RV/Industry SURVEYS

	Survey Name	Lead Person	When	Repeated	Vessel	Aim
1.	Clyde Acoustic Pelagic Survey (CLYDAS)	Susan Lusseau (MSS)	November (2013 cancelled)	Annually	Alba	Principal target is Clyde herring, but have also looked at pelagic juvenile whiting, sprats and euphausids
2.	West Coast Q4 Scottish Groundfish Survey (IBTS WCQ4)	Liz Clarke (MSS) Finlay Burns (MSS)	November	Annually	Scotia	Part of West Coast wide groundfish survey – 3 stations in Clyde
3.	West Coast Q1 Scottish Groundfish Survey (IBTS WCQ1)	Finlay Burns (MSS)	February	Annually	Scotia	Part of West Coast wide groundfish survey – 3 stations in Clyde
4.	Nephrops TV Survey	Adrian Weetman (MSS)	May / June	Annually	Scotia	Surveys Clyde Nephrops grounds – part of wider survey ca. 40 randomly generated stations on mud in Clyde (2 to 3 days in area) Aims: 1) To obtain estimates of the abundance and distribution of *Nephrops* burrow complexes 2) To record the occurrence of other benthic fauna and commercial trawl activity.3) To collect sediment samples at each station 4) To carry out trawling for *Nephrops*, to obtain samples of *Nephrops* for size composition, reproductive condition and morphometric analyses.
5.	Clyde Clean and Safe Seas Survey	Craig Robinson (MSS)	November	Annually	Alba	Survey of sediment and biota contaminants for Scottish Marine Atlas, UKMMAS and MSFD assessments
6.	Clyde Demersal fish survey	CFA with support of SFF and St Andrews University (Simon Northridge). Co-funded by Marine Scotland	March September	Annually (for 5 years) 2016-2021	TR2 vessel skipper John Brown (mid-water sampling expected to be included in later survey)	The survey uses a commercial bottom trawl with a blinder to sample 4-5 geographical regions of the Clyde with randomly selected trawl stations within each strata. The surveys has the following objectives: 1. To collect data on the geographical distribution and relative catch rates of demersal fish. 2. To collect length composition data for demersal species To collect sex and maturity data for cod, haddock and whiting.
7.	Arran Juvenile Demersal Fish Survey (AJDFS)	David Bailey's group (Sophie Elliott, Natasha Walker-Milne and others, Glasgow)	July – October	2013-14, 2018-19	COAST RIB Actinia, Commercial vessels	Relative abundance, distribution and behaviours of juvenile demersal fish. Seabed habitat mapping and assessment of benthic biodiversity.

	Survey Name	Lead Person	When	Repeated	Vessel	Aim
8.	Clyde Industry / Science White Fish Survey (CISWFS)	Bill Turrell (MSS) Peter Gibson (MSS)	February	One Off 2014	1 x TR2 vessels	- To map the distribution of adult white fish in the Clyde in November, by age and species - To arrive at a survey based estimate of abundance, by species - To collect a small sub-set of representative stomach samples
9.	West Coast Inshore Industry Science Surveys (WCIISS)	Nick Bailey (MSS)	September 2013 November 2013 March 2014 June 2014 September 2014 November 2014	Quarterly 2013 2014	1 x TR2 vessels who have undertaken fish sampling training (2 other vessels outside Clyde)	- To provide data on inshore fish populations
10.	Industry Survey - Cod Spawning Area	St Andrews Univ.	March	One Off 2016	1 x TR2 vessel	The CFA in collaboration with the Scottish Fishermen's Federation (SFF) proposed, designed and agreed to fund a survey with the overall aim of improving the current understanding of different aspects of the cod population within the Firth of Clyde. The SFF helped with all aspects related to the survey design and data collection protocols. The survey was designed primarily to address three specific pre-agreed objectives: 1. To collect data on the geographical distribution and relative catch rates of cod within the seasonal closure area. 2. To investigate the vertical distribution of cod within the water column. 3. To provide baseline data for future survey comparability.
11.	Soft sediment community and biogeochemistry	Matt Pace and David Bailey (Glasgow) Mike Heath (Strathclyde) Bill Turrell (MSS) David Donnan (SNH)	April 2017 (SJM) October 2017 (Alba) Requested for 2018	2 per year 2017 2018	Sir John Murray Alba na Mara	Objectives: 1. To map spatial distribution of sediment characteristics, infaunal composition, pore-water nutrients and organic matter content within the Firth of Clyde. 2. To map the relationship between mean particle grain size and permeability/porosity in the Firth of Clyde. 3. Determine how this relationship is this modified by fishing activity and bioturbation potential.

