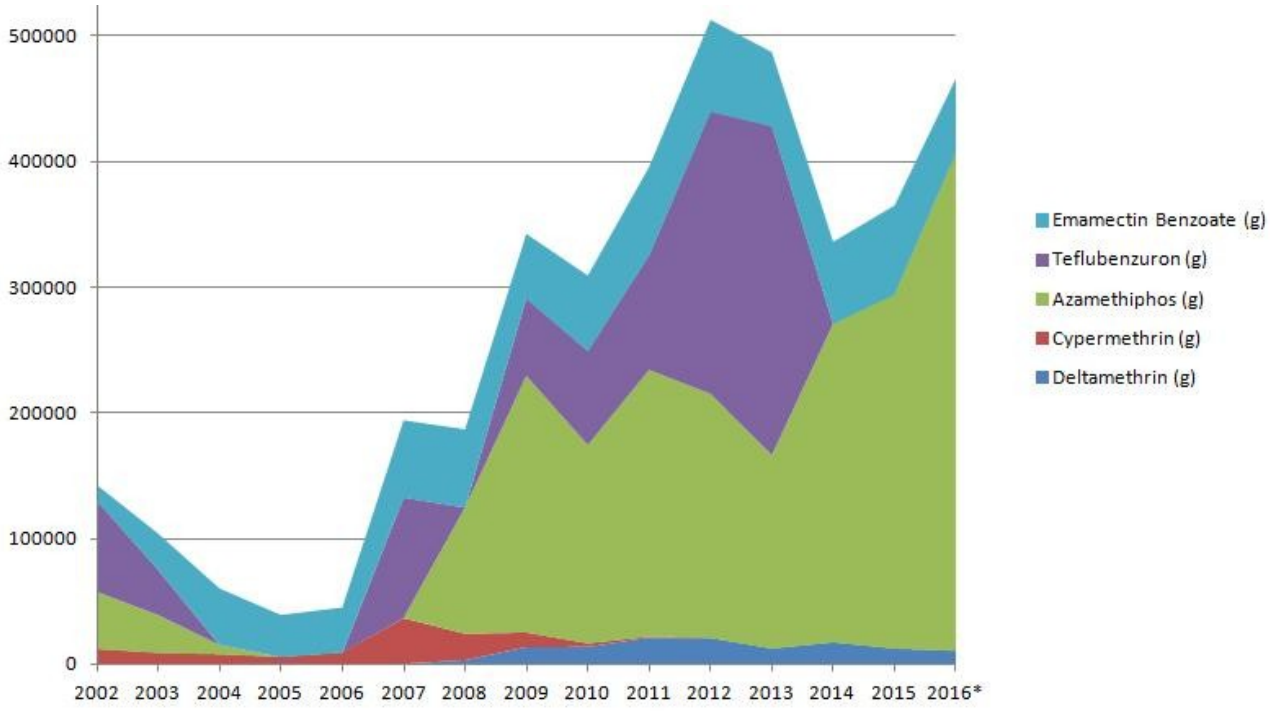
The Global Alliance Against Industrial Aquaculture, 1 January 2017

Fish Farmageddon: Scottish Salmon's Lethal Legacy - Ten-fold Increase in Toxic Chemical Use in Ten Years

Exclusive data obtained from the Scottish Environment Protection Agency (SEPA) reveals that the use of toxic chemicals on Scottish salmon farms is now ten times higher than a decade ago. Fifteen years of data (2002-2016) obtained via Freedom of Information (FOI) by the Global Alliance Against Industrial Aquaculture (GAAIA) reveals that nearly 4,000 kg of Azamethiphos, Cypermethrin, Deltamethrin, Emamectin benzoate and Teflubenzuron has been used on Scottish farmed salmon in over 8,400 separate chemical treatments since 2002.

More via The Sunday Times: "Salmon industry toxins soar by 1000 per cent" (1 January)



The SEPA data (submitted monthly by salmon farmers) also reveals that Scottish salmon's annual 'mort mountain' now stands at a staggering 20,000 tonnes of dead farmed salmon (an estimated 10 million dead farmed salmon per year) with a mortality rate during the seawater phase alone of nearly a quarter. Since 2002 a total of 164,412 tonnes of dead farmed salmon (equivalent to Scotland's salmon farming production in 2013) has occurred on disease-ridden Scottish salmon farms **[1]**.

According to the data (published monthly via Scotland's Aquaculture but never collated before), the use of the toxic organophosphate Azamethiphos has increased yearly since 2013 and is set to leap to an estimated 400 kg in 2016 (the worst year on record). The use of marine pollutant Emamectin benzoate increased six-fold between 2002 and 2015 whilst the use of Cypermethrin ceased in 2012 (as Deltamethrin took over due to resistance concerns) and the use of Teflubenzuron ceased in 2014 (due to toxicity concerns).

"Scottish salmon farming has lost the chemicals arms race and is fighting a losing battle against chemically resistant sea lice," said Don Staniford of The Global Alliance Against

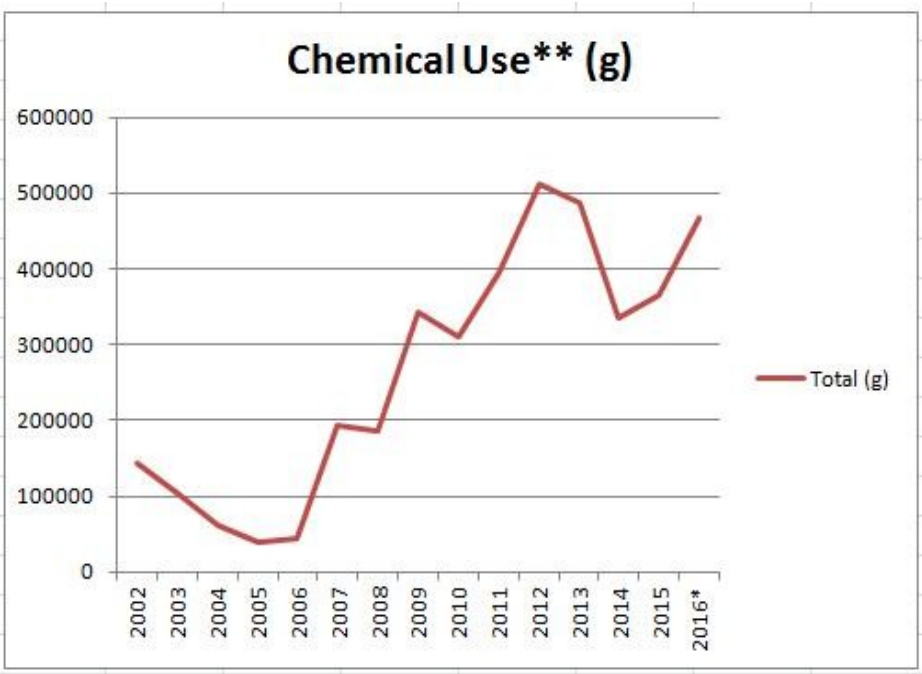
Industrial Aquaculture. "The drugs don't work anymore so farmers are having to use more and more toxic chemicals - including the deadly organophosphate Azamethiphos. Sadly, Scotland's lobsters and other shellfish are collateral damage in the salmon farming industry's war on sea lice. The chemically embalmed salmon farming industry is Scotland's Silent Spring of the Sea. To save Scotland's shellfish and wild fish the public must boycott cheap and nasty toxic Scottish salmon."

The data obtained from SEPA in December 2016 (made available as a 7MB Excel spreadsheet with over 54,000 lines of data entries - download summary online here) reveals that:

- 467 kg of Azamethiphos, Cypermethrin, Deltamethrin, Emamectin benzoate and Teflubenzuron is expected to be used in 2016 compared to 45 kg in 2006 (39 kg was used in 2005 compared to 367 kg in 2015)

- In the last decade (2006-2016), whilst salmon farming production increased only 35% (up from 131,847 tonnes in 2006 to 177,857 tonnes in 2016) the use of toxic chemicals increased a whopping 932%

Year	Total (g)
2002	142810.08
2003	104125.775
2004	60434.11387
2005	39287.2477
2006	45203.32196
2007	194261.7607
2008	187085.63
2009	342674.4462
2010	309441.7435
2011	396004.9055
2012	513001.2117
2013	487332.5552
2014	336359.5016
2015	365302.0173
2016*	466424.3
Total	3989749



* 2016 data pro rated from September

** Azamethiphos, Cypermethrin, Deltamethrin, Emamectin benzoate and Teflubenzuron

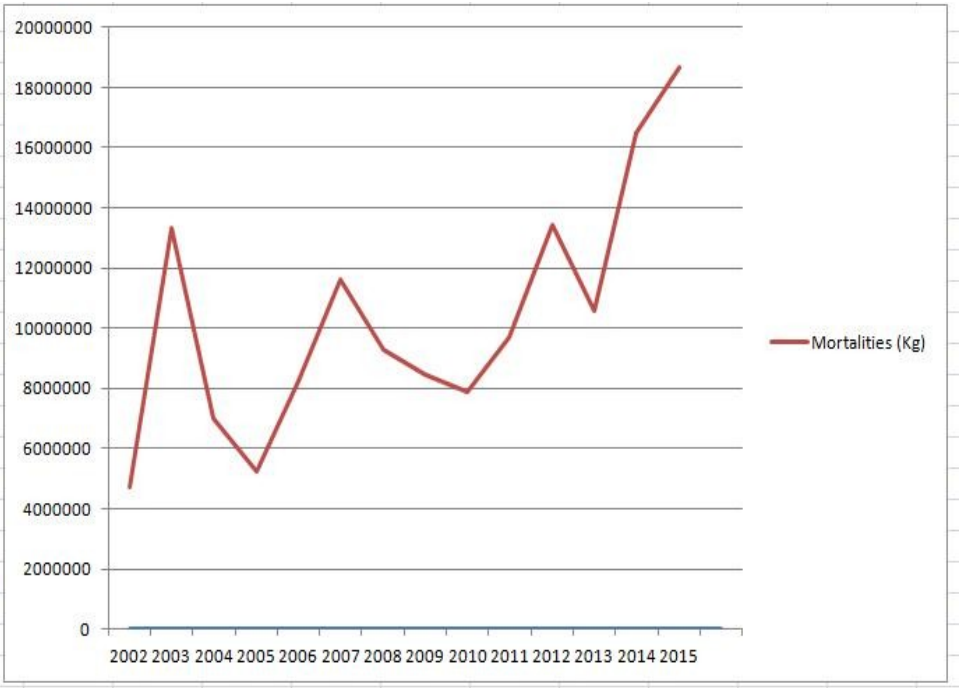
- Since 2002, a staggering 3,990 kg of Azamethiphos, Cypermethrin, Deltamethrin, Emamectin benzoate and Teflubenzuron has been used on Scottish salmon farms (Azamethiphos accounted for 2,036 kg representing 51%; Teflubenzuron accounting for 920 kg representing 23%; Emamectin benzoate accounting for 792 kg representing 20%; Deltamethrin accounting for 125 kg representing 3%; and Cypermethrin accounting for 118 kg representing 3%)

- Since 2002, Scottish farmed salmon has been subjected to a total of 8,416 separate chemical treatments (with Emamectin benzoate responsible for 3,831; Deltamethrin responsible for 1901; Cypermethrin responsible for 1330; Azamethiphos responsible for 1313 and Teflubenzuron responsible for 41)

- Scottish salmon's 'mort mountain' now stands at a staggering 20,000 tonnes during 2016 (an estimated 10 million dead farmed salmon per year) with a mortality rate during the seawater phase alone of nearly a quarter (24%)

- Since 2002, a total of 164,412 tonnes of dead farmed salmon (equivalent to Scotland's salmon farming production in 2013) has occurred on Scottish salmon farms

