



ATLAS Deliverable 4.1

Reproductive tissue collections for ATLAS

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Introduction

Brief summary on the content of this deliverable: the Deliverable includes:

- (1) a database on the species from which tissue collections can be made available to ATLAS partners. This can be used for reproductive histological studies to understand species reproductive and dispersal strategies and how these affect genetic connectivity
- (2) a bibliographic compilation on reproductive studies on cold-water coral species and sponges, as well as some general reference papers and/or book chapters.

Information prepared and compiled by Covadonga Orejas (IEO), Maria Rakka (IMAR), Marina Carreiro (IMAR)

Database on available samples of cold-water corals for reproductive studies

A database has been prepared including the information received from ATLAS partners as well as from researchers from other research institutes, museums and universities, regarding available samples of selected cold-water coral species to be analysed for reproductive patterns and traits.

The species considered were agreed in the First Annual Meeting of ATLAS in Edinburgh last year (2016), with the exception of *Solenosmillia variabilis* which has been added later.

The species included in the database are:

Scleractinian corals: *Lophelia pertusa*, *Madrepora oculata*, *Dendrophyllia cornigera*, *Desmophyllum dianthus*, *Solenosmillia variabilis*

Octocorals: *Acanella arbuscula*, *Acanthogorgia armata*, *Callogorgia verticillata*, *Dentomuricea aff. meteor*, *Paracalyptrophora josephinae*, *Viminella flagellum*

Antipatharia: *Leiopathes glaberrima*, *Antipathella wollastoni*

Additionally, we added some available information on samples of the sponge *Spongorites coralliophaga* which are also available for reproductive studies. Also the polychaete *Eunice* sp. has been included. As these two species were initially not targeted for this deliverable the information included is very limited, nevertheless this database can be enlarged through the project duration and partners can be encouraged to add any samples they could have and also collect new ones.

The amount of information regarding available samples is fairly limited. From the total number of ATLAS partners (24), ten replied to our request and only six partners had samples available. We

contacted a further 22 institutions external to ATLAS in order to explore possible contributions to our database from other colleagues. From all contacted external institutions, our replied and one had samples available for the database. In addition, two institutions were willing to collect specimens in future cruises and/or campaigns.

The Excel file attached to this deliverable contains the following information:

- An Excel sheet with general information requested for this deliverable and the partners which have contributed to the database;
- One Excel sheet for each species. Each sheet includes general information on the institution responsible for the samples, geographical area, location, sampling gear, number of specimens, preservation method, analyses already available, month and year of collection and the contact person. At present, only general information on the geographical location has been added but in a second stage, the contributing partners will be contacted and requested for more detailed information which will be included in a comprehensive database that will be uploaded in Zenodo.

In general, the areas from which samples are available are located in the North Atlantic (e.g. Flemish Pass and Nova Scotia in Canada, Mingulay Reef, Logachev mounds, Gulf of Biscay, off Galicia, Azores, Gulf of Cadiz). Some samples are also available from the SE Atlantic (e.g. Angola), and the Mediterranean (e.g. off Almeria, Alboran Sea). It is expected that throughout the duration of the ATLAS project this database will be enlarged with samples collected in different research cruises.

Bibliographic compilation on the reproductive biology of cold-water coral species and sponges

The present work is the result of an attempt to collect information on the reproductive biology of cold-water coral species. It compiles information from a total of 67 studies, from which 62 refer to specific species, including a total of 81 cold-water corals, one actinarian and several sponge species, while the remaining five references include reviews or studies on more general aspects on reproductive traits, characteristics and patterns for deep-sea benthic invertebrates, which can be of great importance for reproductive studies. Referred studies are provided in PDF format in an attached folder, with the exception of six studies for which locating the respective file was not possible. An Excel spreadsheet is also available with the containing the bibliographic research results.

Structure and content of the table: Each entry corresponds to a bibliographic reference. References including more than one target species are further divided, with one sub-entry for each referred *Species*. On the first columns of each entry, we gathered all bibliographic information, including *Author, Year, Title of Journal or Book, Name* of the publication and associated *Keywords*.

