers reduction	M	EMP	Partially
NL_Neth	Restocking	Stocking with glass eels	M	EMP	Fulfilled

13.3 Summary data on glass eel

Table NL.I Overview usage of glass eel.

KG	2013	2012	2011	2010	2009
Caught in commercial fishery	0	0	0	0	0
Used in stocking	630	766*	244	904	100
Used in aquaculture for consumption	6700	6775	6750	?	?
Consumed direct	0	0	0	0	0
Mortalities	?	?	?	?	?

*not all translocated glass eel is stocked for recovery purposes

14 Sampling intensity and precision

Nothing new to report.

15 Standardisation and harmonisation of methodology

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	

Silver Eel Monitoring

Gear	Location	Frequency	Time	Period
Fykes (6 sites) Eel shocker (Rhine)	Den Oever, Kornwerderzand, Noordzee kanaal, Nieuwe waterweg, Haringvliet, upper reaches rivers Rhine and Meuse	continuous	fykes were lisfted weekly; shocker was used once a week	SEP-NOV

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 were located in the polluted areas and sampling ceased on 1 April 2011. A alternative program is currently being developed and will hopefully start in 2013.

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	

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
IJssel Plus	150-200 eels per sample	twice	2	2 eels per 10 cm size class	Apr-Aug
Lauwersmeer	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	2	2 eels per 10 cm size class	Apr-Aug
Veluwe Randmeren	150-200 eels per sample	twice	2	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
Volkeral-Zoommeer	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	8 (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	8 (samples collected for each fishing gear: summer fyke, fyke, eelbox, long line)	2 eels per 10 cm size class	Apr-Aug

15.3 Sampling

Nothing to report.

15.4 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.

15.5 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.

15.6 Sex determinations

Sex is determined by macroscopic examination of the gonads.

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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18 Kwaliteitsborging

IMARES beschikt over een ISO 9001:2008 gecertificeerd kwaliteitsmanagementsysteem (certificaatnummer: 124296-2012-AQ-NLD-RvA). Dit certificaat is geldig tot 15 december 2015. 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 1 april 2017 en is voor het eerst verleend op 27 maart 1997; deze accreditatie is verleend door de Raad voor Accreditatie.

Verantwoording

Rapportnummer : C048.14

Projectnummer : 4301218520, 4301218521, 4301218522, 4301218523, 4301218524, 4301218525, 4301218526, 4301218527, 4301218528, 4301216004, 4301218008.

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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