

Scotland's Seas: Towards Understanding their State – Annex 2

Topic	Descriptor(s)	Parameter/ data programme	Is info. available?	Is info. reported?	Confidence rating	Data collection frequency	Reporting frequency	Data source / who collects it?	Year(s) for which data available	Regions for which data available (Fig. 1.7 (ch.1))
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ANNEX 2

DETAILS OF THE VARIOUS MARINE MONITORING PROGRAMMES AND DATA COLLECTION SURVEYS UNDERTAKEN BY FRS, SEPA, SNH

PHYSICAL CHARACTERISTICS OF THE SEAS

Weather and Climate	Wind Speed and Air Temperature	FRS Scottish Ocean Climate Status	Yes	Yes	III	Hourly from Met Stations	Collated by FRS in the Scottish Ocean Climate Status Report on a biennial basis.	Met Office and British Atmospheric Data Centre	Average presented for 1961 – 1990 with recent measurements compared to normal. Most recent published data is 2004 and 2005	Clyde, Minches & Malin Sea (Stornoway), Shetland, East Scotland Coast (Aberdeen and Leuchars).
	Rainfall	FRS Scottish Ocean Climate Status	Yes	Yes	III	Hourly from Met Stations	Collated by FRS in the Scottish Ocean Climate Status Report on a biennial basis.	Met Office and British Atmospheric Data Centre	Average presented for 1961 – 1990 with recent measurements compared to normal. Most recent published data is 2004 and 2005	Clyde, Minches & Malin Sea (Stornoway), Shetland, East Scotland Coast (Aberdeen and Leuchars).
		Hydrometric Network Rain Gauges	Yes - data held in SEPA's HIMS database.	Data on some sites is reported to MET Office.	III	Either event intensity, or every 15 minutes.	SEPA	SEPA	Variable – depends on site	Most of Scotland

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Sea	Sea Surface Temperature	Coastal Ecosystem Monitoring	Yes	Yes	III	Weekly - Stonehaven Hourly – Loch Ewe	6 monthly	FRS	Stonehaven: 1997 – present Loch Ewe: 2002 – Present	East Scotland Coast (Stonehaven), and Minches and Malin Sea (Loch Etive).
		Inshore Coastal Long Term Monitoring	Yes	Yes	III	Hourly	6 monthly	FRS	Mallaig: 1999 – present Millport: 1953 – present Loch Maddy: 2003 – present Orkney: 1999 – present Shetland: 1999 - present Fair Isle: 2003 – present Ythan: 2005 – present Findon: 1996 – present Cromarty: 2003 – present North Berwick: 2006 - present Torridon: 2006 – present	Clyde, Minches and Malin Sea, North Scotland Coast, Shetland, Moray Firth, East Scotland Coast, Forth.

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		Routine Water Quality Monitoring Programme for Various Drivers (WFD, OSPAR, UWWTD, DSD)	Yes	No	III	Quarterly	Not reported	SEPA	1970s to present	Irish Sea, Clyde, Minches & Malin, East Scotland Coast, Forth
	Salinity	Hydrographic Stations and standard cruise thermosalinograph	Yes	Yes	III	Periodic	Periodic in conjunction with annual cruise programmes e.g. IBTS	FRS; then data transferred to BODC and ICES data centres	Hydrographic Stations: 1960 – present Thermosalinograph: 1987 - present	All regions
		Coastal Ecosystem Monitoring	Yes	Yes	III	Weekly	6 monthly	FRS	Stonehaven: 1997 – present Loch Ewe: 2002 – Present	East Scotland Coast (Stonehaven), and Minches & Malin Sea (Loch Etive).
		Inshore Coastal Long Term Monitoring	Yes	Yes	III	Weekly	6 monthly	FRS	Loch Maddy: 2003 – present Orkney: 1999 – present Shetland: 1999 – present Fair Isle: 2003 – present Ythan: 2005 – present Torridon: 2006 - present	Minches & Malin Sea, North Scotland Coast, Shetland, East Scotland Coast.