Year	Morts (Kg)	Morts (t)
2002	4735523	4,735
2003	13320044	13,320
2004	6998211	6,998
2005	5250462	5,250
2006	8245111	8,245
2007	11618823	11,619
2008	9279675	9,280
2009	8467250	8,467
2010	7859774	7,860
2011	9674658	9,675
2012	13429327	13,429
2013	10598601	10,599
2014	16489297	16,489
2015	18649723	18,650
2016*	14847090	14,847
2016**	19796	19,796
* Up to Sept		
** pro rated	**Total morts (2002-2016): 164,412 t**	



- 2016 chemical use is set to be the 3rd worst year on record with only 2012 (513 kg) and 2013 (487 kg) using more Azamethiphos, Cypermethrin, Deltamethrin, Teflubenzuron and Emamectin benzoate

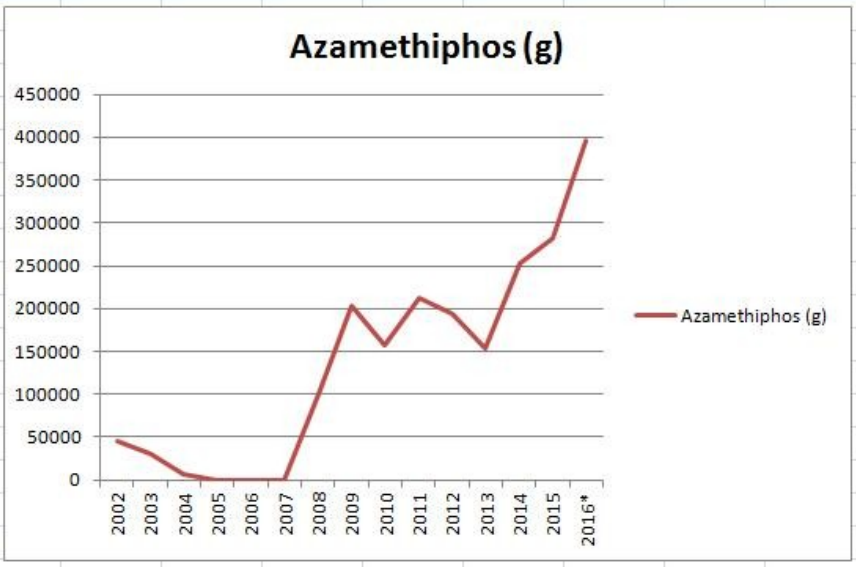
- Since 2002, Marine Harvest has used the most Azamethiphos (700 kg), Cypermethrin (38 kg), Deltamethrin (63 kg) and Emamectin benzoate (289 kg) and is responsible for the most mortalities (43,802 tonnes) whilst Scottish Sea Farms has used the most Teflubenzuron (334 kg)

- The sites using the most of each toxic chemical in a single treatment are:
Azamethiphos (Marine Harvest: Ardintoul in Loch Alsh in December 2015)
Cypermethrin (The Scottish Salmon Company: Vacasay in Loch Roag in March 2008)
Deltamethrin (Marine Harvest: Sron in Loch Alsh in March 2016)
Emamectin benzoate (Scottish Sea Farms in Vidlin North in Vidlin Voe in December 2011)
Teflubenzuron (Scottish Sea Farms in Teisti Geo in Clift Sound in May 2013)

- The use of the toxic organophosphate Azamethiphos now dwarfs other chemicals (Azamethiphos represented 85% of all the chemicals used in 2016)

- Azamethiphos use has increased from zero in 2005 to 282 kg in 2015 with 2016 predicted to be to worst on record with an estimated 400 kg used

Year	Azamethiphos (g)
2002	45599.55
2003	30165
2004	7585
2005	0
2006	0
2007	0
2008	100187.062
2009	203934.6003
2010	157615.0006
2011	211919.5005
2012	193920.3609
2013	153728.0003
2014	253287.7812
2015	281784.9993
2016*	396573.33
Total	2036300.185



* 2016 data pro rated from September

1313 chemical treatments since 2002

- Emamectin benzoate use increased six-fold between 2002 and 2015 (12 kg in 2002 compared to 71 kg in 2015)

- Deltamethrin use increased from zero in 2007 to 3 kg in 2008 followed by a seven-fold increase to 21 kg in 2012 (estimated use in 2016 is 11 kg)

- Salmon farming companies exceeded SEPA biomass limits 858 times since 2002 racking up 74,284 tonnes of overproduction (Marine Harvest was the biggest culprit accounting for 249 biomass exceedances representing 24,539 tonnes of overproduction closely followed by The Scottish Salmon Company with 245 biomass exceedances representing 17,301 tonnes of overproduction)

- The most mortalities (641 tonnes) occurred at Grieg Seafood's Cole Deep salmon farm in Gon Firth, Shetland, in December 2015 followed by Cooke Aquaculture's Pegal Bay salmon farm (565 tonnes) in Scapa Flow, Orkney, in February 2010.

Download a summary of the data - including graphs and tables - online here (6MB Excel spreadsheet)

Today (1 January 2017), GAAIA wrote to both OSPAR and the Scottish Government calling for drastic reductions in the use of toxic chemicals on Scottish salmon farms - including an immediate ban on the use of Azamethiphos, Deltamethrin and Emamectin benzoate.

In 2006, the UK Government stopped reporting chemical use to the OSPAR Commission: "OSPAR 2006 agreed that, for the time being, implementation reporting on PARCOM Recommendation 94/6 could cease for all Contracting Parties, but that if there were significant developments in the aquaculture industry in the future, the need for implementation reporting should be revisited".

In 2012, GAAIA filed a complaint to OSPAR regarding the UK's failure to adhere to PARCOM Recommendation 94/6 on Best Environmental Practice for the Reduction of Inputs of Potentially Toxic Chemicals from Aquaculture Use (read GAAIA's letter to OSPAR online here and letter to SEPA online here).

"Scottish salmon is addicted to a dangerous cocktail of toxic chemicals," concluded Staniford, author of 'Silent Spring of the Sea'. "Toxic salmon should carry a Government health warning rather than being marketed as healthy food. If you make one New Year's resolution for 2017 then give Scottish salmon a very wide berth indeed. Scottish salmon is pharmed and dangerous."

Read more via a Scientific Backgrounder **[2]** and Media Backgrounder **[3]**.

Contact:

Don Staniford: 07771 541826 (dstaniford@gaaia.org)

Notes to Editors:

[1] Download a summary of the data obtained by GAAIA from SEPA via FOI on 9 December 2016 - including graphs and tables - online here

Includes:

Year	Deltamethrin (g)	Cypermethrin (g)	Azamethiphos (g)	Teflubenzuron (g)	Emamectin Benzoate (g)	Total (g)
2002	0	11995.34	45599.55	72730	12485.19	142810.08
2003	0	8960.71	30165.00	36000	29000.07	104125.78
2004	0	7872.1	7585.00	0	44977.01	60434.11
2005	0	5694	0.00	0	33593.25	39287.25
2006	0	9154.5	0.00	0	36048.82	45203.32
2007	0	36789.2	0.00	95769	61703.56	194261.76
2008	2877.105	21453.44	100187.06	0	62568.02	187085.63
2009	13371.79	11857.34	203934.60	61759	51751.72	342674.45
2010	13609.405	2961.7	157615.00	75000	60255.64	309441.74
2011	21045.32	979.08	211919.50	91555.1	70505.91	396004.91
2012	20921.335	0	193920.36	224797	73362.52	513001.21
2013	12362.65	0	153728.00	261955	59286.90	487332.56
2014	17471.07	0	253287.78	0	65600.65	336359.50
2015	12356.55	0	281785.00	0	71160.47	365302.02
2016	10621.82667	0	396573.33	0	59229.11	466424.30

Company Summary (2002-2016)

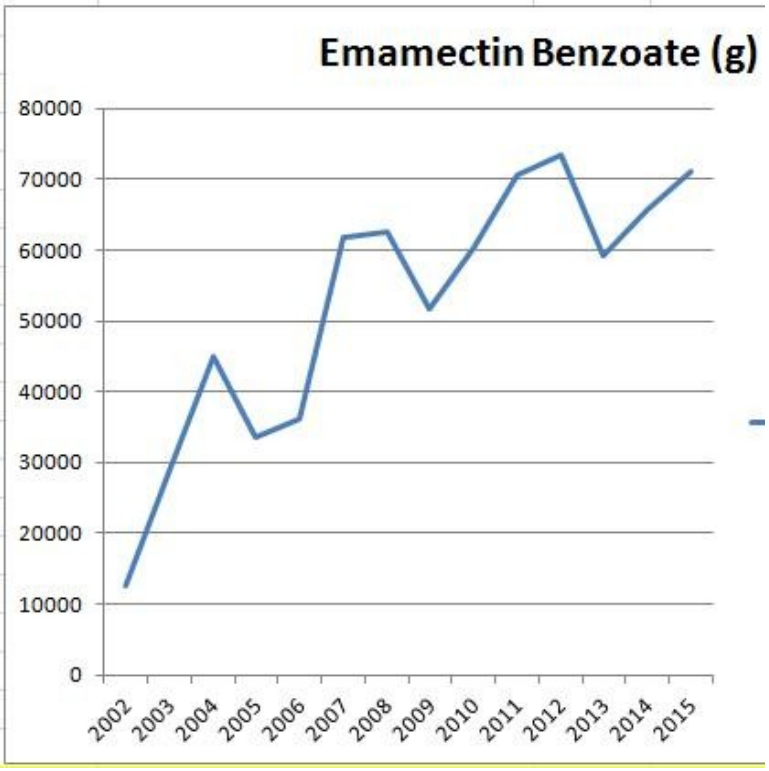
Operator	Morts (t)	Delt (g)	Cyp (g)	Aza (g)	Tefl (g)	Em b (g)	Bio Ex (t)	Bio Ex (#)
Marine Harvest	**43802**	**62831**	**37782**	**700344**	131995	**288706**	**24539**	**249**
The Scottish Salmon Co.	26060	36495	37503	382510	153600	158109	17301	245
Scottish Sea Farms	25060	12155	25509	330313	**334207**	137652	6503	78
Grieg Seafood	22653	1660	112	239745	0	105983	4294	49
Cooke Aquaculture	20535	348	724	57029	0	29341	12551	128
Loch Duart	7189	4806	11216	159290	92935	32612	920	18

Top 20 Uses of Azamethiphos (2002-2016)

Year	Azamethiphos (g)	Site Name	Operator	Receiving Water	Local Authority
01-Dec-15	13650	Ardintoul	Marine Harvest (Scotland) Ltd	Loch Alsh	Highland
01-Sep-16	10330	Soay Sound	Marine Harvest (Scotland) Ltd	West Loch Tarbert	Eilean Siar
01-Jun-14	7600	Gousam	The Scottish Salmon Company Ltd	Loch Roag	Eilean Siar
01-Feb-15	7350	Camas an Leim (Torridon)	Marine Harvest (Scotland) Ltd	Loch Torridon	Highland
01-Jul-08	7200	Brei Geo Offshore	Scottish Sea Farms Ltd	Sandsound Voe	Shetland Islands
01-Dec-10	7000	Burrastow	Cooke Aquaculture Scotland	Vaila Sound	Shetland Islands
01-Sep-08	6674	Camas an Leim (Torridon)	Marine Harvest (Scotland) Ltd	Loch Torridon	Highland
01-Sep-16	6340	Carradale (North)	Marine Harvest (Scotland) Ltd	Kilbrannan Sound	Argyll and Bute
01-Jan-16	6175	Ardintoul	Marine Harvest (Scotland) Ltd	Loch Alsh	Highland
01-Jun-15	5950	Camas an Leim (Torridon)	Marine Harvest (Scotland) Ltd	Loch Torridon	Highland
01-Jul-11	5920	Papa, East Head of Scalloway	Grieg Seafood Shetland Ltd	The Deeps	Shetland Islands
01-Jun-16	5850	Ardintoul	Marine Harvest (Scotland) Ltd	Loch Alsh	Highland
01-Aug-16	5800	Vuia Mor	The Scottish Salmon Company Ltd	Loch Roag	Eilean Siar
01-Oct-14	5700	Seaforth	Marine Harvest (Scotland) Ltd	Loch Seaforth	Eilean Siar
01-Sep-08	5307	Ardgour (Linnhe)	Marine Harvest (Scotland) Ltd	Loch Linnhe	Highland
01-Sep-11	5250	Aird Ardheslaig	The Scottish Salmon Company Ltd	Loch Sheildaig	Highland
01-Apr-15	5250	Camas an Leim (Torridon)	Marine Harvest (Scotland) Ltd	Loch Torridon	Highland
01-Mar-15	5250	Camas an Leim (Torridon)	Marine Harvest (Scotland) Ltd	Loch Torridon	Highland
01-Apr-15	5100	Isle of Ewe	Marine Harvest (Scotland) Ltd	Loch Ewe	Highland
01-Jul-08	4901	Fore Holm	Scottish Sea Farms Ltd	Sandsound Voe	Shetland Islands