	Survey Name	Lead Person	When	Repeated	Vessel	Aim
		Bhavani Narayanaswamy (SAMS)				
12.	S Arran MPA Survey	Phil Boulcott Matt Gubbins	October	One Off 2017	Alba	1617A- To conduct further assessments of PMF abundance within the South Arran MPA and areas outside.
13.	Clyde MPA fish trap and BRUV surveys	Phil Boulcott	November 2017	Repeated in 2018 and beyond	Fishing charter vessels (Lady Nicola, 2017)	EMFF funded project to use fishing vessels for MPA survey. Fish traps to determine changes in fish abundance related to management measures in MPAs. Data provided to University of Glasgow and combined into Arran Juvenile Demersal Fish Survey (AJDFS)
14.	EU WFD Transitional Water Fish	Myles O'Reilly (SEPA)	September 2016	Every 3rd year (but 2019 sampling postponed)	SV Sir John Murray/ SV Iona	Assess and classify the transitional fish community of the Clyde Estuary.
15.	Whiting distribution	Neil Burns (Glasgow), with Peter Wright (MSS) and David Bailey (Glasgow)	West Coast Inshore Industry Science Surveys (WCIISS)			Mapped distribution of whiting at different life history stages and identify connectivity between areas occupied by juveniles and adults. Project covers whole of the west coast.
16.	PMF distribution	Gillian O'Flaherty, with Neil Burns and David Bailey (Glasgow)	Based on GEMS database	n/a	n/a	Aims to map distributions of PMF covered by review and determine whether depth or distance-based measures make sense. Project covers whole of Scotland.
17.	Wrasse fisheries	Neil Burns and David Bailey (Glasgow)	Arran Juvenile Demersal Fish Survey (AJDFS)			Aims to assess habitat requirements of wrasse species targeted by commercial fishers as cleaner fish.
18.	Clyde Scallop survey 1719A	Lynda Blackadder	30th September – 18th		MRV *Alba na Mara*	Objectives: 1. To carry out a dredge survey of king scallops in the Clyde, collect various biological data of king scallops and samples for

	Survey Name	Lead Person	When	Repeated	Vessel	Aim
			October 2019			genetic and hazardous substance testing, by-catch information and camera trials is conditions allow.
19.	Lamlash Bay NTZ and South Arran MPA crustacean surveys	Bryce Stewart (University of York) COAST	July and August	Every year or other year since 2012	Variable / Julie-Ann in 2018	To assess the effects of the protected areas on population dynamics of commercially valuable crustaceans
20.	Lamlash Bay NTZ and South Arran MPA diver and video surveys	Bryce Stewart (University of York) COAST	July and August	Most years since 2010 (funding dependent	Variable / Wreckspeditions in 2019	To assess the effects of the protected areas on population dynamics of commercially valuable species (scallops & finfish) along with recovery of seabed species and habitats

PhD STUDENTSHIPS

	HEI Partner Institutions (highlight where student is registered)	Funding Source (e.g. MSS, MASTS, NERC - please indicate percentages when joint funding)	Name of student	MSS Supervisor / HEI Supervisor	Title of Study Project	Starts	Ends
1.	University of York	Fauna and Flora International	Leigh Howarth	Bryce Stewart and Julie Hawkins (York)	Measuring the Effects of Scotland's First Fully Protected Marine Reserve	2011	2014
2.	University of Strathclyde	University of Strathclyde (80%), MSS (20%)	Alessandro Sabatino	Mike Heath (Strathclyde) Alejandro Gallego (MSS) Alan Hills (SEPA)	Modelling water circulation and the dispersal of shellfish larvae in the Firth of Clyde	2012	2015
3.	Glasgow University	MSS (£20k per year for 3 years)	Neil Burns	David Bailey (Glasgow) Peter Wright (MSS) Bill Turrell (MSS)	How has gadoid biomass in the Clyde Sea been sustained? (Looking at reasons for abundance: life history traits, e.g. reduced mortality rate? more "r" selected? or connectivity e.g. immigration).	2013	2017
4.	Glasgow University University of Strathclyde	MSS (£10k per year)	Sophie Elliot	David Bailey (Glasgow) Mike Heath (Strathclyde) Bill Turrell (MSS)	The importance of coastal environments for the resilience of fish populations	2013	2015