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		Offshore Ecosystem Monitoring	Yes	Yes	III	3 times per year	Annual	FRS	Faroe-Shetland Channel: 1903 – present Jonsis line (east of Orkney): 1972 - present	Faroe-Shetland Channel, West Shetland and Fladen (Jonsis line)
		Routine Water Quality Monitoring Programme for Various Drivers (WFD, OSPAR, UWWTD, DSD)	Yes	No	III	Quarterly	Not reported (used to normalise winter nutrients)	SEPA	1970s to present	Irish Sea, Clyde, Minches & Malin, East Scotland Coast, Forth
		Site Condition Monitoring – lagoons	Yes	Yes	III		Every six years	SNH	2002 - Present	Selected lagoons
	Ocean Temperature Profiles	Hydrographic Stations and standard cruise thermosalinograph	Yes	Yes	III	Periodic	Periodic in conjunction with annual cruise programmes e.g. IBTS	FRS Data transferred to BODC and ICES data centres	Hydrographic Stations: 1960 – present Thermosalinograph: 1987 - present	All regions
		Offshore Standard Oceanographic Sections	Yes	Yes	III	April/May, Sept/Oct, Dec	Annual	FRS Data transferred to BODC and ICES data centres	Faroe-Shetland Channel: 1903 – present Jonsis line (east of Orkney): 1972 – present	Faroe-Shetland Channel, West Shetland, and Fladen (Jonsis line).

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	Ocean Currents	Offshore Ecosystem Monitoring	Yes	Yes	III	Hourly	Annual	FRS Data transferred to BODC and ICES data centres	1994 - present	Faroe Shetland Channel
	Changes in Sea Level	Coastal and Estuarine Flood Warning	Yes	No	III	Every 15 mins	Not Reported	SEPA	1996-Present	Clyde
	Inputs	Freshwater Inputs from Major Rivers	Yes - data held in SEPA's HIMS database	Yes – and used to calculate OSPAR loadings	III	Every 15 minutes, converted to flow via rating curve		SEPA	Variable – depends on site	Most major Scottish rivers

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EVIDENCE FOR CLEAN AND SAFE SEAS

Microbiology	Microbial Contamination	Shellfish Microbiological Contamination Monitoring (Shellfish Hygiene Directive Classification based on <i>E. coli</i>)	Yes	Yes	III	Monthly (Maximum of 9 per year)	Annual report to the Food Standards Agency Scotland	FRS and SSQC Ltd	1992 – present	Shellfish production areas: Minches & Malin Sea, Hebrides, North Scotland Coast, West Shetland, East Shetland, Moray Firth.
	Sediment Microbiological Quality	FEPA Sewage Sludge Disposal sites Check Monitoring	Yes	Yes	II	Cyclic triennial programme	Annual	FRS (and licensees)	1985 - 1998	Forth (St Abbs Head & Bell Rock) and Clyde (Garroch Head).
	Microbiological Quality of Shellfish Flesh (sites achieving Class A or SGW guideline standard)	SEPA Shellfish Growing Waters programme	Yes	Yes	III	Quarterly	Annually	SEPA	1982-present	Clyde, Minches & Malin, North Scotland Coast, West & East Scotland Coast, Forth
	Bathing Water Quality	Bathing Waters Monitoring Programme	Yes	Yes	III	20x during the Summer Season (1/4-15/9)	Annually	SEPA	1987-present	Clyde, Minches & Malin, North Scotland Coast, Moray Firth, East Scotland Coast, Forth
Eutrophication	CSEMP Determinants	CSEMP Monitoring Programme (Comprehensive	Yes	Yes	III	SEPA – rolling monitoring	Every few years. Nutrients	MERMAN/FRS, SEPA,	2001 – present	Areas designated under the OSPAR Comprehensive

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		Procedure and EU Directive Assessments)				programme	data are routinely reported, but other parameters (e.g. chl. & phytoplankton) not routinely reported			Procedure
		Winter Nutrient Time Series	Yes	Data submitted to MERMAN & ICES	III	Annual	Annual	FRS	2001 – present	Coastal around Scotland – Irish Sea, Clyde, Minches & Malin Sea, Hebrides, North Scotland Coast, West Shetland, East Shetland, Fladen, Moray Firth, East Scotland Coast, Forth.
	Sea Loch Nutrient 'Hotspot' Monitoring	Nutrients and ratios, chlorophyll, temperature, salinity, dissolved oxygen, phytoplankton, macroalgal cover	Yes	1. OSPAR 2. FRS UKAS archive	III	Winter, spring and summer surveys in 2002, 2004 and 2005. Winter only in 2003	Winter, spring and summer surveys in 2002, 2004 and 2005. Winter only in 2003	FRS and SEPA	2002 - 2006	Sea lochs in Minches & Malin Sea and Hebrides and Voes in East and West Shetland.
Litter	Bathing Waters Directive	Component of aesthetics monitoring.	Yes	Yes	II	During Bathing Waters season.	Annual	SEPA	1996-present	Most coastal areas