Year	Emamectin Benzoate (g)
2002	12485.19
2003	29000.07
2004	44977.01
2005	33593.25
2006	36048.82
2007	61703.56
2008	62568.02
2009	51751.72
2010	60255.64
2011	70505.91
2012	73362.52
2013	59286.90
2014	65600.65
2015	71160.47
2016*	59229.12
Total	779043.65

* 2016 pro rated



		Top 20 Uses of Emamectin Benzoate (2002-2016)			
Year	**Em benz (g)**	**Site Name**	**Operator**	**Receiving Water**	**Local Authority**
01-Dec-11	1474	Vidlin North	Scottish Sea Farms Ltd	Vidlin Voe	Shetland Islands
01-Jun-04	1313	Scallastle Bay	Scottish Sea Farms Ltd	Sound of Mull	Argyll and Bute
01-Jan-13	1272	Camas an Leim (Torridon)	Marine Harvest (Scotland) Ltd	Loch Torridon	Highland
01-Dec-11	1200	Bellister	Scottish Sea Farms Ltd	Dury Voe	Shetland Islands
01-Dec-03	1190	Binna Ness	Scottish Sea Farms Ltd	Stromness Voe	Shetland Islands
01-May-12	1175	Invasion Bay	Marine Harvest (Scotland) Ltd	Loch Sunart	Highland
01-Mar-11	1088	Ardgour (Linnhe)	Marine Harvest (Scotland) Ltd	Loch Linnhe	Highland
01-Feb-13	1064	Ardgour (Linnhe)	Marine Harvest (Scotland) Ltd	Loch Linnhe	Highland
01-Jun-04	1055	Greshornish	Marine Harvest (Scotland) Ltd	Loch Snizort	Highland
01-Jul-04	1050	Eishort	Marine Harvest (Scotland) Ltd	Loch Eishort	Highland
01-Dec-04	1049	Skipport Outer (Ornish)	Marine Harvest (Scotland) Ltd	Loch Skipport	Eilean Siar
01-Aug-11	1045	Ardgour (Linnhe)	Marine Harvest (Scotland) Ltd	Loch Linnhe	Highland
01-Oct-09	1007	Druimyeon Bay	The Scottish Salmon Company Ltd	Sound of Gigha	Argyll and Bute
01-Nov-11	1001	Maol Ban	Marine Harvest (Scotland) Ltd	Inner Sound	Highland
01-Dec-04	996	Gorsten	Marine Harvest (Scotland) Ltd	Loch Linnhe	Highland
01-Aug-04	978	Duich	Marine Harvest (Scotland) Ltd	Loch Duich	Highland
01-Mar-09	975	Gorsten	Marine Harvest (Scotland) Ltd	Loch Linnhe	Highland
01-Dec-04	975	Ardgour (Linnhe)	Marine Harvest (Scotland) Ltd	Loch Linnhe	Highland
01-Jun-04	969	Skipport Outer (Ornish)	Marine Harvest (Scotland) Ltd	Loch Skipport	Eilean Siar
01-Jun-12	945	Scallastle Bay	Scottish Sea Farms Ltd	Sound of Mull	Argyll and Bute

Top 20 Sites for Mortalities (2002-2016)

Year	Morts (kg)	Site Name	Operator	Receiving Water	Local Authority
01-Dec-15	640812	Cole Deep	Grieg Seafood Shetland Ltd	Gon Firth	Shetland Islands
01-Feb-10	564900	Pegal Bay	Cooke Aquaculture Scotland	Scapa Flow	Orkney Islands
01-Oct-13	494652.3731	Portnalong	Marine Harvest (Scotland) Ltd	Loch Bracadale	Highland
01-Apr-02	423165	Sand Sound, Bixter	Scottish Sea Farms Ltd	Sandsound Voe	Shetland Islands
01-Oct-14	392856.0973	Greshornish	Marine Harvest (Scotland) Ltd	Loch Snizort	Highland
01-Oct-14	361742.2665	Marulaig Bay	Marine Harvest (Scotland) Ltd	Loch Boisdale	Eilean Siar
01-Oct-12	340000	Setterness South	Grieg Seafood Shetland Ltd	Off Lunnaness	Shetland Islands
01-Nov-14	330998.5855	Eilean Raineach	Marine Harvest (Scotland) Ltd	East Loch Tarbert	Eilean Siar
01-Aug-02	326520	Arbhair	Marine Harvest (Scotland) Ltd	Loch Leurbost	Eilean Siar
01-Aug-08	317940	Fiunary	Scottish Sea Farms Ltd	Sound of Mull	Highland
01-Nov-14	294281.1441	Greshornish	Marine Harvest (Scotland) Ltd	Loch Snizort	Highland
01-Oct-11	291056	St Molios	The Scottish Salmon Company Ltd	Lamlash Bay	North Ayrshire
01-Sep-16	289180.2091	Soay Sound	Marine Harvest (Scotland) Ltd	West Loch Tarbert	Eilean Siar
01-Nov-14	285003.843	Scotasay	Marine Harvest (Scotland) Ltd	East Loch Tarbert	Eilean Siar
01-Nov-07	271358	Chalmers Hope	Cooke Aquaculture Scotland	Scapa Flow	Orkney Islands
01-Feb-15	266341.487	Noster	Marine Harvest (Scotland) Ltd	Loch Seaforth	Eilean Siar
01-Feb-12	266000	Skewart Holm (Linga)	Grieg Seafood Shetland Ltd	Brindister Voe	Shetland Islands
01-Oct-12	260000	Collafirth Delting Site 3	Grieg Seafood Shetland Ltd	Colla Firth	Shetland Islands
01-Dec-15	257964.7395	Caolas a Deas East	Marine Harvest (Scotland) Ltd	Loch Shell	Eilean Siar
01-Nov-15	254409	Cole Deep	Grieg Seafood Shetland Ltd	Gon Firth	Shetland Islands

Top 20 Biomass Exceedances (t)

Year	Biomass Exceedence (t)	Site Name	Operator	Maximum Biomass Allowed (t)	Receiving Water	Local Authority
01-Jul-02	827	East of Hildasay	Scottish Sea Farms Ltd	1500	The Deeps	Shetland Islands
01-Mar-14	800	Poll na Gille	Marine Harvest (Scotland) Ltd	1500	Sound of Jura	Argyll and Bute
01-Feb-14	778	Poll na Gille	Marine Harvest (Scotland) Ltd	1500	Sound of Jura	Argyll and Bute
01-Mar-03	717	Mid Taing	Cooke Aquaculture Scotland	500	Gruting Voe	Shetland Islands
01-Jan-14	682	Poll na Gille	Marine Harvest (Scotland) Ltd	1500	Sound of Jura	Argyll and Bute
01-Feb-03	675	Mid Taing	Cooke Aquaculture Scotland	500	Gruting Voe	Shetland Islands
01-Jan-02	581	Mid Loch Shell / Pairc - West (A & B cage groups)	Marine Harvest (Scotland) Ltd	1331	Loch Shell	Eilean Siar
01-Jun-03	573	Dales Voe (South)	Hunter Salmon	100	Dales Voe, Delting	Shetland Islands
01-Apr-10	569	Maol Ban	Marine Harvest (Scotland) Ltd	2250	Inner Sound	Highland
01-Aug-07	565	Erisort, North Shore West	Marine Harvest (Scotland) Ltd	1650	Loch Erisort	Eilean Siar
01-Dec-12	549	Callert (Leven)	Marine Harvest (Scotland) Ltd	1450	Loch Leven	Highland
01-Jun-02	517	East of Hildasay	Scottish Sea Farms Ltd	1500	The Deeps	Shetland Islands
01-Nov-07	514	Erisort, North Shore West	Marine Harvest (Scotland) Ltd	1650	Loch Erisort	Eilean Siar
01-Jun-07	508	Ardgour (Linnhe)	Marine Harvest (Scotland) Ltd	2500	Loch Linnhe	Highland
01-Aug-02	505	East of Hildasay	Scottish Sea Farms Ltd	1500	The Deeps	Shetland Islands
01-Oct-07	495	Erisort, North Shore West	Marine Harvest (Scotland) Ltd	1650	Loch Erisort	Eilean Siar
01-Feb-02	491	Mid Loch Shell / Pairc - West (A & B cage groups)	Marine Harvest (Scotland) Ltd	1331	Loch Shell	Eilean Siar
01-Jun-08	485	Wick of Belmont North	Cooke Aquaculture Scotland	1720	Bluemull Sound	Shetland Islands
01-Aug-07	482	Isle of Ewe	Marine Harvest (Scotland) Ltd	1027	Loch Ewe	Highland
01-May-03	480	Dales Voe (South)	Hunter Salmon	100	Dales Voe, Delting	Shetland Islands

Sourced from a FOI reply from SEPA on 9 December 2016:

Sent: 09 December 2016 14:44
To: 'Salmonfarmingkills@gmail.com'
Subject: ACCESS TO INFORMATION REQUEST - F0187034 - PROVISION OF DATA

Attached: 161208 monthly biomass and treatment reports data extract.xlsx (7 MB); 161208 sealice in treatment residues data extract.xlsx (181 KB); 161209 fish farm annual emissions data.xlsx (433 KB); 161209 fish farm licence conditions.xlsx (124 KB); F0187034 Data information sheet.docx (922 KB)

Email dstaniford@gaaia.org for more details

[2] Scientific Backgrounder: Ecotoxicity & Chemical Resistance

The toxic chemicals used on salmon farms - specifically labelled by chemical manufacturers as "Marine Pollutants" - were designed for use in terrestrial farming systems to kill pests on land with specific caution that they are "very toxic to aquatic organisms" and hence must not be used near waterways let alone in the sea on salmon farms (read more via "Silent Spring of the Sea").

The chemicals used on salmon farms target and are designed to kill sea lice parasites which are crustaceans. "Deltamethrin is a potent biocide, which formulated as AlphaMax is designed to kill small crustaceans in the form of sea lice," admitted SEPA in 2008. You therefore do not need to be a rocket scientist to work out that chemicals designed to kill sea lice can also kill lobsters and other shellfish (read more via "Silent Spring of the Sea"; "Scottish Salmon's 'Silent Spring of the Sea'"; and "New Scientific Paper: Salmon Farming Chemical Kills Lobsters!!").

The salmon farming industry's increasing dependence on toxic chemicals has led to drug resistance as well as significant environmental concerns (read more via "Drug resistance in sea lice: a threat to salmonid aquaculture" published in Trends in Parasitology in 2015; "Chemical use in salmon aquaculture: a review of current practices and possible environmental effects" published by WWF in 2008 and "A Review and Assessment of Environmental Risk of Chemicals Used for the Treatment of Sea Lice Infestations of Cultured Salmon" published in Environmental Effects of Marine Finfish Aquaculture in 2005).