Reproductive traits are described in the following three columns, including main reproductive features such as:

- Sexuality: the degree and manner of sexual allocation within a colony (Kerr et al. 2010). Species are characterised as hermaphroditic or gonochoristic with the former including both female and male gametes in one colony and the latter including the two sexes in separate colonies.
- Reproductive mode: the way in which reproduction or mating occurs. Broadcast spawning refers to the release of both male and female gametes in the water column, where fertilisation occurs. Brooding includes the retention of oocytes on the mother colonies where fertilisation and larval development occurs. This can be done within the maternal polyp (internal brooding) or on the surface tissue (external brooding).
- Sex ratio: the fraction of female to male colonies within the sampled population or sampling unit.
- Information regarding gametogenesis, mainly the seasonality of gamete presence and development are included under *Gametogenic cycle*, while under *Spawning* we included references on timing and duration of spawning events.

Appendix I: Document Information

EU Project N°	678760	Acronym	ATLAS
Full Title	A trans-Atlantic assessment and deep-water ecosystem-based spatial management plan for Europe		
Project website	www.eu-atlas.org		

Deliverable	N°	4.1	Title	Reproductive tissue collections for ATLAS
Work Package	N°	4	Title	Connected Resources

Date of delivery	Contractual
Dissemination level	Public

Authors (Partner)	IEO			
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Version log			
Issue Date	Revision N°	Author	Change

Appendix II: PDF copy of the Excel table “Database on available samples of cold-water corals for reproductive studies” (Page 1 only)

Collection of samples for reproduction studies



General comments	20 samples is the ideal situation (but please send ANYTHING YOU HAVE). 10 samples each sex is also the ideal scheme	
For colonial corals	3 to 5 polyps per specimen	At least 10 cm (for gorgonias, black corals)
For solitary corals	20 specimens if possible	

In the spread sheets **scleractinians (and Eunice sp. As symbiont of Lophelia & Madrepora) are labeled in red**, gorgonians in purple and antipatharians in green
 Information regarding the deep sea sponge Spongiarites coralliophaga is included in blue

Contact persons		
IEO	Covadonga Orejas	cova.orejas@ba.ieo.es
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Information sent by partners	Partner / name	Information sent
	Cova Orejas / IEO Mallorca (Spain)	info included in the table
	Steve Ross / UNCW, Center for Marine Science (USA)	no samples available
	Dick van Oevelen / NIOZ (The Netherlands)	possibility to collect samples in coming cruises (2017. Rockall Bank)
	Marina Carreiro / IMAR (Portugal)	info included in the table
	Sybille van de Hove / IODINE (Belgium)	no samples available
	Lea-Anne Henry, Georgios Kazanidis / UEDIN (United Kingdom)	info included in the table
	Pablo Durán and Mar Sacau / IEO Vigo (Spain)	info included in the table
	Ellen Kenchington / DFO (Canada)	info included in the table / possibility to collect samples in coming cruises
	Sophie Arnaud-Haond, Joana Boavida / IFREMER (France)	info included in the table / possibility to collect samples in coming cruises
	Jens Carlsson / UCD (Iceland)	no samples available
	Jose Luis Rueda / IEO Málaga (Spain)	info included in the table
	Stefan Aki, Steinunn Hilma Ólafsdóttir / MFRI (Iceland)	info included in the table

Information sent by other institutions	Partner / name	Information sent
	Oscar Ocaña / Museo Ceuta (Spain)	info included in the table
	Vreni Hausserman / Huinay Marine Field Station (Chile)	they can collect samples in further occasions
	Norbert Frank / Heidelberg University (Germany)	no samples available
	Sandra Brooke/Florida State University	she can provide samples of hexacorals and octocorals from previous and future studies. Samples will be limited to species not being worked on by myself and collaborators (specific species to be determined).

Appendix III: PDF copy of the Excel Table “Bibliographic compilation on the reproductive biology of cold-water coral species and sponges”

White background: papers on cold-water corals
 Grey background: papers on sponges
 Pink background general-reference papers