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Integrated classification	Integrated Water Quality	Estuary & Coastal Waters Classification Scheme (now WFD)	Yes	Yes	III	Annual	Annual	SEPA	1985-2006	Forth & Clyde estuaries & most coastal areas
Contaminants in the environment	Prevalence of Externally Visible Fish Disease and Liver Neoplasia/Hyperplasia	East coast dab contaminant and disease monitoring programme PAH, Bile metabolites, EROD	Yes	Yes, annually to ICES	II	Annual	Annual	FRS Contaminants Database ICES Database (Fish disease)	2000 – present	North Scotland Coast (Fair Isle), Moray Firth, Forth (St Abbs Head & Bell Rock) and Forties (Marr Bank).
	Concentrations of Naturally Occurring Substances and Xenobiotics	Clyde Trend Monitoring: PAHs, CBs, metals in fish liver, Bile metabolites, EROD,	Yes	Yes through FRS Reports and Journals	III	Annual	Biennial	FRS Contaminants database	Garroch Head and Pladda – 1993 - present Four additional Clyde Sites and two reference sites – 1999 – present	Clyde Reference Sites – Minches & Malin Sea (Colonsay and Broad Bay).
	Contaminant Concentrations in Sediment	Clyde Trend Monitoring: Hazardous Substances	Yes	Yes through FRS Reports and Journals	III	Annual	Biennial	FRS Contaminants database	Garroch Head and Pladda – 1993 - present Four additional Clyde Sites and two reference sites – 1999 – present	Clyde Reference Sites – Minches & Malin Sea (Colonsay and Broad Bay).
		CSEMP Monitoring Programme:	Yes	Yes, annually to OSPAR	II	Annual	Annual	FRS UKAS Archive FRS Contamin-	1999 – present	Initially 6 sites covering Irish Sea, Clyde, Minches & Malin Sea, Moray

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		PAHs, CBs, PBDEs, metals						ants Database MERMAN ICES Database		Firth and East Scotland Coast. Revision includes East & West Shetland and Fladen.
		PAHs in Coastal sediments	Yes	Yes	III	Periodic	Periodic	FRS	1997 - 2001	Shetland, North Scotland Coast (Orkney), Moray Firth and Minches and Malin Sea.
		Hydrocarbons in Offshore Sediments	Yes	Yes	III	Periodic	Periodic	FRS	1986 - 2002	East Shetland, Fladen
	Contaminants in Deep Sea Fish	Deep sea fish Contaminant Monitoring Programme	Yes	Yes	III	Annual	Annual	FRS	2006 - present	Rockall
	Imposex	Imposex in Marine Gastropods	Yes	Yes	III	Every 2 – 3 years in Sullom Voe; Every 3 – 5 years at other Scottish sites Annual rolling programme (SEPA)	Every 2 – 3 years in Sullom Voe; Every 3 – 5 years at other Scottish sites	ICES Database FRS and other e.g. SOTEAG, reports SEPA	Periodic 1987 - present	West Shetland (Sullom Voe) Irish Sea, Clyde, Minches and Malin Sea, North Scotland Coast, Moray Firth, East Scotland Coast, Forth

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	Dredge Spoil Quality	FEPA Check Monitoring	Yes	Yes	II	Rolling annual programme	Annually to OSPAR	FRS in conjunction with FEPA Licensees	1990 – present	23 ports currently licensed around Scottish coast including islands
	Sediment Chemical Quality	FEPA Sea Disposal Site Check Monitoring	Yes	Yes	II	Rolling annual programme	Annually	FRS	1990 – present	23 sea disposal sites around Scottish coast including islands
		FEPA Sewage Sludge Disposal sites Check Monitoring	Yes	Yes	II	Cyclic triennial programme	Annual	FRS (and licensees)	1975 - 1998	Forth (St Abbs Head & Bell Rock) and Clyde (Garroch Head).
	Sediments in Biota and Water Column	CSEMP Benthic and Sediment Contaminant Background Monitoring: Waters - EQS Compliance for DSD (now WFD Operational); sediments - DSD standstill monitoring NMMP/ CSEMP (and WFD Surveillance); Biota – DSD standstill monitoring (now WFD Operational), Shellfish Directive and Mussel Watch	Yes	Yes	III	Waters Quarterly; sediments & biota annually	Annually to MERMAN	SEPA	Waters EQS Compliance 1987-Present; Sediments 1987-Present; Biota 1982-Present	Clyde, Minches & Malin, North Scotland Coast, West & East Shetland, Moray Firth, East Scotland Coast, Forth