Chemical resistance has been reported since the 1980s when sea lice developed resistance to the organophoshate Dichlorvos and salmon farmers responded by developing more lethal weapons in the 'war on sea lice' (read more via 'Silent Spring of the Sea'). A chemicals 'arms race' has been waged ever since as salmon farmers fight a losing battle against their nemesis - the sea louse (read more via "Sea lice - a never ending battle"; "Sea lice resistance to chemotherapeutants" and "Plague of 'Super-Lice' Threatens Wild Salmon"). Scientific papers reported sea lice resistance to Azamethiphos in 2004, Deltamethrin and Cypermethrin in 2005 and Emamectin benzoate in 2008.

A scientific paper - "Repeated sublethal exposures to the sea lice pesticide Salmosan® (azamethiphos) on adult male lobsters (Homarus americanus) causes neuromuscular dysfunction, hypoxia, metabolic disturbances and mortality" - published in Ecotoxicology and Environmental Safety in December 2016 adds to the weight of scientific evidence detailing lethal and sub-lethal impacts of Azamethiphos on lobsters and in mussels (read more via "Sublethal impact of short term exposure to the organophosphate pesticide azamethiphos in the marine mollusc Mytilus edulis" published in Marine Pollution Bulletin in 2006; "Seasonal lethality of the organophosphate pesticide, azamethiphos to female American lobster" published in Ecotoxicology and Environmental Safety in 2005; "The lethality of Salmosan (Azamethiphos) to American lobster (Homarus americanus) larvae, postlarvae, and adults" published in Ecotoxicology and Environmental Safety in 1999; and "The effects of cypermethrin (Excis) and azamethiphos (Salmosan) on lobster Homarus americanus H. Milne Edwards larvae in a laboratory study" published in Aquaculture Research in 1999).

Resistance to Azamethiphos has been reported for over a decade (read more via "Mechanism behind Resistance against the Organophosphate Azamethiphos in Salmon Lice (*Lepeophtheirus salmonis*)" published in PLoS One in 2015; "Evidence for occurrence of an organophosphate-resistant type of acetylcholinesterase in strains of sea lice (Lepeophtheirus salmonis Krøyer)" published in Pest Management Science in 2004; and "Analysis and management of resistance to chemotherapeutants in salmon lice, Lepeophtheirus salmonis (Copepoda: Caligidae)" published in Pest Management Science in 2002).

Emamectin benzoate use is increasing (up from 34 kg in 2005 to 71 kg in 2015) and not surprisingly the scientific community is reporting resistance issues (read more via "Transcriptomic responses to emamectin benzoate in Pacific and Atlantic Canada salmon lice Lepeophtheirus salmonis with differing levels of drug resistance" published in Evolutionary Applications in 2015; "Emamectin benzoate resistance and fitness in laboratory reared salmon lice (Lepeophtheirus salmonis)" published in Aquaculture in 2013; and "The Efficacy of Emamectin Benzoate against Infestations of Lepeophtheirus salmonis on Farmed Atlantic Salmon (Salmo salar L) in Scotland, 2002–2006" published in PLos One in 2008).

The ecological impacts of Emamectin benzoate have long been recognized by the scientific community (read more via "Joint Action Effects of Emamectin Benzoate and Cypermethrin on the Marine Copepod Tigriopus californicus" published in Ursidae in 2016; "Toxic Effects of Antiparasitic Pesticides Used by the Salmon Industry in the Marine Amphipod Monocorophium insidiosum" published in Archives of Environmental Contamination and Toxicology in 2014; "Effect of emamectin benzoate on the molt cycle of ovigerous American lobsters Homarus americanus is influenced by the dosing regimen" published in Aquatic Biology in 2010; "Chemical use in salmon aquaculture: A review of current practices and possible environmental effects" published in Aquaculture in 2010; "Environmental effects of the anti-sea lice (Copepoda: Caligidae) therapeutant emamectin benzoate under commercial use conditions in the marine environment" published in Aquaculture in 2006; "Relationship between dose of emamectin benzoate and molting response of ovigerous American lobsters (Homarus americanus)" published in Ecotoxicology and Environmental Safety in 2007; "Acute toxicity of emamectin benzoate (SLICE™) in fish feed to American lobster, Homarus americanus" published in Aquaculture Research in 2004; and "Toxicity of emamectin benzoate in commercial fish feed to adults of the spot prawn and dungeness crab" published in OCEANS 2003).

Whilst the use of Cypermethrin ceased in 2012 (due to resistance issues) the use of Deltamethrin has taken over but there are now resistance concerns to both Deltamethrin and Azamethiphos (read more via: "Surveillance of the Sensitivity towards Antiparasitic Bath-Treatments in the Salmon Louse (Lepeophtheirus salmonis)" published in PLoS One in 2016; "Mechanism behind Resistance against the Organophosphate Azamethiphos in Salmon Lice (*Lepeophtheirus salmonis*)" published in PLoS One in 2015; and "Determination of reduced sensitivity in sea lice (Lepeophtheirus salmonis Krøyer) against the pyrethroid deltamethrin using bioassays and probit modelling" published in Aquaculture in 2003).

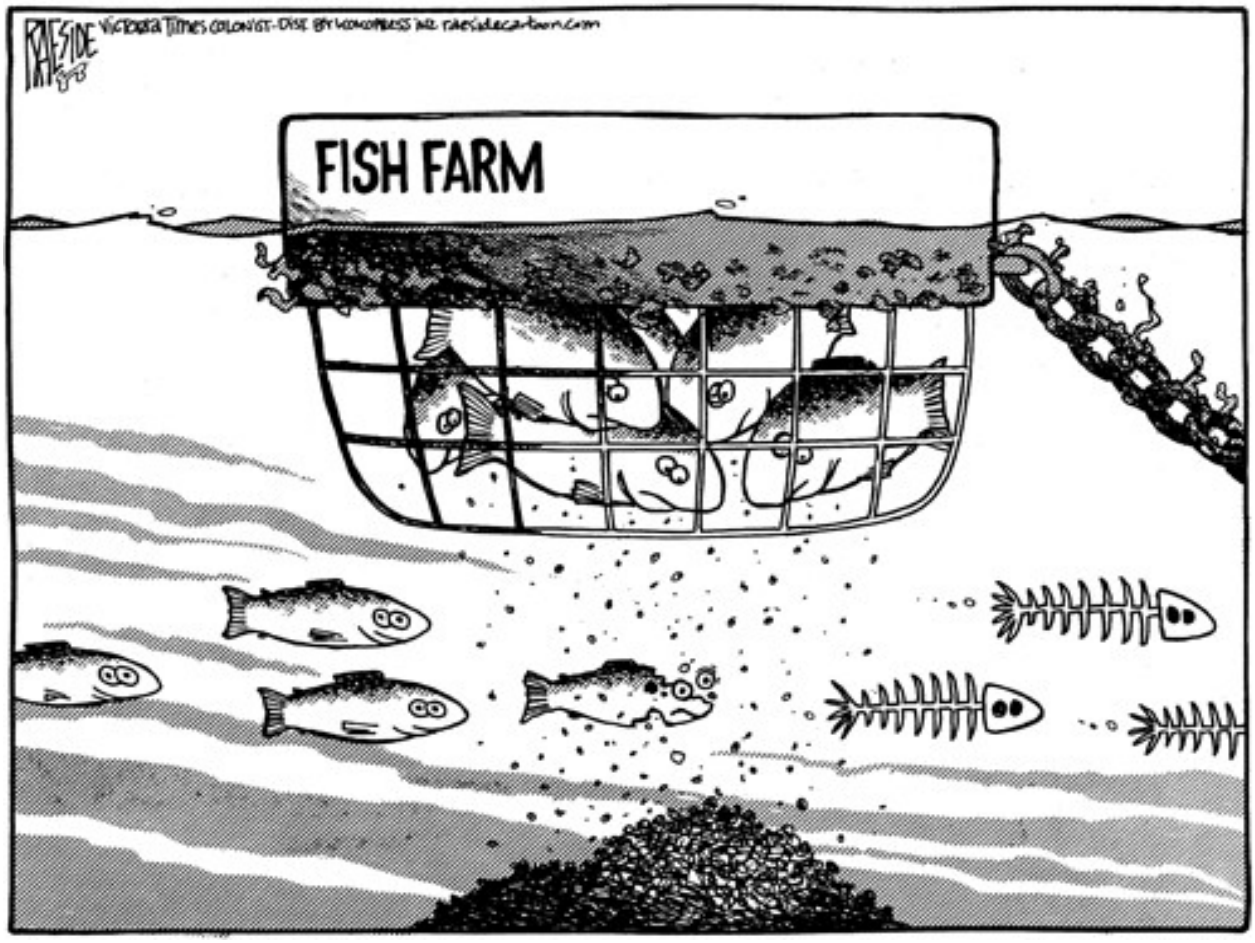
Scientific research has reported that Cypermethrin can impact on the reproductive functions of wild salmon as well as impacts on shellfish (read more via "The effects of a synthetic pyrethroid pesticide on some aspects of reproduction in Atlantic salmon" published in Aquatic Toxicology in 2001; "Cypermethrin induces glutathione S-transferase activity in the shore crab") published in Marine Environmental Research in 2002; "Effects of cypermethrin on marine plankton communities: a simulated field study using mesocosms" published in Ecotoxicology and Environmental Safety in 2004; "Toxicity of the aquaculture pesticide cypermethrin to planktonic marine copepods" published in Aquaculture Research in 2004).

The use of Deltamethrin has also caused concerns regarding ecosystem impacts on non-target species such as shellfish (read more via "Dispersion and toxicity to non-target crustaceans of azamethiphos and deltamethrin after sea lice treatments on farmed salmon, Salmo salar" published in Aquaculture in 2014; and "Toxic Effects of Antiparasitic Pesticides Used by the Salmon Industry in the Marine Amphipod Monocorophium insidiosum" published in Archives of Environmental Contamination and Toxicology in 2014).