Authors (first author et al.)	Year	Journal	Book	Title	Key words	Species	Main Reproductive Features	Gametogenic cycle	Spawning	PDF	Notes
Ballion S. et al.	2014	Marine Biology		Seasonality in reproduction of the deep-water pennatulacean coral <i>Anthoptilum grandiflorum</i>	pennatulacea, reproduction	<i>Anthoptilum grandiflorum</i>	gonochoristic, broadcast spawning, 1:1 sex ratio	annual for males, continuous for females	Annual, lasts for ~3 months, season differs between regions	yes	
Ballion S. et al.	2015	Marine Ecology-an Evolutionary Perspective		Protracted oogenesis and annual reproductive periodicity in the deep-sea pennatulacean <i>Halipterus finmarchica</i> (Anthozoa, Octocorallia)	pennatulacea, reproduction	<i>Halipterus finmarchica</i>				yes	
Beazley L. & Kenchington E	2012	Deep Sea Research Part I: Oceanographic Research Papers		Reproductive biology of the deep-water coral <i>Acanella arbuscula</i> (Phylum Cnidaria: Class Anthozoa: Order Alcyonacea), northwest Atlantic	Reproduction, Deep-water coral, Gorgonian, NW Atlantic	<i>Acanella arbuscula</i>	gonochoristic, broadcast spawning, 1:1 sex ratio	Continuous/overlapping gametogenic cycles or the female <i>L. pertusa</i> samples overlapped by approximately 2 months, with oogonia visible in January, but this was not evident in the males.		yes	
Brooke S & Jarnegren J	2013	Marine Biology		Reproductive periodicity of the scleractinian coral <i>Lophelia pertusa</i> from the Trondheim Fjord, Norway	<i>Lophelia pertusa</i> , Norway reproductive cycle	<i>Lophelia pertusa</i>				yes	
Brooke S, Young CM	2005	Marine Biology		Embryogenesis and larval biology of the ahermatypic scleractinian <i>Oculina varicosa</i>	embryogenesis, larval biology, <i>Oculina varicosa</i>	<i>Oculina varicosa</i>	gonochoristic, broadcast-spawning	The gametogenic cycle begins in the early summer populations	Spawning occurs during July and August in the shallow populations and in September in the deep	yes	
Brooke S, Young CM	2003	Continental Shelf Research		Reproductive ecology of a deep-water scleractinian coral, <i>Oculina varicosa</i> , from the southeast Florida shelf	Coral, reproduction, ahermatypic, reef, marine reserve, USA, Florida, Fort Pierce	<i>Oculina varicosa</i>	gonochoristic, broadcast spawning	Seasonal, fertile in June-September	seasonal, planulas active swimmers	yes	
Burgess S, Babcock R	2005		Cold-water corals and ecosystems. SPRINGER	Reproductive ecology of three reef-forming, deep-sea corals in the New Zealand region	reproductive ecology, New Zealand, <i>Goniocorella dumosa</i> , <i>Solenosmilia variabilis</i> and <i>Enallapsammia rostrata</i>	<i>Goniocorella dumosa</i> <i>Solenosmilia variabilis</i> <i>Enallapsammia rostrata</i>	Most probably gonochoristic Gonochoristic	Continuous development, could be related to more than one reproductive season per year		yes	
Cordes EE et al.	2001	Marine Biology		Reproduction and growth of <i>Anthomastus ritteri</i> (Octocorallia : Alcyonacea) from Monterey Bay, California, USA	reproduction, growth, <i>Anthomastus ritteri</i> , Monterey Bay	<i>Anthomastus ritteri</i>	gonochoristic larval brooders	continuous reproduction	planula larvae; repeated during the year	yes	
Eckelbarger KJ et al.	1998	Marine Biology		Gonadal morphology and gametogenesis in the sea pen <i>Pennatula aculeata</i> (Anthozoa: Pennatulacea) from the Gulf of Maine	Pennatulacea; gametogenesis; Atlantic; Reproduction	<i>Pennatula aculeata</i>	gonochoristic	Continuous/overlapping		yes	
Edwards DCB, Moore CG	2009	Estuarine Coastal and Shelf Science		Reproduction in the sea pen <i>Funiculina quadrangularis</i> (Anthozoa: Pennatulacea) from the west coast of Scotland	sea pens, oogenesis, synchronicity, spawning, seasonality, fecundity	<i>Funiculina quadrangularis</i>	gonochoristic, sex ratio of 1:1	large pool of asynchronously developing oocytes throughout the year, of which a small proportion mature with increasing synchronicity and are spawned in midwinter	it is proposed that spawning is a brief and synchronous annual event	yes	
Edwards DCB, Moore CG	2008	Marine Biology		Reproduction in the sea pen <i>Pennatula phosphorea</i> (Anthozoa : Pennatulacea) from the west coast of Scotland							
Ereskovsky AV	2000	The Biological Bulletin		Reproduction cycles and strategies of the cold-water sponges <i>Halisarca dujardini</i> (Demospongiae, Halisarcida), <i>Myxilla incrustans</i> and <i>Iophon piceus</i> (Demospongiae, Poecilosclerida) from the White Sea						yes	
Ereskovsky AV	2000	The Biological Bulletin		Reproduction cycles and strategies of the cold-water sponges <i>Halisarca dujardini</i> (Demospongiae, Halisarcida), <i>Myxilla incrustans</i> and <i>Iophon piceus</i> (Demospongiae, Poecilosclerida) from the White Sea.						yes	
Feehan KA, Waller RG	2015	Journal of the Marine Biological Association of the United Kingdom		Notes on reproduction of eight species of Eastern Pacific cold-water octocorals						no	