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	Eco-Toxicology for Problem Discharges	Direct Toxicity Assessment of discharges	Yes	Yes	II	Every 2 months	Annually	SEPA	1998-Present	Clyde, North Scotland Coast, East Scotland Coast, Forth
Radioactivity	Radioactivity in the marine environment	Radioactivity monitoring programme for Scotland	Yes	Yes	III	Annual	Annual	SEPA	1996-present	Clyde, Minches & Malin, North Scotland Coast, Forth Estuary, East Scotland Coast
Contaminants in food	Contaminants in seafood	Shellfish Contaminants Monitoring Programme (Shellfish Hygiene) Metals: Cr, Mn, Co, Ni, Cu, Zn, As, Se, Ag, Cd, Hg, Pd. Organics: PAHs, CBs, OCPs	Yes	Yes	III	Following each sampling programme	Following each sampling programme	FRS Contaminants database; FSAS	Broken 2002 2004 2006	Coastal from shellfish production areas and other <i>ad hoc</i> monitoring for the FSAS e.g. following the <i>Jambo grounding</i>
		Reference mussel monitoring for hazardous substances; OSPAR Hazardous Substances Strategy PAHs and CBs	Yes	Yes through FRS Reports	III	Monthly	Annual	FRS Contaminants database	Loch Etive – 1999 - present Loch Ewe, Bute, Shell Bay and Aberdeen – 2005 - present	Clyde, Minches & Malin Sea and Forth. PBDEs also measured at East Scotland Coast (Aberdeen).

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Shellfish Toxins	Toxic Phytoplankton (Focus on <i>Alexandrium</i> spp., <i>Dinophysis</i> spp., <i>Pseudo-nitzschia</i> spp., <i>Prorocentrum lima</i> and <i>Lingulodinium polyedrum</i>)	Shellfish Contaminants Monitoring Programme (Shellfish Hygiene)	Yes	Yes	II	March to October – weekly November to February – monthly	Annual report published on FSA website	FRS	1994 - 2005	Coastal with a focus on: Minches & Malin Sea, Hebrides, North Scotland Coast, West Shetland, East Shetland.
	Concentrations of PSP, DSP, and ASP	Shellfish Contaminants Monitoring Programme (Shellfish Hygiene Directive and subsequent legislation)	Yes	Yes	II	Summer – weekly Winter – fortnightly or monthly	Annual Reports. Since 2001 this programme funded by FSAS from whom reports are available	Pre-1996 – Food Science Laboratory Torry Post 1996 - FRS	Start Dates 1990 – PSP 1992 – DSP 1999 – ASP Programme ended at FRS in 2005	Mainly coastal with a focus on Minches & Malin Sea, Hebrides, North Scotland Coast, West Shetland, East Shetland. Some sites (e.g. offshore scallops) on east coast.
	Concentrations of Lipophilic Toxins	Passive Adsorption of Lipophilic Toxins onto Resins and Mussels	Yes	Yes	I	Weekly	EC Annual Reports	FRS	2005 – ongoing for Loch Ewe 2007 – ongoing for Loch Torridon	Minches & Malin Sea (Lochs Ewe and Torridon).
		Surveillance of Lipophilic Shellfish Toxins	Yes	Yes	I	Random, 'opportunistic' sampling	Report to the FSA	FRS	2003	Scottish coastal areas

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EVIDENCE FOR HEALTHY AND BIOLOGICALLY DIVERSE SEAS

Ecosystem Functioning and Climate Regulation	Sea Surface Temperature	See 'Physical Characteristics of the Seas' tables					See 'Physical Characteristics of the Seas' tables				
	Species as indicators of change	Site Condition Monitoring/Common Standards Monitoring of biological communities at selected sites	Yes	Yes	III		Every six years	SNH	2000 - Present		
		Offshore biological monitoring – <i>Calanus finmarchicus</i> abundance	Yes	Yes	II	Annually (Dec)	Periodic	FRS	1995 - present	Faroe-Shetland Channel	
		Inshore ecosystem monitoring: phytoplankton community (including toxic species) zooplankton community chlorophyll nutrients temperature salinity	Yes	Yes	II	Weekly	6 monthly	FRS	Stonehaven: 1997 – present Loch Ewe: 2000 – present (phytoplankton) 2002 – present	East Scotland Coast (Stonehaven) and Minches & Malin Sea (Loch Etive)	

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		Phytoplankton community time series (including toxic species)	Yes	Yes	III	Weekly	6 monthly	FRS	Millport: 2005 – present Loch Maddy: 2003 – present Orkney: 2000 – present Shetland: 2000 - present	Clyde (Millport), Minches & Malin Sea (Loch Maddy), North Scotland Coast (Orkney) and West Shetland.
		Sandeel stocks	Yes	Yes	III	Annually	Annually	FRS	1997-present 1985 - 2007	Wee Bankie Shetland
		Benthic community studies in relation to temporal trends (NMMP/ CSEMP)	Yes	Yes	III	Annually	Annually	SEPA	1993-Present	Clyde, Moray Firth, East Scotland Coast, Forth
		CSEMP Sediment toxicity testing	Yes	Yes	II	Annually	Annually	SEPA	1999-Present	Clyde, Forth, Moray Firth
	Species as indicators of pollution e.g. organic	Site Condition Monitoring/Common Standards Monitoring at selected locations	Yes	Yes	III		Every six years	SNH	2000 - Present	