The use of Teflubenzuron ceased in 2014 due to scientific concerns regarding lethal and sub-lethal impacts on lobsters (read more via "Transcriptional responses to teflubenzuron exposure in European lobster" published in Aquatic Toxicology in 2015 and "Mortality and deformities in European lobster juveniles exposed to the anti-parasitic drug teflubenzuron" published in Aquatic Toxicology in 2014) and negative media coverage on Teflubenzuron persistency in sediments (read more via "Fish company investigated after salmon farm pollutes Scottish loch" published in The Guardian in 2013; "Pesticides from salmon farms

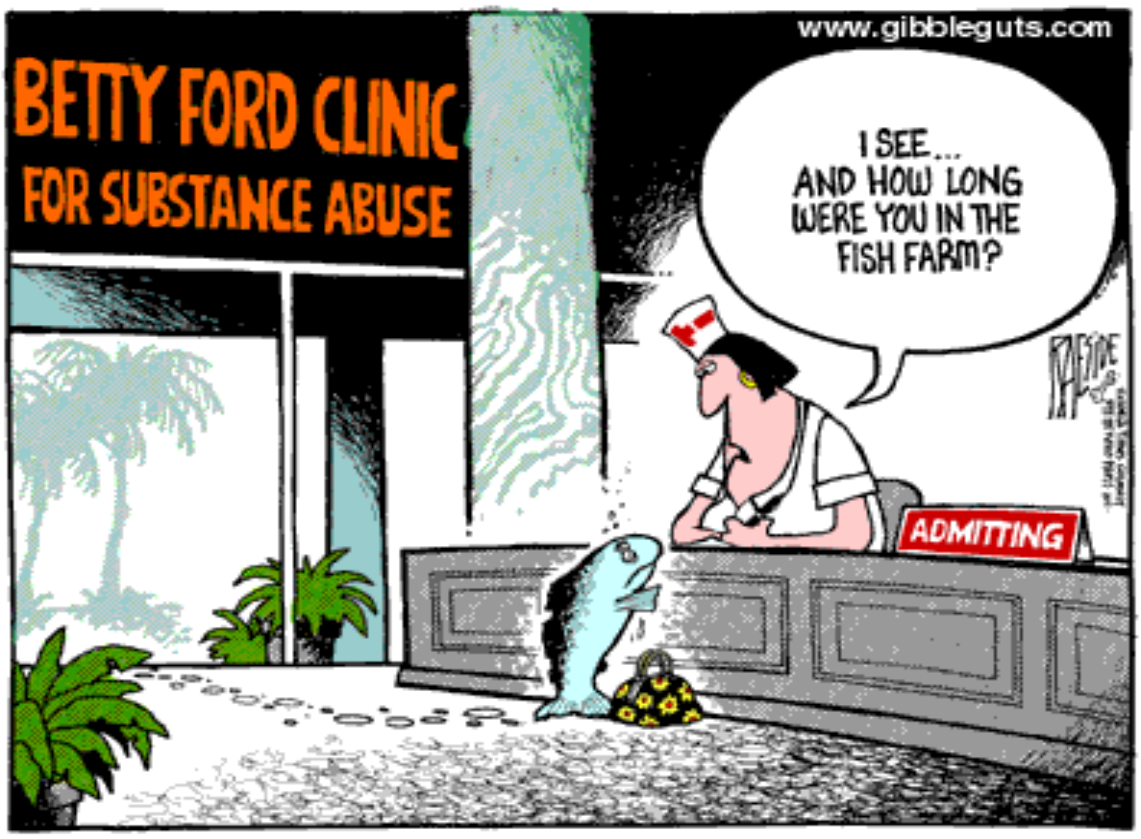
poison Scotland's lochs" published in The Sunday Herald in 2013; "'Dynamite' report reveals fish pollution" published in The Sunday Herald in 2001 and "Shellfish at risk from sea louse 'cure'" published in The Sunday Herald in 2000).

In 2015 Teflubenzuron was withdrawn from the market "after scientists found that that it can leak into lochs and kill crabs, shrimps and lobsters" (read "Salmon farm drug that kills wildlife to be withdrawn from market" and "The drug that's meant to save Salmon but is killing the creatures on the Ocean floor" published in The Sunday Herald in 2015). "SEPA should now ban all the other toxic chemicals used on salmon farms which kill shellfish," said Don Staniford of GAAIA in The Sunday Herald. "Teflubenzuron is just one of the lethal cocktail of chemicals used by Scotland's toxic salmon farming industry".



Read more background on the environmental and public health impacts of chemical use in salmon farming via "Silent Spring of the Sea" (a chapter in the award-winning book 'A Stain Upon the Sea').

[3] Media Backgrounder: Scotland's 'Silent Spring' of the Sea



Scottish salmon farming has been awash with toxic chemicals since its inception in the 1970s - first via the carcinogenic organophosphate Dichlorvos (read more via "Effect of Neguvon® and Nuvan® treatment on crabs (Cancer pagurus, C. maenas), lobster (Homarus gammarus) and blue mussel (Mytilus edulis)" published in Aquaculture in 1987; "Toxicity of dichlorvos to larvae of the common lobster and herring" published by the Department of Agriculture & Fisheries for Scotland in 1990; "Lice licence" published in New Scientist in 1990; "Threshold toxicity and repeated exposure studies of dichlorvos to the larvae of the common lobster" published in Aquatic Toxicology in 1996; "Fly Spray Ban Urged as Cancer Fears Rise" published in The Sunday Herald in 2002 and "Sea lice, Nuvan and Dichlorvos").

In the 1990s, Scottish salmon farms opened the floodgate to the lethal Ivermectin, the organophosphate Azamethiphos and synthetic pyrethroid Cypermethrin (read more via "Salmon farmers win licence to kill"; "Conservationists against ivermectin in salmon farming"; "Official decision imminent on "alarming" salmon pesticide"; "New fish farm pesticides to flood Scottish lochs" and "Leaping in the dark - farmed salmon").

The toxic marine pollutant Emamectin benzoate was first approved in Scotland in 2000 (read more via "Emamectin benzoate") with Deltamethrin approved in 2008 (read more via "Guidance note on the licensing of discharges of AMX (deltamethrin) at marine cage fish farms").

In 1986, New Scientist reported that salmon farmers in Scotland were illegally using the 'dangerous' and "highly toxic" chemical Dichlorvos (read more via "Farmers misuse pesticide" and "Nuvan use in salmon farming - the antithesis of the Precautionary Principle").

In 1989, New Scientist reported that Dichlorvos use on Scottish salmon farms was causing cataracts in the eyes of wild fish (read more via "Science: Pesticide causes cataracts in salmon").

In 1989, New Scientist reported that 'cleaner-fish' could replace Dichlorvos as a treatment for killing sea lice (read more via "Science: Salmon farmers put 'cleaner fish' on the payroll"). The 'news' that cleaner-fish could be the magic bullet has been reported with increasing frequency ever since as the use of toxic chemicals has sky-rocketed (read more via "Could wrasse help salmon fish farms thrive in Scotland?" by BBC News in 2011; "Western Isles salmon farm in wrasse 'first'" by BBC News in 2012; "'Cleaner fish' eat salmon parasites" by BBC News in 2013; "Cleaner-fish keep salmon healthy by eating lice" by BBC News in 2015).

In the 1990s, scientific concerns were raised about the toxic impacts of Ivermectin (read more via "Risks to the Environment from Ivermectin use on marine fish farms"; "The effects of ivermectin, used to control sea lice on caged farmed salmonids, on infaunal polychaetes"; "Acute toxicity of ivermectin to the lugworm Arenicola marina"; "Use of ivermectin in marine fish farms: Some concerns"; "Conservationists against ivermectin in salmon farming" and "Sea lice and ivermectin").

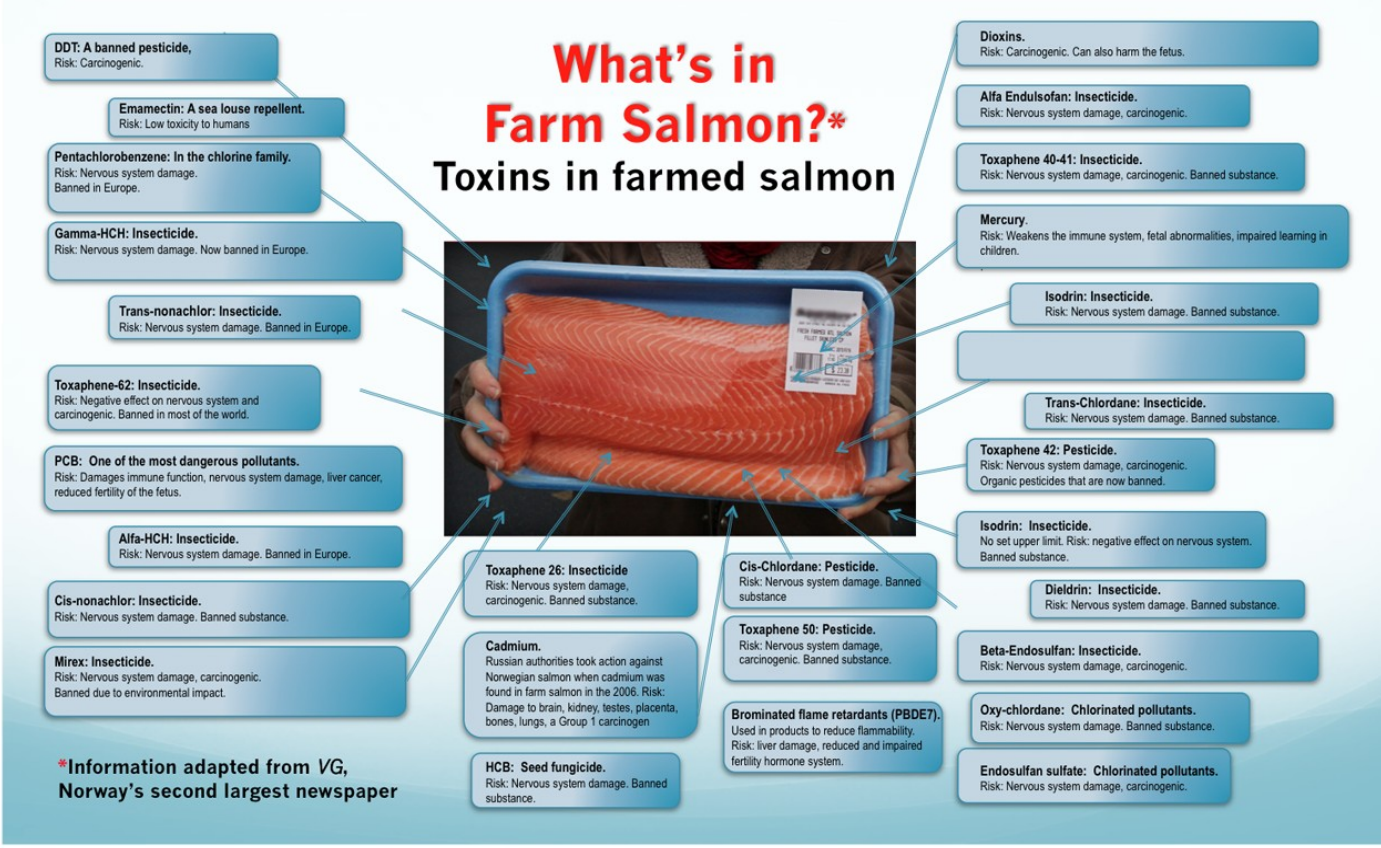
In 1996, the German newspaper Die Zeit reported Ivermectin contamination of Scottish farmed salmon (read more via "Germans shift panic on British food to salmon").

In 1996, New Scientist reported: "Surveys by the Veterinary Medicines Directorate of the Ministry of Agriculture, Fisheries and Food over the past three years have detected ivermectin in up to 10 per cent of the salmon on sale in Britain. In 1994, a fish farm in Shetland had its quality control mark withdrawn after traces of ivermectin were found in its salmon. One fish farm in Wester Ross was fined £500 for failing to record the use of ivermectin in 1993 and another was cautioned in 1992 after the chemical was found in its fish feed" (read more via "Salmon farmers win licence to kill").

In 1997, New Scientist reported that Azamethiphos - "ten times as toxic as Dichlorvos" - and Cypernethrin - "extremely toxic to crustacea" - would soon be used by salmon farms around Scotland "because lice are gaining resistance (to Dichlorvos")" (read more via "New fish farm pesticides to flood Scottish lochs").

In 2000, The Observer reported: "Some of Britain's most prestigious salmon farmers have been accused of using illegal toxic chemicals, which experts claim destroy the marine environment and endanger human health" (read more via "'Illegal poison' used on salmon"). Following testimony from whistleblowers, Ardessie Salmon was kicked out of the Scottish salmon farming industry's Tartan Quality Mark scheme (read more via "Illegal chemical 'used on salmon'" and "Salmon producer kicked out" published by BBC News in 2000).

In 2000, The Independent reported: "In July, one company was expelled from SQS and stripped of its "Tartan Quality Mark" after two former workers signed affidavits alleging that the company had illegally used two toxic chemicals - ivermectin and cypermethrin - to combat sea-lice. Ten days ago, the Veterinary Medicines Directorate (VMD) said it had found levels of ivermectin, a banned neuroinsecticide, four times above official "action levels" in three samples of farmed salmon out of the 30 fish tested" (read more via "Scottish salmon farming revolution that has left the seas awash with toxic chemicals").