Flint H et al.	2007	Marine Biology		Reproductive ecology of <i>Fungiacyathus marenzelleri</i> from 4100 m depth in the northeast Pacific Ocean	reproductive ecology, <i>Fungiacyathus marenzelleri</i> , NE Pacific ocean	<i>Fungiacyathus marenzelleri</i>	gonochoristic. Similar quasi-continuous mode of reproduction to this species examined from the Northeast Atlantic	A quasi-continuous output of gametes would promote successful fertilisation and wide dispersal of the lecithotrophic larvae		yes	
Gaino E, Scoccia F	2010	Zoomorphology		Gamete spawning in <i>Antipathella subpinnata</i> (Anthozoa, Antipatharia): a structural and ultrastructural investigation		<i>Antipathella subpinnata</i>					
Heltzel PS & Babcock RC	2002	Marine Biology		Sexual reproduction, larval development and benthic planulae of the solitary coral <i>Monomyces rubrum</i> (Scleractinia: Anthozoa)	scleractinia, reproduction, larval development	<i>Monomyces rubrum</i>	gonochoristic, internal brooding	Seasonal	Annual	yes	
Kahn AS et al.	2016	Journal of the Marine Biological Association of the United Kingdom		Dynamic change, recruitment and resilience in reef-forming glass sponges						no	
Kahng et al.	2011	Marine Ecology Progress Series		Sexual reproduction in octocorals						yes	this is a reference paper
Lacharité M, Metaxas A	2013	PloS one		Early Life History of Deep-Water Gorgonian Corals May Limit Their Abundance						yes	
Larsson AI et al.	2014	PloS one 9:e102222-e102222		Embryogenesis and Larval Biology of the Cold-Water Coral <i>Lophelia pertusa</i>	embryogenesis, larval biology, Norway	<i>Lophelia pertusa</i>			Planulae survived for eight weeks under laboratory conditions, preliminary results indicate that these planulae are planktotrophic. The late onset of competency and larval longevity suggests a high dispersal potential	yes	
Lawson G	1991	Porcupine Newsletter		Preliminary evidence for seasonal reproduction in the deep-sea gorgonian <i>Acanella arbuscula</i>	seasonal reproduction, NE Atlantic	<i>Acanella arbuscula</i>	gonochoristic	There is no reproductive variability amongst polyps from different areas of the same		yes	
Maldonado M	2006	Canadian Journal of Zoology		The ecology of the sponge larva							
Mercier A & Hamel JF	2011	Coral Reefs		Contrasting reproductive strategies in three deep-sea octocorals from eastern Canada: <i>Primnoa rasedaeiformis</i> , <i>Keratoisis ornata</i> and <i>Anthomastus grandiflorus</i>		<i>Anthomastus grandiflorus</i> <i>Primnoa rasedaeiformis</i> <i>Keratoisis grayi</i> * former <i>Keratoisis ornata</i>	gonochoristic; internal brooder, female skewed sex ratio Broadcast spawner, no females found Broadcast spawner, no females found	Annual Continuous/overlapping Annual	Annual	yes yes yes	
Mercier A & Hamel JF	2009	Canadian Journal of Zoology- Revue Canadienne De Zoologie		Reproductive periodicity and host-specific settlement and growth of a deep-water symbiotic sea anemone						yes	
Mercier A et al.	2011	Journal of Biological Rhythms		Lunar Rhythms in the Deep Sea: Evidence from the Reproductive Periodicity of Several Marine Invertebrates						yes	