	HEI Partner Institutions (highlight where student is registered)	Funding Source (e.g. MSS, MASTS, NERC - please indicate percentages when joint funding)	Name of student	MSS Supervisor / HEI Supervisor	Title of Study Project	Starts	Ends
5.	University of Aberdeen	MASTS (100%)	Michelle McCutchen (TBC)	Francis Neat (MSS) Cath Jones Les Noble	Population genomics and spatial planning for conservation of endangered common skate species complex	2013 (TBC)	2016 (TBC)
6.	University of Strathclyde	NERC (100%)	Aidan Hunter	Mike Heath (Strathclyde) Doug Speirs (Strathclyde)	Changes in growth and maturation of fish in the Clyde (using EwE Model)	2013	2016
7.	University of Strathclyde	Strathclyde University (100%)	Peter Jones	Alison Cathcart & Dougie Speirs (Univ. Strathclyde)	17th and 18th century fisheries in the Clyde (Points at possible overfishing as cause for whitefish decline in the Clyde)	2013	2016
8.	University of Strathclyde	MSS (via MASTS) (50%); University of Strathclyde (50%)	Hazel Smith	Dougie Speirs & Mike Heath (University of Strathclyde); Douglas Neil (Glasgow University)	Dinoflagellate parasite infection of Nephrops in the Clyde	2015	2018
9.	Glasgow University	Glasgow University	Natalie Welden	Dr Philip Cowie Professor Alan Taylor	Micro-plastic pollution in the Clyde	2012	2015
10.	University of Strathclyde	University of Strathclyde (100%)	Ruaraidh McPike	Mike Heath & Michael Grinfeld (University of Strathclyde)	Mean-field game theory modelling of coupled fisheries-economics	2013	2017

	HEI Partner Institutions (highlight where student is registered)	Funding Source (e.g. MSS, MASTS, NERC - please indicate percentages when joint funding)	Name of student	MSS Supervisor / HEI Supervisor	Title of Study Project	Starts	Ends
11.	University of Aberdeen & MSS	MSS and Aberdeen University	Joshua Lawerence	Prof Paul Fernandes Dr Susan Lusseau	Multitrophic investigations of the pelagic marine ecosystem of the Clyde Sea	2014	2018
12.	University of Strathclyde	MSS (via MASTS) (50%, University of Strathclyde (50%)	Craig Brownlie	Mike Heath & Dougie Speirs (University of Strathclyde); Ed Ross (MSS)	Modelling the economic dynamics of marine recreation (in the Clyde)	2015	2018
13.	University of Strathclyde Glasgow University	SNH (via MASTS) (50%), Glasgow University (25%), Strathclyde University (25%) MSS Vessel Time	Mathew Pace	David Bailey Mike Heath	Modelling the fishing activity patterns required to meet ecosystem service goals in the Firth of Clyde under changing environmental conditions. Implementation of an ecosystem model for the Clyde.	2016	2019
14.	University of Glasgow MSS	Project with NIWA in New Zealand. MSS Funding	Natasha Walker-Milne	David Bailey Peter Wright Phil Boulcott	Investigate links between habitat and early growth and survival of cod, haddock and whiting. The work will take place around MPAs in the Clyde and elsewhere.	2017	2021
15.	University of Strathclyde MSS	MSS (via MASTS) 50% Strathclyde 50%	Silvia Malagoli	Dougie Speirs Mike Heath Phil Boulcott	Developing length-based stock assessment methodology for Firth of Clyde finfish and scallops	2019	2022
16.	Royal Holloway, University of London	Sheina Marshall Trust Fund, University of London (100%)	Daniella Hodgson	Prof. Dave Morritt Dr Paul Clark Dr Phillip Cowie	The dynamics, interactions and impacts of microplastic on the Isle of Cumbrae, Scotland	2018	2022
17.	Heriot-Watt University	Fishmonger's Company, Scottish White Fish PA, Southwest Fish PO, Macduff Shellfish, Marine Scotland Science, Heriot-Watt	Mairi Fenton	Prof Michel Kaiser, Dr David Donnan (SNH), Lynda Blackadder (Marine Scotland Science), Dr Bryce Stewart (University of York) and Prof Jan	Understanding the consequences of scallop dredging in relation to seabed habitat types, conservation features and other industry sectors	2020	2023