In 2001, The Observer reported: "In September, it emerged that a study by the Veterinary Medicines Directorate had found traces of the banned toxic neuroinsecticide Ivermectin in samples of farmed salmon at levels up to four times the legal limit. The residues, found in three of 30 fish tested as part of the VMD's routine surveillance scheme, have sparked an investigation by the Ministry of Agriculture, Fisheries and Food's legal branch and the Scottish Environmental Protection Agency. The owners of the farms involved, which have not been identified, may face prosecution" (read more via "How the King of Fish is being farmed to death").

In 2001, The Sunday Herald reported: "A controversial pesticide approved for use on 61 salmon farms in Scotland is classed as a highly toxic marine pollutant and can still be found in sediment on the sea bed nearly two years after use, according to documents revealed this week. The previously unpublished reports also reveal that the chemical Teflubenzuron - administered to fish in a coating on their feed - is hugely inefficient, with as little as 5% being absorbed by the fish. The remaining 95% is excreted straight into the sea. Teflubenzuron, marketed under the name Calicide by aquaculture company Nutreco, was approved for use in 1998 by the Scottish Environment Protection Agency" (read more via "'Dynamite' report reveals fish pollution" and "Shellfish at risk from sea louse 'cure'"). A critical review written by 'Deep Trout' in 2000 pointed out that: "the manufacturers state that teflubenzuron is: 1. Dangerous for the environment; 2. Very toxic to aquatic organisms; 3. May cause adverse long term effects in the environment" (read more via 'Calicide - a critique of its proposed licence by SEPA as a sea lice control agent in salmonid aquaculture').

In 2001, BBC News reported that "UK scientists are calling for urgent research to be carried out into the safety of farmed salmon after research showed some fish contain worrying levels of potentially dangerous chemicals" (read more via "Farmed salmon 'contaminated'").

In 2001, a report by Friends of the Earth Scotland catalogued toxic chemical use on Scottish salmon farms. BBC News reported: "According to the report, The One That Got Away, the number of jobs in salmon production has declined from 1,491 in 1989 to 1,304 by 1999. However, the number of salmon farm chemical licences issued by the Scottish Environment Protection Agency has risen from 49 in 1998 to 474 last year" (read more via "Salmon farming under fire" and "FoE blasts fish farming").

In 2001, ENDS Report reported that chemical company Schering Plough - manufacturer of Emamectin benzoate - were lobbying for the fast-tracking of chemical use in Scotland (read more via "Chemical firm pressures SEPA over fish farm pesticide").

In 2002, a report presented to the European Parliament's Committee on Fisheries included: "The European Medicines Evaluation Agency openly concedes that “the proposed use of Azamethiphos in fish farming means that deliberate contamination of the environment will occur” (EMEA: 1999) yet in Scotland over 700 licences to use cypermethrin, azamethiphos, teflubenzuron and emamectin have been issued since 1998 (Merritt: 2002). The decision to licence them is based more on economic expediency than consumer or environmental safety and is tantamount to state-sponsored pollution" (read more via "Sea cage fish farming: an evaluation of environmental and public health aspects (the five fundamental flaws of sea cage fish farming)").

In 2002, a survey by the Pesticide Residues Committee found DDT, hexachlorobenzene and chlordane in 99% of fresh farmed salmon (read more via "Sunday Herald labels farmed salmon from Tesco's, Safeway, Asda, M&S and Sainsbury's as the "most contaminated food on the shelf"'). The Sunday Herald reported: "Farmed salmon is the most contaminated food sold by British supermarkets, according to a new analysis by government advisors" (read more via "Farm salmon is now most contaminated food on shelf").

In 2002, ENDS Report reported that: "Setterness Salmon has been fined £6,000 for illegal use of a veterinary medicine and causing the discharge of the chemical to coastal waters. The company subsequently announced its withdrawal from an industry quality assurance scheme" (read more via "Fish farm convicted for illegal chemical use", "Hefty fine for Shetland salmon farm which used illegal chemicals" and "Salmon farmers condemn firm").

In 2002, The Scotsman reported that "the number of licences to use chemicals agreed by SEPA has increased sevenfold in the past four years" (read more via "Salmon farms 'a licence to pollute'").

In 2003, The Sunday Herald reported: "Since 1996, there have been a total of 51 pollution incidents at fish farms. In every year until 2002, the number of incidents has been between five and seven. But in 2002-03, it leapt to 13. Concentrated in the northwest, the incidents included leaks of fish sewage, fungi and oil. According to Sepa, one of the worst incidents, on the Morvern peninsula by the Sound of Mull in September, resulted in "sewage fungus blanketing the River Rannoch". At Loch Erisort on the Isle of Lewis in August there were "decaying salmon" floating in the loch after a net allegedly burst. While on the River Ailort, west of Fort William, in December, there were "prominent fungal growths" and "scum deposits". Incidents in previous years included "grease heavily coating cages" in Loch Hourn, Knoydart; "blood water leaking into the harbour" at Portree, Skye; and reports of sea lochs being "turned red" near Tarbert, Harris. In November 2001, at Wharry Burn, Dunblane, there was a complaint about "green foam" caused by the use of a cancer-causing chemical, malachite green, to clean fish cages" (read more via "Fish farming pollution is up by 100%").

In 2003, The Daily Mail reported that "One chemical, dichlorvos, used until recently as a pesticide in some salmon farms, is currently at the centre of a lawsuit from former fish farm workers in Ireland who claim they contracted testicular cancer as a result of using it. The Mail has learned that Scottish workers are planning to launch similar cases. There have been other prosecutions for the illegal use of chemicals" (read more via "Pink Poison").

In 2003, The Scotsman reported: "Residues of an illegal, highly toxic fungicide formerly used to clean fish farm cages are still being detected in salmon on sale to the public in Scotland, according to tests carried out by a government agency" (read more via "Contaminated salmon on sale to public").

In 2003, The Sunday Herald reported: "Salmon from Scottish fish farms have been banned from entering the United States because they are “filthy”, “insanitary” or contaminated with a bug that can cause fatal infections. The powerful US government watchdog, the Food and Drug Administration, has this year condemned 27 imports of smoked salmon from leading Scottish companies as unfit for human consumption" (read more via "US rejects ‘filthy’ Scottish salmon").

In 2003, Greenpeace reported that "Radioactive waste from Sellafield has been found in Scottish farmed salmon sold in major British supermarkets. The tests, conducted independently by Southampton University's oceanography centre, found low levels Technetium-99 (Tc-99) in farmed Scottish salmon sold at Sainsbury's, Tesco, Asda, Safeway, Waitrose and Marks & Spencer" (read more via "Sellafield's radioactive salmon" and "Nuclear waste from Sellafield found in supermarket salmon").

In 2004, a scientific paper - "Global Assessment of Organic Contaminants in Farmed Salmon" - published in the prestigious journal Science reported hazardous levels of polychlorinated biphenyls (PCBs), dioxins, toxaphene, dieldrin, hexachlorobenzene (HCB), lindane, heptachlor epoxide, cis-nonachlor, trans-nonachlor, gamma-chlordane, alpha-chlordane, Mirex, endrin and total DDT in farmed salmon on sale in supermarkets (read more via "Farmed Salmon More Toxic Than Wild Salmon, Study Finds" and "Spinning Farmed Salmon").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WARNING!
EATING SALMON CAN SERIOUSLY DAMAGE YOUR HEALTH NEWS, PAGE 3

THE TIMES

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The Guardian reported: "Levels of cancer-causing toxins in Scottish farmed salmon are so high that consumers are being advised not to eat more than one portion every two months to safeguard their health. Some scientists were so alarmed by the findings that they believe that young girls and women of child bearing age would be advised not to eat Scottish salmon at all for fear of causing birth defects and brain damage in their unborn children" (read more via "Cancer warning over Scottish farmed salmon"; "Scottish farmed salmon 'is full of cancer toxins'" and "Sunday papers swarm around Scottish salmon like flies around.....").


The Telegraph

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Scottish farmed salmon 'is full of cancer toxins'

A salmon farm on Loch Linnhe, near Fort William

By Roger Highfield, Science Editor

In 2004, The Daily Mail reported: "The Scottish salmon farming industry faces a sales ban and fines after traces of a cancer-risk chemical was discovered in the fish. Malachite green, a cheap disinfectant treatment for eggs and young fish, was banned in June 2002 but traces of

the chemical are still being found in up to 19 per cent of farmed salmon" (read more via "New salmon cancer scare").


Daily Scottish Mail

NEWSPAPER OF THE YEAR 40p

'ONLY EAT SALMON THREE TIMES A YEAR'

SCIENTISTS issued a devastating new warning last night about the safety of Scottish farmed salmon.

By Sean Poulter
Consumer Affairs Correspondent

"Fears about the toxicity of malachite green are expected to be confirmed next month by US safety experts on the National Toxicity Program," reported The Independent On Sunday in 2004. "That panel is expected to state - for the first time - that it is a proven carcinogen which causes mutations. The chemical - traditionally used as a fungicide to "disinfect" fish eggs - was banned for use by fish farmers by the Government more than two years ago because of its suspected toxicity. But routine surveillance checks by the official Veterinary Medicines Directorate have continued to find high levels of the chemical in salmon and trout - fuelling suspicions that fish farmers are using it illegally" (read more via "'Toxic' salmon faces EU-wide sales ban").

In 2004, The Daily Mail reported "In a survey of farmed salmon on sale at major stores, samples from Morrisons contained malachite green, a chemical banned in Britain in 2002 amid concerns that it might trigger cancer" (read more via "Cancer-link chemical in store salmon").

In 2004, data obtained via FOI from SEPA by the Salmon Farm Protest Group revealed that "there are now ca. 1,400 licences for the use of Azamethiphos, Cypermethrin, Dichlorvos, Emamectin Benzoate, Formalin and Teflubenzuron on Scottish salmon, cod and halibut farms". Moreover: "SEPA concede that since 1998 they have issued 311 licences for Cypermethrin, 282 for Azamethiphos, 212 for Teflubenzuron and 211 for Emamectin Benzoate (1016 in total). According to SEPA "around 20" licences are also still outstanding for the banned carcinogen Dichlorvos and the Scottish Executive admitted last year that SEPA has issued a further 360 licences for the use of Formalin since 1998" (read more via "Scotland's Toxic Toilets Revealed: "Filthy Five" flood Scottish waters with chemical wastes").