Mercier A et al.	2011	Marine Biology		Reproductive periodicity, spawning and development of the deep-sea Scleractinian coral <i>Flabellum angulare</i>	reproductive periodicity, NW Atlantic, solitary coral	<i>Flabellum angulare</i>	gonochoristic, broadcast spawner	Annual, gametogenesis was synchronous among males and females and fluctuated seasonally	Annual, different seasons among areas	yes	
Nonaka N et al.	2014	Pacific Science		Sexual reproduction in precious corals (Coralliidae) collected in the Ryukyu Archipelago	Reproduction, Japan, Coralliidae	<i>Paracoralium japonicum</i>	gonochoristic, broadcast-spawning, sex ratio of 1:1	Indication for overlapping	Annual		
						<i>Corallium elatius</i>	gonochoristic, broadcast-spawning, sex ratio of 1:1	Indication for overlapping	Annual		
						<i>Corallium konojoi</i>	gonochoristic, broadcast-spawning, sex ratio of 1:1	Indication for overlapping	Annual	yes	
Orejas C et al.	2002	Marine Ecology Progress Series		Distribution and reproductive ecology of the Antarctic octocoral <i>Ainigmaptilon antarcticum</i> in the Weddell Sea	Antarctic octocorals · Reproductive patterns · Distribution	<i>Ainigmaptilon antarcticum</i>	gonochoristic, sex ratio of 1:1	The relative frequency of the largest oocyte size class decreased in the autumn samples.		yes	
Orejas C et al.	2007	Marine Biology		Reproduction patterns of four Antarctic octocorals in the Weddell Sea: an interspecific, shape, and latitudinal comparison	Antarctic octocorals · Reproductive patterns	<i>Thouarella sp.</i>	gonochoristic	overlapping generations	seems to have seasonal spawning.		
						<i>Dasystenella acanthina</i>	gonochoristic	overlapping generations	seems to have seasonal spawning.		
						<i>Fanyella rossi</i>	gonochoristic	seems to have annual reproductive cycle			
						<i>Fannella spynosa</i>	gonochoristic	seems to have annual reproductive cycle		yes	
Pearse JS et al.	1991	Amer Zool		Reproduction of Antarctic benthic marine invertebrates. Tempos, modes and timing						no	this is a reference paper
Pearse JS, Lockhart SJ	2004	Deep-Sea Research Part II: Topical Studies in Oceanography		Reproduction in cold water: paradigm changes in the 20th century and a role for cidaroid sea urchins.						yes	This paper is on seurchins but it is relevant for reproduction studies in cold-waters
Pires DO et al.	2014	Deep Sea Research Part II: Topical Studies in Oceanography		Reproduction of deep-sea reef-building corals from the southwestern Atlantic	reproduction, SW Atlantic	<i>Madrepora oculata</i>	gonochoristic	Continuous gametogenesis			
						<i>Solenasmilia variabilis</i>	gonochoristic	fertile all year round, reproductive peak between April and September			
						<i>Lophelia pertusa</i>	gonochoristic	Seasonal reproductive peaks	possible spawning season between May and July		
						<i>Enallopsammia rostrata</i>	gonochoristic	Continuous gametogenesis		yes	
Pires DO et al.	2009	Marine Ecology Progress Series		Reproductive Biology of the deep-sea pennatulacean <i>Anthoptilum murrayi</i> (Cnidaria, Octocorallia)	Pennatulacea, Gametogenesis, Fecundity, Deep-sea	<i>Anthoptilum murrayi</i>	gonochoristic, broadcast spawner, 1:1 sex ratio	Continuous/overlapping		yes	
Porcu C et al.	2017	Mediterranean Marine Science		Reproductive patterns in deep versus shallow populations of the precious Mediterranean gorgonian <i>Corallium rubrum</i> (Linnaeus, 1758) (Sardinia, Central-Western Mediterranean)		<i>Corallium rubrum</i>				yes	
Rakka M et al.	2016	Deep Sea Research II		<i>Reproductive biology of the black coral Antipathella wallastoni</i> (Cnidaria: Antipatharia) in the Azores Archipelago	Antipatharia, reproductive patterns, gametogenesis, atlantic ocean, azores	<i>Antipathella wallastoni</i>	Gonochoristic, most probably brooder	Seasonal gametogenesis, May to November	Seasonal, probably between September-November	yes	
Rice AL et al.	1992	Journal of Marine Biological Association UK		The pennatulid <i>Kophobelemnon stelliferum</i> (Cnidaria: Octocorallia) in the Porcupine Seabright (North-East Atlantic Ocean)	reproduction, seapen, <i>Kophobelemnon stelliferum</i> , NE Atlantic	<i>Kophobelemnon stelliferum</i>	gonochoristic, sex ratio of 1:1	Continuous		yes	
Rodriguez E et al.	2013	Marine Biology		Reproduction in the externally brooding sea anemone <i>Epiactis georgiana</i> in the Antarctic Peninsula and the Weddell Sea	reproduction, Antarctic Peninsula, external brooding, Anemone	<i>Epiactis georgiana</i>	gonochoristic and some hermaphrodites	Continuous/overlapping	releasing the embryos/larvae in the last months of the austral spring (December)	yes	
Simpson A et al.	2005		Abstract book:Third International Symposium on Deep-Sea Corals, Miami, FL	Reproductive Morphology of <i>Metallogorgia melanotrichos</i> (Chrysogorgiidae) and <i>Paramuricea plicamus</i> (Plexauridae)	Chrysogorgiidae, Plexauridae, reproduction	<i>Metallogorgia melanotrichos</i>	gonochoristic	Male: seasonal; female: Indications for continuous		yes	