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		Benthic community studies in relation to discharges, dredge spoil grounds, sludge dumping sites and marine caged fish farms	Yes	No	III	Every 3 years	Not reported	SEPA	1974-Present	Clyde, Forth, Minches & Malin, East Scotland Coast
		Imposex Monitoring (OSPAR)	Yes	Yes	III	Every 3 years	Annual	SEPA	1989-Present	Clyde, Minches & Malin, West & East Shetland, Moray Firth, East Scotland Coast, Forth
	Seabed erosion and sediment type change	Site Condition Monitoring/Common Standards Monitoring: Particle size analyses of intertidal and subtidal sediments along transects at selected locations	Yes	Yes	III		Every six years	SNH	2000 - Present	
Distribution and Quality of Marine Habitats	Observed damage (e.g. trawl/dredge tracks)	Site Condition Monitoring/Common Standards Monitoring	Yes	Yes	III		Every six years	SNH	2000 - Present	Selected sites

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	Extent of habitats (area)	Site Condition Monitoring of extent of <i>Serpula vermicularis</i> reef, <i>Modiolus modiolus</i> beds, Seagrass beds, Maerl and <i>Lophelia pertusa</i>	Yes	Yes	III		Every six years	SNH	2000 - Present	
	Distribution, extent and character of landscapes/ habitats	Site Condition Monitoring/Common Standards Monitoring on the extent/density of foxtail stonewort <i>Lamprothamnium papulosum</i> .	Yes	Yes	III		Every six years	SNH	2000 - Present	

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		Site Condition Monitoring/ Common Standards Monitoring on the species abundance/ composition of communities associated with <i>Serpula vermicularis</i> reefs, <i>Modiolus modiolus</i> beds, seagrass beds, maerl, rocky reef, subtidal and intertidal sediments, marine caves and <i>Lophelia pertusa</i> .	Yes	Yes	III		Every six years	SNH	2000 - Present	
Species Abundance and Distribution	Benthic Monitoring	UKMMAS Benthic data set	Yes	Yes	II	Annual	Periodic	FRS	2001 - Present	Irish Sea, Clyde, Minches and Malin Sea, Moray Firth, East Coast Scotland
		MAFCONS	Yes	Yes	II	Annual	Periodic	FRS	2001 - 2004	East Coast Scotland, Forties, Moray Firth, Fladen, East Shetland, West Shetland, North Scotland Coast, Minches and Malin Seas, Hebrides, Clyde, Irish Sea

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	Fish stock assessment	Commercial fish and shellfish landings – Amount and Effort	Yes	Yes	II	Variable depending on vessels, markets, area	Annual	Scottish Fisheries Protection Agency (SFPA) FRS receives copies	1960s – present (1900 – 1960 on paper)	Main fishing areas by ICES Statistical rectangle
		Commercial fish and shellfish landings – Biological data	Yes	Yes	II	Variable – monthly or quarterly	Quarterly	FRS	1960s – present (1900 – 1960 on paper)	Main fishing areas – stock dependent
		Commercial and Non-commercial Fish and Shellfish Discards (Observer Programme)	Yes	Yes	II		Annual	FRS	1975 - present	Main fishing areas
		Commercial and non-commercial fish and shellfish – distribution, abundance and biological data	Yes	Yes	II	By cruise. Variable depending on species. Some biannual, some annual	By cruise	FRS	1970 – present (1900 – 1970 on paper)	Surveys designed to national and international (ICES) programmes which are related to fish distributions
		Assessment of presence and absence of fish species	Yes	No	II	Quarterly/ Biannually	Not Reported	SEPA	1974-Present	Clyde, Forth
		Assessment of fish species at cooling water intakes	Yes	Yes	I	Quarterly	Periodically	SEPA	1982-Present	Clyde, Forth

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DETAILS OF THE VARIOUS MARINE MONITORING PROGRAMMES AND DATA COLLECTION SURVEYS UNDERTAKEN BY THE WIDER COMMUNITY