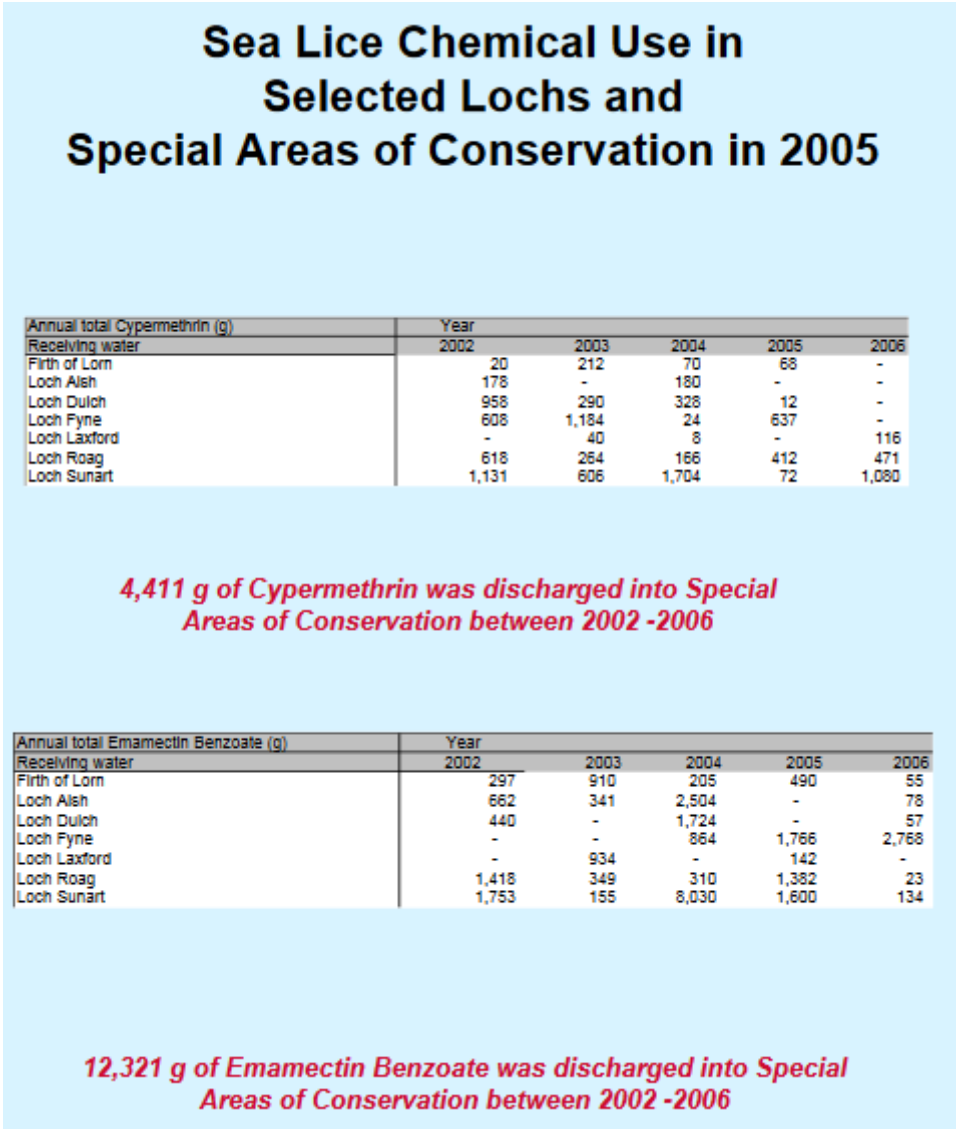
A report – "Ecological effects of sea lice medicines in Scottish sea lochs" – published by the Scottish Association of Marine Science in 2005 stated that Teflubenzuron was "highly toxic to aquatic crustacean invertebrates". The project, however, was blocked by salmon farming

companies who refused to co-operate with the scientific research (read more via "Fish farmers 'blocked' vital safety study" published in The Sunday Herald in 2002). New Scientist reported in 2002 on "the possibility of a large-scale effect that may be related to the use of chemicals on the fish farms" (read more via "Big Catch - Fish farming is flourishing at the expense of other marine life").

In 2005, ENDS Report reported that: "Two Shetland fish farms - both subsidiaries of the Norwegian multinational Marine Farms ASA - have been fined for polluting water with the sea lice treatment emamectin benzoate. The compound is authorised by the Scottish Environment Protection Agency to kill lice on salmon, but neither company held a licence" (read more via "Fish farms fined over unlicensed chemical use"). Panorama Acuicola reported: "Two Shetland fish farm companies have been fined £2000 each for illegally administering sea lice chemicals. Hoganess Salmon Ltd pled guilty at Lerwick Sheriff Court on Wednesday 6 July to polluting the Gruting Voe at Mid Taing between 2 June 2004 and 11 August 2004 by applying the chemical, emamectin benzoate (sold by Schering Plough as SLICE), to its salmon. Wester Sound Salmon Ltd admitted permitting the same chemical to enter Cloudin Site, Vaila Sound, between 2 June 2004 and 11 August 2004" (read more via "Shetland salmon farms fined for illegal use of sea lice chemical").

In 2007, The Sunday Herald reported: "Salmon farmers are again using a toxic pesticide years after it was thought to have been phased out. The chemical, Teflubenzuron, known commercially as Calicide, is given to salmon to kill sea lice parasites. A 1999 report by the Scottish Environment Protection Agency (Sepa) found Teflubenzuron to be "potentially highly toxic to any species which undergo moulting within their life cycle. This will therefore include some commercially important marine animals such as lobster, crab, shrimp and some zooplankton species." Safety reports commissioned by the manufacturer, Nutreco, revealed Calicide can still be found in sediment on the sea bed nearly two years after use" (read more via "Toxic pesticide again in use on salmon farms").

In 2008, the Pure Salmon Campaign presented data on chemical use on Scottish salmon farms from 2002 to 2006 - including use of toxic chemicals in Special Areas of Conservation:



Sea Lice Chemical Use in Selected Lochs and Special Areas of Conservation in 2005

Annual total Cypermethrin (g)	Year				
Receiving water	2002	2003	2004	2005	2006
Firth of Lorn	20	212	70	68	-
Loch Alsh	178	-	180	-	-
Loch Duich	958	290	328	12	-
Loch Fyne	608	1,184	24	637	-
Loch Laxford	-	40	8	-	116
Loch Roag	618	264	166	412	471
Loch Sunart	1,131	606	1,704	72	1,080

4,411 g of Cypermethrin was discharged into Special Areas of Conservation between 2002 -2006

Annual total Emamectin Benzoate (g)	Year				
Receiving water	2002	2003	2004	2005	2006
Firth of Lorn	297	910	205	490	55
Loch Alsh	662	341	2,504	-	78
Loch Duich	440	-	1,724	-	57
Loch Fyne	-	-	864	1,766	2,768
Loch Laxford	-	934	-	142	-
Loch Roag	1,418	349	310	1,382	23
Loch Sunart	1,753	155	8,030	1,600	134

12,321 g of Emamectin Benzoate was discharged into Special Areas of Conservation between 2002 -2006

Read more via "Scottish Farmed Salmon Exposed".

In 2009, The Scotsman reported: "In its early, buccaneering days, the salmon farming industry rewrote the definition of "cavalier". Its response to health problems among farmed salmon was bigger and better chemical warfare. An article in The Ecologist claimed that, prior to the banning in 1999 of Dichlorvos (DDVP), a pesticide linked to cancer, Scottish salmon farms used up to nine million tonnes of the stuff. Such was the reputation of salmon farming that the World Wildlife Fund labelled it a "junkie industry" (read more via "All talk and no action as fish farms kill off our wild salmon").

In 2009, Rob Edwards reported that: "A Norwegian fish farming multinational has apologised for offering to reward officials at Scotland's environment watchdog with smoked salmon for giving the go-ahead for a new toxic pesticide in record time. Marine Harvest suggested sending "some sides of smoked salmon" to staff at the Scottish Environment Protection Agency (Sepa) after they processed applications to dose salmon cages with deltamethrin in a matter of days" (read more via "Company says sorry for offering environment officials free salmon").

In 2010, the Sea Trout Group warned of a plague of 'super lice' resistant to chemicals. During 2011 and 2012, a total of 67 salmon farms breached the SSPO's thresholds for sea lice - including sites operated by Marine Harvest, Loch Duart, Grieg Seafood, The Scottish Salmon Company, Scottish Sea Farms and Wester Ross Fisheries (read more via "Plague of 'super lice' threatens wild salmon" and "Stop protecting the salmon farmers from proper scrutiny").

In 2010, Shetland News reported: "Thousands of farmed fish that died in a cage belonging to Hoganess Salmon, in Shetland, may have been treated with a chemical not approved for use by the industry" (read more via "Illegal chemical may have killed salmon").

In 2011, the Salmon & Trout Association revealed alarming results of Government inspections of Scottish salmon farms including high levels of sea-lice. In 2012, the Salmon & Trout Association reported that over 30% of salmon farms were breaching the industry's own sea-lice standards; and chemical resistance was recorded at 17% of sites.

In 2012, Rob Edwards reported via The Sunday Herald that Scottish salmon farmers are refusing to share sea lice data with the Government to avoid the damning information being released under Freedom of Information law. Rob Edwards reported further: "In one email, Norwegian-owned Marine Harvest said that releasing the information "could result in misrepresentation of the facts which would of course be damaging to our commercial interests as a company" (read more via "Keeping salmon farming problems secret" and "Salmon firms 'hiding damning reports'").

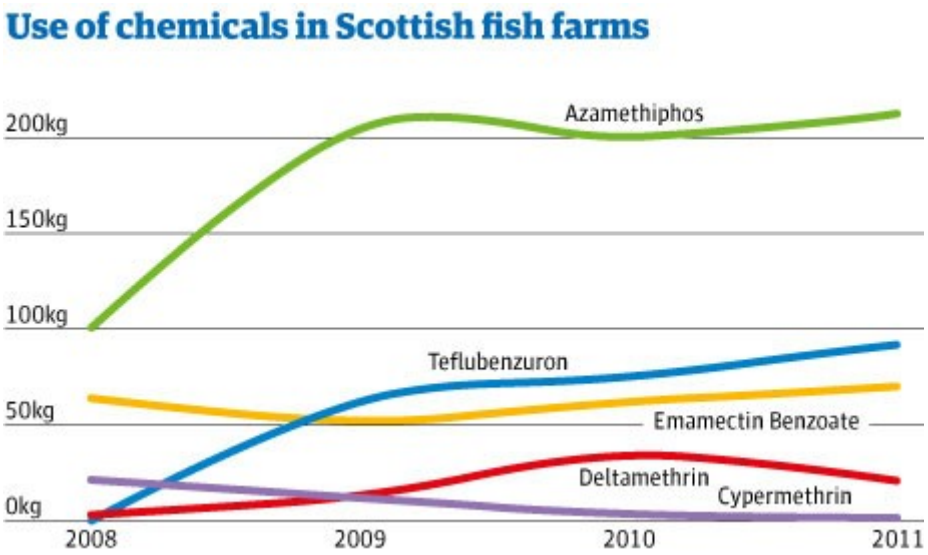
In 2011, a BBC Scotland investigation - 'Salmon: A Dirty War' - revealed a "sharp increase" in the use of toxic chemicals on salmon farms but did not name companies or sites. "Scottish government figures showed that over the past five years, the industry used a broader range of chemicals and more of them," reported BBC Scotland (read more via "Sharp rise reported in Scots fish lice chemical"). BBC Scotland reported that "The increased range of products arises because of the introduction of the new medicine AMX, containing Deltamethrin in 2008 and the reintroduction of Salmosan, containing azamethiphos, in 2007" (read more via "Q&A: Salmon lice and pesticide use"). STV News reported that "The investigation shows the use of all veterinary chemicals has risen in the last five years, some by as much as 163%. Salmon production has increased by 11.3% since 2005, according to figures" (read more via "Salmon farming industry 'using more chemicals'").

In 2012, BBC News reported that "Scottish sea lochs are being polluted by salmon farms, according to a report published by the Salmon and Trout Association. The report stated that in some cases, sea lice chemical residues had been higher than is allowed by environmental quality standards (EQS). Between 2005 and 2010, nearly 13% of sea-bed residue samples from fish farms were in excess of EQS (read more via "Salmon farms 'polluting' lochs in Scotland").

In 2012, the Scottish Wildlife Trust reported that Scottish Natural Heritage had expressed concern that chemical use could spread to the Firth of Lorn Special Area of Conservation, protected under EU law because of the rarity of its reefs (read more via "Will wildlife have to pay the price for salmon farming?"). Previously in 2002, BBC News reported contamination of the seabed around salmon farms in the Firth of Lorn (read more via "Pollution fears over fish farms" and watch a video report via "David Ainsley shows us the waste impacts of salmon farms").

In 2012, data obtained from SEPA and published via FishyLeaks revealed that Scottish salmon farmers were using record amounts of the toxic chemicals Azamethiphos, Cypermethrin, Deltamethrin, Emamectin benzoate and Teflubenzuron (read more via "Scottish Salmon's Toxic Toilets Named & Shamed!", "Chemical Culture in Scotland", "Dossier of Chemical Use on Scottish Salmon Farms 2008-2011" and "Loch Duart: TheToxic Salmon Company").