Simpson A et al.	2005		Abstract book:Third International Symposium on Deep-Sea Corals, Miami, FL	Reproductive Morphology of Metallogorgia melanotrichos (Chrysogorgiidae) and Paramuricea placamus (Plexauridae)	Reproduction	<i>Paramuricea placamus</i>	gonochoristic	Male:seasonal		yes	
Sun Z. et al.	2011	Invertebrate Biology		Planulation, larval biology and early growth of the deep-sea soft corals <i>Gersemia fruticosa</i> and <i>Duva florida</i>	larval biology, early growth	<i>Duva florida</i>	gonochoristic, internal brooder			yes	
Sun Z. et al.	2011	Invertebrate Biology		Planulation, larval biology and early growth of the deep-sea soft corals <i>Gersemia fruticosa</i> and <i>Duva florida</i>	reproduction, brooding, octocoral, cnidarian	<i>Gersemia fruticosa</i>	gonochoristic, internal brooder		Annual; lasts for ~2 months	yes	
Sun Z. et al.	2010	Marine Biology		Reproductive biology of the deep-sea octocoral <i>Drifa glomerata</i> in the Northwest Atlantic	Atlantic, octocoral, reproduction	<i>Drifa sp.</i>	Hermaphrodite, internal brooder	Continuous		yes	
Sun Z. et al.	2010	Marine Biology		Reproductive biology of the deep-sea octocoral <i>Drifa glomerata</i> in the Northwest Atlantic	Atlantic, octocoral, reproduction	<i>Drifa glomerata</i>	gonochoristic, internal brooder	Continuous		yes	
Teixidó N et al.	2006	Deep-Sea Research Part II-Topical Studies in Oceanography		Observations of asexual reproductive strategies in Antarctic hexactinellid sponges from ROV video records						yes	
Thresher RE et al.	2011	Coral Reefs		Modal analysis of the deep-water solitary scleractinian, <i>Desmophyllum dianthus</i> , on SW Pacific seamounts: inferred recruitment periodicity, growth, and mortality rates	Demography, Deep-sea, Scleractinia, Modal analysis, Holocene	<i>Desmophyllum dianthus</i>				yes	
Tyler PA et al.	1995	Int. Revue ges. Hydrobiol.		Ecology and gametogenic biology of the genus <i>Umbellula</i> (Pennatulacea) in the North-Atlantic Ocean	gametogenesis, Umbellula, North Atlantic	<i>Umbellula lindahli</i>	gonochoristic	Continuous for females		yes	
Tyler PA et al.	1992		Marine eutrophication and population dynamics: 25th European Marine Biology Symposium, Ferrara, Italy, Vol VIII	Reproduction and recruitment in deep-sea invertebrate populations in the NE Atlantic Ocean a review of the options						no	this is a reference paper
Tyler PA, Young CM	1992	Invertebr Reprod Dev		Reproduction in marine invertebrates in stable environments - the deep-sea model						yes	
Van-Praet M	1990	Journal of the Marine Biological Association of the United Kingdom		Gametogenesis and the reproductive cycle in the deep-sea anemone <i>Paracallactis stephensoni</i> (Cnidaria: Actiniaria)	Actiniaria, Reproduction	<i>Paracallactis stephensoni</i>	gonochoristic	seasonal reproduction	seasonal	no	
						<i>Stichopathes variabilis</i>	gonochoristic, broadcast spawners				We only included in the list the species with depth range distribution below 100 m. Details for each species in the review paper
						<i>Antipathes assimilis</i>	gonochoristic, broadcast spawners				
						<i>Tylopathes crispa</i>	gonochoristic, broadcast spawners				
						<i>Schizopathes affinis</i>	gonochoristic, broadcast spawners				
						<i>Parantipathes euantha</i>	gonochoristic, broadcast spawners				
						<i>Bathypathes patula</i>	gonochoristic, broadcast spawners				
						<i>Myriopathes ulex</i>	gonochoristic, broadcast spawners				
						<i>Anthipathella subpinnata</i>	gonochoristic, broadcast spawners				
						<i>Sibopathes gephura</i>	gonochoristic, broadcast spawners				
						<i>Helioopathes americana</i>	gonochoristic, broadcast spawners				