	HEI Partner Institutions (highlight where student is registered)	Funding Source (e.g. MSS, MASTS, NERC - please indicate percentages when joint funding)	Name of student	MSS Supervisor / HEI Supervisor	Title of Study Project	Starts	Ends
				Hiddink and Dr Jenny Shepperson (Bangor University).			
18.	University of Strathclyde & MSS	NERC SUPER DTP	Ana Adao	Dr Robin Cook Prof Mike Heath Dr Liz Clarke Dr Tanja Miethe	Estimation of finfish discard quantities in the Clyde Nephrops fishery and their role in stock dynamics	2019	2023
19.	University of Strathclyde, SAMS & SNH	NERC SUPER DTP	Alejandra Cabanillas	Prof Mike Heath Dr Douglas Speirs Prof Mike Burrows Dr Tom Adams Dr Tracey Begg (SNH)	Modelling the dynamics of kelp forest (not exclusively in the Clyde but could include the Clyde)	2019	2023
20.	University of Strathclyde, Univ St Andrews	NERC SUPER DTP	Anai Valdivia	Dr Bingzhang Chen Prof Mike Heath Dr Andrew Blight	Modelling the spread of sargassum muticum (wireweed) (not exclusively in the Clyde but could include the Clyde)	2019	2023

RELATED RESEARCH

	Who?	Contact?	What?
1.	COAST	Paul Chandler	Research projects in the COAST no take zone and Lamlash Bay MPA
2.	University of York	Bryce Stewart	Research projects in the Lamlash Bay No Take Zone & South Arran MPA (generally in collaboration with COAST – see above)

	Who?	Contact?	What?
3.	University of Strathclyde	Dave Mckee	Optimal remote sensing for coastal and estuarine waters: current capabilities and future developments
4.	SAMS / MSS	Sheila Heymans Stephen Holmes Karen Alexander	ECOSYM modelling of west coast gadoid populations.
5.	MSS	Peter Wright Rob Fryer	Trends in local spawning-stock biomass (SSB) among putative subpopulations
6.	FSC Millport	Alex MacFie	Research projects (BSc and MSc levels) on a variety of marine biology related topics

Clyde Bibliography – C2020 / SG Associated

Article details
Alexander, K. A., Heymans, J. J., Magill, S., Tomczak, M. T., Holmes, S. J., & Wilding, T. A. (2015). Investigating the recent decline in gadoid stocks in the west of Scotland shelf ecosystem using a foodweb model. ICES Journal of Marine Science, 72(2), 436–449. https://doi.org/10.1093/icesjms/fsu149
Burns, N. M., Bailey, D. M. and Wright, P. J. (2019) A method to improve fishing selectivity through age targeted fishing using life stage distribution modelling. PLoS ONE, 14(4), e0214459. (doi:10.1371/journal.pone.0214459) (PMID:30939152) (PMCID:PMC6445474)
Clarke, J., Bailey, D.M., Wright, P., 2015. Evaluating the effectiveness of a seasonal spawning area closure. ICES Journal of Marine Science 72, 2627-2637.
Coram, A., A. Kingston and S. Northridge (2016). Cod Catches from Demersal and Pelagic Trawl Gears: Results from an Industry-led Survey. Scottish Oceans Institute, University of St Andrews.
Elliott, S.A.M., R.J. Milligan, M.R. Heath, W.R. Turrell and D.M. Bailey (2016). Disentangling habitat concepts for demersal marine fish management. Oceanography and Marine Biology: An Annual Review, 54, 173-191