PHYSICAL CHARACTERISTICS OF THE SEAS

Weather and Climate	NAO Winter Index		Yes				CRU, UEA	1821-2007	Difference in pressure between Gibraltar & Reykjavik
	Wind Direction	Marine Automatic Weather Station Network	Yes	Yes	III	Collected 3 hourly; reported on BBC Weather Centre Web Site	Met Office	- present	West Shetland, North Scotland Coast (Orkney).
	Wind Speed	FRS Scottish Ocean Climate Status	Yes	Yes	III	Collected hourly & reported biennially.	Met Office and British Atmospheric Data Centre	Average presented for 1961 – 1990. Most recent published data is 2004 and 2005	Clyde, Minches & Malin Sea (Stornoway), Shetland, East Scotland Coast (Aberdeen and Leuchars).
	Air Temperature	Marine Automatic Weather Station Network	Yes	Yes	III	Collected 3 hourly; reported on BBC Weather Centre Web Site	Met Office	- present	West Shetland, North Scotland Coast (Orkney).

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		FRS Scottish Ocean Climate Status	Yes	Yes	III	Collected hourly & reported biennially.	Met Office and British Atmospheric Data Centre	Average presented for 1961 – 1990. Most recent published data is 2004 and 2005	Clyde, Minches & Malin Sea (Stornoway), Shetland, East Scotland Coast (Aberdeen and Leuchars).
	Rainfall	FRS Scottish Ocean Climate Status	Yes	Yes	III	Collected hourly & reported biennially.	Met Office and British Atmospheric Data Centre	Average presented for 1961 – 1990. Most recent published data is 2004 and 2005	Clyde, Minches & Malin Sea (Stornoway), Shetland, East Scotland Coast (Aberdeen and Leuchars).
	Bottom pressure	Gravity Recovery And Climate Experiment (GRACE)					NASA (via POL)	2002 - Present	
		Historical	Yes				Institute of Oceanographic Sciences	1980s	
Sea	pH		Yes				ICES Oceanographic Data Centre	1907 - Present	
	Sea Temperature	Sub-tidal (6-18m) seawater temperature Tiree Passage current meter mooring	Yes	Yes	III	Hourly	SAMS	1981- Present	Clyde and Minches & Malin Sea.

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		Surface (< 10m)	Yes				ICES Oceanographic Data Centre	- Present	
		Marine Automatic Weather Station Network	Yes	Yes	III	Collected 3 hourly; reported on BBC Weather Centre Web Site	Met Office	- present	Faroe Shetland Channel.
	Salinity	Surface (< 10m)	Yes				ICES Oceanographic Data Centre		
			Yes				POL		
	Thermo-haline profile (Ellett line and extended Ellett line oceanographic section)	Surface to seabed				3 or 4 times a year	SAMS	1975-1996	Minches & Malin Sea, Hebrides and Rockall.
	Circulation	Hindcast model for depth-averaged currents; MAIA monitoring inflows				Periodically updated	POL	1955 - 2007	
		Tiree Passage current meter mooring	Yes	Yes	III	Hourly	SAMS	1981-Present	Clyde and Minches & Malin Sea
	Sediment concentration & transport						Satellite Observing Systems Ltd		

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	Changes in Sea Level and Seabed	Permanent Service for Mean Sea Level and Hindcast model	Yes			Monthly	POL	1955 - Present	
		UK Tide Gauge	Yes			Daily, with 3 month delay	POL – national tidal and sea level facility	1915 - Present	
Waves	Waves	WAVSAT	Yes			Daily	Satellite Observing Systems Ltd, POL	1985 - Present	All
	Wave height	University of Aberdeen and Aberdeen City Council	Yes	Yes	II	Continuous	University of Aberdeen	2007 - Present	East Coast Scotland (Aberdeen)
		Marine Automatic Weather Station Network	Yes	Yes	III	Collected 3 hourly; reported on BBC Weather Centre Web Site	Met Office	- present	Faroe Shetland Channel
	Wave period	Marine Automatic Weather Station Network	Yes	Yes	III	Collected 3 hourly; reported on BBC Weather Centre Web Site	Met Office	- present	Faroe Shetland Channel

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	Surf	UK Observer Programme	Yes	Yes	II	Collected daily, reported on the BBC Weather Centre Web site	Surf Observer Programme	- present	East Coast Scotland (Aberdeen) and Hebrides (Lewis)

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EVIDENCE FOR CLEAN AND SAFE SEAS

Microbiology	Increase in sites achieving Class A or SGW guideline standard	Shellfish hygiene programme	Yes; raw microbiological results only available to relevant stakeholders	Yes	III	Classification results reported annually.	FSA Scotland	2007	Sites vary on annual basis
							Integrin Advanced Biosystems Ltd		
							Shetland Seafood Quality Control		
Eutrophication	CSEMP determinants	CSEMP Monitoring Programme (Comprehensive Procedure and EU Directive Assessments)	Yes	Nutrients data are routinely reported, but other parameters (e.g. chl. & phytoplankton) not routinely reported	III	Every few years	MERMAN/FRS, SEPA,		
	Plankton	Continuous Plankton Recorder		In annual Ecological Status Reports	III	Monthly	SAHFOS	1946 - Present	All