Wagner D et al.	2011	Invertebrate Biology		Sexual reproduction of Hawaiian black corals, with a review of the reproduction of antipatharians (Cnidaria: Anthozoa: Hexacorallia)	<i>Heliopathes pacifica</i>	gonochoristic, broadcast spawners				
					<i>Hexapathes alis</i>	gonochoristic, broadcast spawners				
					<i>Hexapathes australiensis</i>	gonochoristic, broadcast spawners				
					<i>Hexapathes hivaensis</i>	gonochoristic, broadcast spawners				yes
					<i>Antipathes contorta</i>	gonochoristic, broadcast spawners				
					<i>Antipathes dichotoma</i>	gonochoristic, broadcast spawners				
					<i>Antipathes minor</i>	gonochoristic, broadcast spawners				
					<i>Antipathes plana</i>	gonochoristic, broadcast spawners				
					<i>Cirripathes rumphii</i>	gonochoristic, broadcast spawners				
					<i>Cirripathes spiralis</i>	gonochoristic, broadcast spawners				
					<i>Pteropathes fragilis</i>	gonochoristic, broadcast spawners				
					<i>Stichopathes ceylonensis</i>	gonochoristic, broadcast spawners				
					<i>Stichopathes paucispina</i>	gonochoristic, broadcast spawners				
					<i>Stichopathes poutalesi</i>	gonochoristic, broadcast spawners				
					<i>Stichopathes richardi</i>	gonochoristic, broadcast spawners				
<i>Stichopathes saccula</i>	gonochoristic, broadcast spawners									
<i>Stichopathes solorensis</i>	gonochoristic, broadcast spawners									
<i>Stichopathes spiessi</i>	gonochoristic, broadcast spawners									
Wagner D et al.	2012	Coral Reefs		Sexual reproduction of the Hawaiian black coral <i>Antipathes griggi</i> (Cnidaria: Antipatharia)	Anthozoa, Antipathidae, Coral spawning, Gametogenesis, Precious coral	<i>Antipathes griggi</i>	gonochoristic with a 1:1 sex ratio	annual reproductive cycle	several events but great intensity November/December	yes
Waller RG	2005		Cold-water corals and ecosystems	Deep-water Scleractinia (Cnidaria: Anthozoa): current knowledge of reproductive processes						yes
Waller RG & Tyler PA	2005	Coral Reefs		The reproductive biology of two deep-water, reef-building scleractinians from the NE Atlantic Ocean	Hermatypic, Azooxanthellate, Gametogenesis, <i>Lophelia pertusa</i> , <i>Madrepora oculata</i>	<i>Lophelia pertusa</i>	gonochoristic, broadcaster spawner	seasonal reproduction	spawning around January/February. lecithotrophic larva is expected	yes
Waller RG & Tyler PA	2005	Coral Reefs		The reproductive biology of two deep-water, reef-building scleractinians from the NE Atlantic Ocean	Hermatypic, Azooxanthellate, Gametogenesis, <i>Lophelia pertusa</i> , <i>Madrepora oculata</i>	<i>Madrepora oculata</i>	gonochoristic, broadcaster spawner	multiple cohorts	unknown	yes
Waller RG & Tyler PA	2011	Journal of the Marine Biological Association of the United Kingdom		Reproductive patterns in two deep-water solitary corals from the north-east Atlantic <i>Flabellum alabastrum</i> and <i>F. angulare</i> (Cnidaria: Anthozoa: Scleractinia)	reproduction, gametogenesis, seasonality, solitary coral, azooxanthellate	<i>Flabellum alabastrum</i>	gonochorism with a 1:1 sex-ratio and broadcast spawning of gametes	unknown	no larvae detected but suggested lecithotrophic larval development	yes
Waller RG & Tyler PA	2011	Journal of the Marine Biological Association of the United Kingdom		Reproductive patterns in two deep-water solitary corals from the north-east Atlantic <i>Flabellum alabastrum</i> and <i>F. angulare</i> (Cnidaria: Anthozoa: Scleractinia)	reproduction, gametogenesis, seasonality, solitary coral, azooxanthellate	<i>Flabellum angulare</i>				yes
Waller RG et al.	2014	PLoS one 9(4)		Sexual Reproduction and Seasonality of the Alaskan Red Tree Coral, <i>Primnoa pacifica</i>	oocytes, corals, fecundity, histology, spawning, gulf of Alaska, Sperm, Larvae	<i>Primnoa pacifica</i>	gonochoric with a 1:1 sex ratio	Continuous/overlapping	annual for some female colonies; tree times per year for males	yes
Waller RG et al.	2007	Bulletin of Marine Science		Reproductive morphology of three species of deep-water precious corals from the Hawaiian Archipelago: <i>Gerardia sp.</i> , <i>Corallium secundum</i> , and <i>Corallium lauense</i>	reproduction, precious corals, Hawaiian Archipelago	<i>Corallium lauense</i>		Continuous/overlapping		yes
Waller RG et al.	2007	Bulletin of Marine Science		Reproductive morphology of three species of deep-water precious corals from the Hawaiian Archipelago: <i>Gerardia sp.</i> , <i>Corallium secundum</i> , and <i>Corallium lauense</i>	reproduction, precious corals, Hawaiian Archipelago	<i>Corallium secundum</i>		Continuous/overlapping		yes