"Data released by the Scottish Environment Protection Agency (Sepa) shows a 110% increase in the use of chemicals to treat sea lice in the past four years, mainly because the parasite is becoming resistant to treatment," reported The Guardian in September 2012. "During that same period, however, salmon production has increased only by 22%, to 158,000 tonnes."



Read more via The Guardian's "Scottish fish farmers use record amounts of parasite pesticides" and "Chemicals to control salmon parasites"

The huge increase in the use of toxic chemicals on Scottish and Norwegian salmon farms prompted a complaint in 2012 by GAAIA to OSPAR regarding the UK and Norway's failure to adhere to PARCOM Recommendation 94/6 on Best Environmental Practice for the Reduction of Inputs of Potentially Toxic Chemicals from Aquaculture Use (read GAAIA's letter online here).

In 2012, GAAIA reported: "In June 2012, the Veterinary Residues Committee reported: "One sample of salmon muscle contained a residue of emamectin at a concentration of 150 µg/kg. Officers from Marine Scotland have been asked to carry out a follow-up investigation and the results will be reported to a later meeting of the Committee." In July 2011, the Veterinary Medicines Directorate reported contamination of Scottish farmed salmon with a 'pesticide screen' which included PCBs, DDT and dieldrin. Testing by the Veterinary Residues Committee in 2005 also found Emamectin benzoate in four samples of farmed salmon (read FOI dossier online here)". Marine Scotland provided a 149 page dossier of information on Emamectin contamination of Scottish farmed salmon since 2005 including cases involving Marine Harvest, Scottish Sea Farms, Skelda Salmon and the Scottish Salmon Company (read more via "Media Backgrounder: Chemical Culture in Scotland" and "Emamectin residues in farmed salmon").

In 2011, The Sunday Herald reported that "The sea lochs that line Scotland's north west coast, famed for their natural splendour, are polluted by poisonous chemicals used by fish farms, surveys by the Scottish government's green watchdog have revealed". Traces of Emamectin benzoate were found in sediment at all nine lochs tested in 2008 and 2009, including Loch Linnhe, Loch Ewe, Loch Nevis, Loch Fyne and lochs around Skye, Mull and the Summer Isles. Teflubenzuron was found at six lochs, and diflubenzuron at four (read more via "Revealed: the toxic pesticides that pollute our loch").

"Pesticides killed my business" reported The Sunday Herald in 2011 following reports by SEPA of chemical contamination near salmon farms: "I'm convinced that the prawns were killed by the chemicals used by fish farmers to treat sea lice," said creel fisherman Donald Macleod. "There's hardly any prawns to be found in Loch Shell any more unless you go some distance from the salmon cages, he claims," continued The Sunday Herald. "And prawns aren't that different from the sea lice that the chemicals are designed to kill."

20.11.11

'These chemicals destroyed my business'

DONALD Macleod knew he had a problem when he found dead prawns in the creels he used to catch live shellfish. Since then, his 20-year-old fishing business has collapsed and he has sold his boat. Two months ago, he left his native Isle of Lewis to try to make a new life in Wales.

Macleod, 43, used to fish prawns in Loch Shell on Lewis. But in 2009 he noticed that they were starting to die, and began asking questions.

Scientists from the Scottish Environment Protection Agency came to investigate, and detected traces of two fish-farming pesticides in the loch sediments. At Macleod's suggestion, they also took away some dead prawns to analyse.

Unfortunately, Sepa's Stornoway office was unable to analyse them, and it appears that they were thrown away.

"The worst thing is not knowing for sure, not being able to prove anything," Macleod says. "But I'm convinced that the prawns were killed by the chemicals used by fish farmers to treat sea lice."

There are hardly any prawns in Loch Shell now unless you go some distance from the salmon cages, he claims. Prawns are not that different from the sea lice that the chemicals are designed to kill.

"It has become obvious that fish farmers can do almost anything they want and no-one has the ability to deal with the mess they can create," Macleod says.

Read more via "Revealed: the toxic pesticides that pollute our lochs"

In 2012, the Salmon & Trout Association reported that "approximately 13% of fish-farms reported self-monitored samples to SEPA of sea-bed residues in excess of Environmental Quality Standards between 2005 and 2010" (read more via "Salmon & Trout Association exposes sea-bed pollution of Scottish sea-lochs").

In 2012, Fisheries Information Services reported: "The Scottish Salmon Company, Marine Harvest and Scottish Sea Farms are all seeing mass mortalities of up to 70 per cent in their farms" (read more via "Chlamydia and gill disease ravage Scottish salmon: GAAIA" and "Gill Disease: Scottish Salmon's Dirty Big Secret").

In 2013, the Salmon & Trout Association reported that: "Sea-bed monitoring under Scottish salmon farms reveals breaches of Environmental Quality Standards at nearly one in five fish farms for residues of sea-lice treatments toxic to lobster, crabs and prawns" (read more via "Chemical pollution of the sea-bed continues unabated under salmon farms").

In 2013, The Sunday Herald reported that "pesticides from 12 salmon farms have contaminated lochs around Scotland's coast in breach of safety limits, according to SEPA". "By far the worst pollution was found in Loch Shell on the east of Lewis near a fish farm operated by the Norwegian-owned company, Marine Harvest. There, levels of a pesticide called Teflubenzuron, were up to 455 times higher than Sepa's environmental quality standards in 2012" (read more via "Revealed: the dirty dozen salmon farms that contaminate lochs with pesticides" and "Scottish salmon's 'Silent Spring of the Sea'"). The Guardian reported in 2013: "Marine Harvest, one of the world's largest fish-farming companies, is under investigation after its salmon farms polluted a Scottish loch with toxic pesticide residues hundreds of times above environmental limits" (read more via: "Fish company investigated after salmon farm pollutes Scottish loch" and "Two fifths of Marine Harvest Scotland farms breach pesticide standards").

In 2013, GAAIA revealed that Scottish salmon farmers sanctioned the discharge of 1,400 litres of the carcinogenic chemical Formalin into a Special Area of Conservation (Loch Roag on the Isle of Lewis in the Outer Hebrides) against the advice of SEPA (read more via "Pickled Scottish Salmon, Anyone?"; "Formalin - Scottish Salmon's Toxic Solution" and "Farms turning pristine waters to 'toxic toilets'" published in The Sunday Express).

In 2013, The Sunday Herald reported that: "A mountain of 13,627 tonnes of dead fish had to be disposed of in 2012 by 230 fish farms along the west coast and on the islands, compared to 9,717 tonnes in 2011 and 7,159 tonnes in 2010" (read more via "Farmed salmon killed by disease leaps to 8.5 million").

Later in 2013, The Sunday Herald revealed that SEPA "agreed to delete information on millions of fish deaths from a public database on fish farming launched this month because the Scottish Salmon Producers' Association (SSPO) argued it would be commercially damaging" (read more via "Scottish watchdog labelled 'lapdog' after agreeing to keep fish farm deaths secret" and "Complaint over dead fish dumping forces rule change").

In 2013, the Salmon & Trout Association reported that salmon farms in Wester Ross were "nine times over the threshold set under the salmon farming industry's own Code of Good Practice" with sea trout near salmon farms infested with over 500 sea lice (read more via "Wild sea trout being 'eaten alive' by fish farm parasites in Wester Ross following farmers' failure to control lice numbers on farmed salmon" and "Fish-farm parasites eating Wester Ross trout alive").

In 2014, data obtained by GAAIA via FOI revealed a staggering increase in the use of Hydrogen peroxide. The Sunday Times reported: "More than 15m litres of treatments containing hydrogen peroxide, a key ingredient in rocket fuel and bleach, was used by Scottish salmon farms last year. The amount - enough to fill six Olympic swimming pools - was about five times more than the 2.7m litres used by the industry in 2012. In 2011, about 500,000 litres was used" (read more via "Chemical war on sea lice attacked"; "'Fighting a losing battle' Scottish salmon industry under threat from sea lice treatment"; "Increase in fish farm hydrogen peroxide use" and "Eye-watering figures reveal five-fold increase in use of Hydrogen Peroxide (H2O2) at Scottish fish farms in 2012").

The use of Hydrogen peroxide has sky-rocketed to such an extent that chemical resistance has also been reported (e.g. "First report of reduced sensitivity towards hydrogen peroxide found in the salmon louse Lepeophtheirus salmonis in Norway" published in Aquaculture Reports in 2015) as well as fish welfare impacts (read more via "H202 treatment concerns" and "Hydrogen peroxide treatment in Atlantic salmon induces stress and detoxification response in a daily manner").

In 2014, The Daily Mail reported Cypermethrin and Deltamethrin contamination of farmed salmon sold in UK supermarkets (read more via "DDT found in salmon: Pesticide discovered in farmed fish on sale in five major British supermarkets"; "Farmed & Dangerous Salmon - the most contaminated food on the supermarket shelf"; and "Supermarket Scamon: Pesticide Contamination of Farmed Salmon").

In 2014, The Sunday Times reported that the supermarket Asda (owned by Walmart) had axed Wester Ross Fisheries following reports of sea lice infestation on benthic contamination (read more via "Asda axes salmon from 'problem' WRF"; "Award-winning fish farm in pollution row" and "Campaign FOI reveals true state of Wester Ross Salmon Pollution").

In 2015, Salmon & Trout Conservation Scotland wrote to top chefs asking them to reconsider their endorsements to Loch Duart: "When it comes to sea-lice control, Loch Duart's farms in the north-west Highlands were collectively above, often very significantly above, the industry's threshold (based on the number of adult female lice per farmed fish) in no less than 31 out of the last 33 reported months. During this period there were at least 63 chemical treatments on Loch Duart's farms against sea lice, including using synthetic pyrethroid and organophosphate chemicals, but the sea-lice levels remained stubbornly high" stated the letters (read more via "S&TCS asks top chefs to examine the environmental record of salmon farmed by Loch Duart Ltd and reconsider their endorsements").

In November 2016, GAAIA revealed that 77,000 farmed salmon had been killed during 2016 by a Hydrogen peroxide treatment with a further 95,000 farmed salmon killed following treatment with a 'Thermolicer' (read more via "Daily Telegraph: "Poached alive - fish die as farm overheats water" and "Sunday Herald: "Oops: fish farm firm kills 175,000 of its salmon by accident").

Further deaths due to the Thermolicer have been reported during 2016 in Norway (read more via (e.g. "De-lousing kills 32,700 fish at Marine Harvest operation", "Mye laks dør i alternativ lusebehandling", "400.000 oppdrettsfisk døde" and "Tusenvis av laks dør etter avlusing").

In late November 2016, the Norwegian Food Safety Authority launched a new research project looking into the welfare aspects of the Thermolicer (read online here) but the Scottish Government admitted in reply to a Parliamentary Question by Mark Ruskell MSP in November 2016 that "no safety and welfare review has been carried out" (read more via "Parliamentary Questions turn up the heat on The Thermolicer!" and "Compassion in World Farming: "Scottish intensive salmon farming plumbs new depths").

Researchers in Norway now report sea lice resistance to the Thermolicer. "Like with chemical treatments it seems that any temperature tolerant parasites survive treatment and pass their genes to the next generation," said Professor Tor Horsberg in an article in Fish Farming Xpert on 5 December 2016).

In December 2016, Salmon & Trout Conservation Scotland revealed that Scottish salmon farms were still suffering from "rampant sea lice numbers". "Over the year to September 2016, regions representing a staggering 80.1% of the Scottish production of farmed salmon have been over industry criteria for at least one month in the last year," reported Salmon & Trout Conservation Scotland (read more via "Sainsbury's and the Co-Op called upon to give ultimatums to farmed salmon suppliers").