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	Phytoplankton	Remote sensing of ocean colour	Yes – freely available via NASA websites	No – not routinely	II – problems with Case 2 waters	Weekly / Monthly	Satellite Observing Systems (NASA/ NOAA)	1998 - Present	All, but resolution limits near coastal areas
Litter	Beach Monitoring	MCS beachwatch survey	Yes	Beachwatch report		Annually	MCS	- Present	Irish Sea, Clyde, Minches & Malin Sea, Moray Firth, East Scotland Coast and Forth.
	Offshore Water Monitoring	CSEMP	Yes	No, 2 years of data reported in Cefas MEMR	III	Not regularly	Cefas		Offshore Waters
		KIMO Fishing for Litter				Continuously	KIMO	2005-2008	Landed into harbours in regions – Minches and Malin Sea, Hebrides, North Scotland Coast, East & West Shetland, Moray Firth, East Scotland Coast and Forth.
	Marine Mammal stranding autopsy reports	UK Cetacean Strandings Investigation Programme					Zoological Society of London		

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		(CSIP)							
	Concentrations of microplastic litter	Sand and sediment samples					Plymouth University		
Contaminants in the environment	Inputs	CAMP, RID	Yes Yes	Yes Yes	II	Annually to OSPAR	Various monitoring authorities/ Defra collates and reports to OSPAR		
		Oil and Gas, Accidents, Munitions	Yes	Yes	II	Annually	ACOPS		
		Dumping of waste oil at sea					Satellite Observing Systems		
	Hydrocarbons in sediment	Shetland Oil Terminal Environmental Advisory Group (SOTEAG)	Yes	Yes	III	Bi-annual	SOTEAG and contractors		West Shetland (Sullom Voe)
	Contaminants in animal tissues	Contaminants in Seals (including grey seal condition monitoring programme)	Yes			Annually/ ad-hoc depending on region and species of seal	SMRU		Grey seals in North Scotland Coast and Forth; Ad-hoc for harbour seals

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Contaminants in food	Contaminants in seafood	Shellfish hygiene programme: monitoring of chemical contaminants in new harvesting areas	Yes	Yes	III		FSA Scotland	2006 - Present	Sites vary on annual basis
		Chemical contaminants survey programme: research/ surveys commissioned on ad-hoc basis.	Yes	Yes	I	On completion of surveys	FSA UK		Retail surveys- not possible to trace to region therefore may not be relevant
		Chemical contaminants survey programme: shellfish monitoring at harvesting sites.	Yes	Yes	II		FSA Scotland	Biannual: 2001-2006	Sites vary
		Feedstuffs programme	NA	NA	0	NA	FSA		
Shellfish Toxins	Toxic Phytoplankton	Shellfish hygiene programme	Yes	Yes	II	Weekly to industry and LAs; also published on FSA website.	FSA Scotland	2005-2007	Sites vary on annual basis

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		Toxic Phytoplankton Monitoring Programme (Shellfish Hygiene)	Yes	Yes	III	Weekly since 2005	SAMS	2005-Present	Coastal with a focus on west coast, Western Isles and Northern Isles
							CEFAS and Integrin Advanced Biosystems Ltd		

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EVIDENCE FOR HEALTHY AND BIOLOGICALLY DIVERSE SEAS

Ecosystem Functioning and Climate Regulation	Long-Term Mean Sea Level	See 'Physical Characteristics of the Seas' tables				See 'Physical Characteristics of the Seas' tables			
	Sea Surface Temperature	See 'Physical Characteristics of the Seas' tables				See 'Physical Characteristics of the Seas' tables			
	Wave Height	See 'Physical Characteristics of the Seas' tables				See 'Physical Characteristics of the Seas' tables			
	Species as indicators of change	Wetland Bird Survey (WeBS)	Yes			Monthly	BTO, Wildfowl & Wetlands Trust, RSPB, JNCC		
		Surveys of Scottish sea bird populations on small islands	Yes			Annually (breeding)	SAMS	1982-Present	Minches & Malin Sea.
		Seabird Monitoring Programme (SMP) of 26 species	Yes			Monthly & annually	JNCC, RSPB, SOTEAG		Key sites: Minches & Malin Sea (Canna), East Shetland (Fair Isle) and Forth (Isle of May. Triennial for North Scotland Coast.
		Marine Mammals (including grey seal condition monitoring programme)	Yes			Annually	JNCC, SMRU		Coastal, including North Scotland Coast, Forth
Intertidal species	Yes	Yes	III	10+ yearly	SAMS, MBA	1950-55	Irish Sea, Clyde, Minches & Malin		