Article details
Elliott, S. A. M., P. A. Ahti, M. R. Heath, W. R. Turrell, and D. M. Bailey. 2016. An assessment of juvenile Atlantic cod Gadus morhua distribution and growth using diver operated stereo-video surveys. Journal Of Fish Biology 89 (2):1190-1207.
Elliott, S. A.M., Allan, B. A., Turrell, W. R., Heath, M. R. and Bailey, D. M. (2018) Survival of the fittest: explanations for gadoid imbalance in heavily fished seas. Aquatic Conservation: Marine and Freshwater Ecosystems, 28(5), pp. 1192-1199. (doi:10.1002/aqc.2926)
Elliott, S.A.M., W.R. Turrell, M.R. Heath, D.M. Bailey (2017). Juvenile gadoid habitat and ontogenetic shift observations using stereo-video baited cameras. Marine Ecology Progress Series, 568, 123-135. DOI: https://doi.org/10.3354/meps12068.
Elliott, S. A.M., Sabatino, A. D., Heath, M. R., Turrell, W. R. and Bailey, D. M. (2017) Landscape effects on demersal fish revealed by field observations and predictive seabed modelling. PLoS ONE, 12(12), e0189011. (doi:10.1371/journal.pone.0189011) (PMID:29228035) (PMCID:PMC5724865)
Holmes, S. J., Millar, C. P., Fryer, R. J., & Wright, P. J. (2014). Gadoid dynamics: differing perceptions when contrasting stock vs. population trends and its implications to management. ICES Journal of Marine Science, 71, 1433–1442. https://doi.org/10.1093/icesjms/fsu075
Hunter, A., Speirs, D.C. and Heath, M.R. (2015). Fishery-induced changes to age and length dependent maturation schedules of three demersal fish species in the Firth of Clyde. Fisheries Research, 170, pp.14-23.
Hunter, A., D.C. Speirs, M.R. Heath (2016). Investigating trends in the growth of five demersal fish species from the Firth of Clyde and the wider western shelf of Scotland. Fisheries Research, 177, 71–81.
McIntyre, F., Fernandes, P. and Turrell, W.R. (2012). Clyde Ecosystem Review. Scottish Marine and Freshwater Science, 3(3).
Sabatino, A.D., Murray, R.B.H., Hills, A., Speirs, D.C. and Heath, M.R. (2016). Modelling sea level surges in the Firth of Clyde, a fjordic embayment in south-west Scotland. Natural Hazards, 84(3), pp.1601-1623.
Sabatino, A.D. and Thurlbeck, I. (2016). FVCOM Clyde Sea Hydrodynamic Model User Guide and Technical Report.
Turrell, W.R., P. Gibson, G. McAllister and N. Bailey (2016). Investigation of Reports of Semi-Pelagic White Fish in the Clyde. Marine Scotland Science Report 01/16.
Welden, N.A.C. (2015). Microplastic pollution in the Clyde sea area: a study using the indicator species Nephrops norvegicus (Doctoral dissertation, University of Glasgow).
Lawrence, J.M., Armstrong, E., Gordon, J., Lusseau, S.M. and Fernandes, P.G. (2016). Passive and active, predator and prey: using acoustics to study interactions between cetaceans and forage fish. ICES Journal of Martine Science 73, 2075-2084.

Article details

Clyde Bibliography – York University

Article details
Stewart BD & Howarth LM (2016). Quantifying and managing the ecosystem effects of scallop dredge fisheries. In: Shumway SE, Parsons GJ (Eds.) Scallops: biology, ecology and aquaculture, 3rd Edition, Elsevier, Amsterdam.
Howarth LM, Pickup SE, Evans LE, Cross TJ, Hawkins JP, Roberts CM, Stewart BD (2015). Sessile and mobile components of a benthic ecosystem display mixed trends within a temperate marine reserve, Marine Environmental Research 107: 8-23.
Howarth LM, Roberts CM, Hawkins JP, Steadman DJ, Beukers-Stewart BD (2015). Effects of ecosystem protection on scallop populations within a community-led temperate marine reserve. Marine Biology 162: 823–840.
Howarth LM, Stewart BD, (2014). The dredge fishery for scallops in the United Kingdom (UK): effects on marine ecosystems and proposals for future management. Report to the Sustainable Inshore Fisheries Trust. Marine Ecosystem Management Report no. 5, University of York, 54 pp
Howarth LM, Roberts CM, Thurstan RH, Stewart BD (2014). The unintended consequences of simplifying the sea: making the case for complexity. Fish and Fisheries 15: 690–711
Howarth LM, Wood HL, Turner AP, Beukers-Stewart BD (2011) Complex habitat boosts scallop recruitment in a fully protected marine reserve. Marine Biology 158: 1767-1780
Stewart, B.D., Howarth, L.M., Wood, H.L., Whiteside, K., Carney, W., Crimmins, É., O'Leary, B.C., Hawkins, J.P. and Roberts, C.M., (2020). Marine conservation begins at home: How a local community and protection of a small bay sent waves of change around the UK and beyond. Frontiers in Marine Science, 7 (76): https://www.frontiersin.org/articles/10.3389/fmars.2020.00076/full