Waller RG et al.	2005	Coral Reefs		Sexual reproduction in three hermaphroditic deep-sea Caryophyllia species (Anthozoa : Scleractinia) from the NE Atlantic Ocean	Ahermatypic, Azooxanthellate, Solitary coral, Gametogenesis, Cyclical hermaphrodite	<i>Caryophyllia ambrosia</i>	broadcast spawner	Continuous		yes	
Waller RG et al.	2005	Coral Reefs		Sexual reproduction in three hermaphroditic deep-sea Caryophyllia species (Anthozoa : Scleractinia) from the NE Atlantic Ocean	Ahermatypic, Azooxanthellate, Solitary coral, Gametogenesis, Cyclical hermaphrodite	<i>Caryophyllia sequenzae</i>	broadcast spawner	Continuous		yes	
Waller RG et al.	2005	Coral Reefs		Sexual reproduction in three hermaphroditic deep-sea Caryophyllia species (Anthozoa : Scleractinia) from the NE Atlantic Ocean	Ahermatypic, Azooxanthellate, Solitary coral, Gametogenesis, Cyclical hermaphrodite	<i>Caryophyllia cornuformis</i>	broadcast spawner	Continuous		yes	
Waller RG et al.	2008	Deep-Sea Research Part II- Topical Studies in Oceanography		Fecundity and embryo development of three Antarctic deep-water scleractinians: <i>Flabellum thouarsii</i> , <i>F. curvatum</i> and <i>F. impensum</i>	Larval ecology, Antarctic, Cold watercoral, Reproduction, Brooding	<i>Flabellum thouarsii</i> <i>Flabellum curvatum</i> <i>Flabellum impensum</i>	gonochoric, brooder gonochoric, brooder gonochoric, brooder			yes	
Waller RG et al.	2002	Coral Reefs		Reproductive ecology of the deep-sea scleractinian coral <i>Fungiacyathus marenzelleri</i> (Vaughan, 1906) in the northeast Atlantic Ocean	Ahermatypic, Azooxanthellate, Solitary coral, Gametogenesis	<i>Fungiacyathus marenzelleri</i>	gonochoric, broad casting inferred		june /july ?	yes	
Waller RG, Feehan KA	2013	Deep-Sea Research Part II- Topical Studies in Oceanography		Reproductive ecology of a polar deep-sea scleractinian, <i>Fungiacyathus marenzelleri</i> (Vaughan, 1906)		<i>Fungiacyathus marenzelleri</i>	gonochoric		oocyte size-frequency patterns suggest irregular spawning	yes	
Watling L. et al	2011	Advances in Marine Biology		Biology of Deep-Water corals	Octocorals, deep-sea, biology, ecology, reproduction					yes	Review paper