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								2001-04	Sea, Hebrides, North Scotland Coast and East Scotland Coast.	
	Species as indicators of pollution						University of Aberdeen, Glasgow Caledonian University and University of Stirling			
	Concentrations of contaminants in animal tissues	Contaminants in Seals (including grey seal condition monitoring programme)	Yes			Annually/ ad-hoc depending on region.	SMRU		Annually for grey seals in North Scotland Coast and Forth; Ad-hoc elsewhere for grey and harbour seals	
	Nutrients (winter nutrient max, total nitrogen, nitrate:phosphate ratio)	See 'Clean Safe Scottish Seas' tables					See 'Clean Safe Scottish Seas' tables			
	Seabirds, Rocky shore species, Macrobenthos, Endocrine disruptive effects in marine snails	Shetland Oil Terminal Environmental Advisory Group (SOTEAG)	Yes	Yes	III	Annual	SOTEAG and contractors (including FRS)	1978-present	West Shetland (Sullom Voe) and East Shetland.	

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Distribution and Quality of Marine Habitats	Biodiversity	Deep Sea Benthos Biodiversity and Morphology	Yes			Annually	SAMS	1973-Present	Rockall.
			Yes	Yes	III		NOCS	1996, 1998, 1999, 2000, 2002	Rockall, Bailey, Faroe-Shetland Channel and West Shetland.
		Seamounts	Yes	Yes	III	Reports written	SAMS, UoP,	2005 - 2006	Hebrides, Rockall and Bailey.
		Deep-sea benthic surveys of the Rockall Trough region	Yes	Yes	III	Papers published as data analysed	SAMS	1973 – 1990's, 2005 present	Hebrides and Rockall.
		Faunal surveys of the Faroe-Shetland Channel	Yes	Yes	III	Papers published as data analysed	SAMS, NOCS	1996, 1998, 2000, 2006, present	Faroe-Shetland Channel and West Shetland.
		Surveying cold water coral in the Minch	Yes	Yes	III	Papers published as data analysed	SAMS	2000 - present	Minches & Malin Sea.
Species Abundance and Distribution	Population studies	Bivalve surveys	Yes			Monthly	SAMS	1977-1983	West and east coasts
		Population densities and growth rates of juvenile fishes in shallow sandy nursery areas				Monthly during season	SAMS	1972-Present (broken)	Clyde and Minches & Malin Sea.
		Wetland Bird	Yes			Monthly	BTO, Wildlife &		

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		Survey (WeBS)					Wetlands Trust, RSPB, JNCC		
		Goose and Swan Monitoring (GSMP)					Wildfowl & Wetlands Trust, JNCC		
		Seabirds at Sea					JNCC		
		Annual Survey of Grey Seal Pup Production	Yes			Annually during breeding period (Oct-Nov)	SMRU	1962-Present	Minches & Malin Sea, Hebrides, North Scotland Coast, East & West Shetland, Moray Firth and Forth.
		Estimation of Harbour Seal Population Size	Yes			5 yearly during moult (Aug); some areas annually if required	SMRU	1988-Present	Irish Sea, Clyde, Minches & Malin Sea, Hebrides, North Scotland Coast, East & West Shetland, Moray Firth, East Scotland Coast and Forth.
		Cetacean abundance					CODA via SMRU	2007 -	All

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			Yes	Yes	II	1995 and 2005 in summer	Small Cetacean Abundance in the European Atlantic and North Sea (SCANS) via SMRU	1995 & 2005	In 1995: North Scotland Coast, Faroe-Shetland Channel, East & West Shetland, Fladen, Moray Firth, Forties and Forth. All in 2005.	
	Broadscale survey as indicator of climate change	Broadscale surveys of rocky shore community structure	Yes	Yes	III	5 yearly	SAMS	2001-Present	Irish Sea, Clyde, Minches and Malin Sea, Hebrides, North Scotland Coast and East Scotland Coast.	
	Amount of marine litter e.g. loss of fishing gear	See 'Clean Safe Seas' tables					See 'Clean Safe Seas' tables			
	Ghost fishing i.e. loss of gear and litter on seabed- disease	Cetacean bycatch	Yes				SMRU	1999-Present		

Confidence rating used: III – High; II – Good / satisfactory; I – Low; 0 – no assessment possible.

Year(s) for which data available: If year included that is when programme ends; 'Present' indicates that data will be collected beyond 2007.