Identification of Protected Corals Progress Report

RFP: 4650 INT2015-03 IDENTIFICATION AND STORAGE OF COLD-WATER CORALS
31 July 2019

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Attention	Shannon Weaver
Project:	DOC16307 - INT2015-03

Specific objectives

In Schedule 1 the specific objectives in Contract INT2015-03 are:

1. To determine, through examination of returned cold-water coral specimens and photos, the taxon, and where possible the provenance of cold-water corals killed in New Zealand fisheries (for returned dead specimens).
2. To collect sub-samples of all protected cold-water coral specimens for genetic analysis in future.

There are several milestones for this project, here we report on Milestone 11 which is to produce a "Summary of identified corals, and photographs assessed for the period 1 July 2018 – 31 December 2018." Deliverable due 31 July 2019.

Milestone 11

This Progress report for Milestone 11 includes:

1. A summary description of protected coral fauna recently identified from physical specimens and images. This includes a summary of specimens examined by visiting black coral expert Dr Marzia Bo.

2. Appendix A: Spreadsheet summary output from NIWA Invertebrate Collection (NIC) *Specify* Database *niwainvert*; updated with revised identifications of 20 specimen lots identified between July 2018 to March 2019.

3. Appendix B: Spreadsheet output summary from Fisheries New Zealand (FNZ) Ministry of Primary Industry (MPI), Centralised Observer database *COD*; updated with revised identifications of specimens identified between July 2018 and March 2019.

4. Appendix C: Spreadsheet summary of digital images processed and identified for the reporting period 1 July 2018 – 31 December 2018.

Description of protected coral fauna

Physical specimens

During the reporting period 1 July to 31 December 2018, NIWA received and processed nine observer collected and one research trawl collected protected coral specimens, some of which were identified during this reporting period.

A summary of specimens identified by experts between July 2018 to March 2019, are provided in the NIWA Invertebrate Collection (NIC) *Specify* Database *niwainvert* extract (Appendix A). This extract includes identifications of physical specimens carried out by black coral expert Dr Marzia Bo (Università degli Studi di Genova, Italy), who visited the NIC in January 2019.

Only one historical observer sample was reidentified during this reporting period by Dennis Opresko (Smithsonian Institution), a black coral *Diplopathes multipinnata* (Opresko *et al.* in prep). This is a new species and the specimen will likely be the holotype for the species. Additionally, three historical research trawl survey samples were identified, a scleractinian cup coral *Stephanocyathus platypus*, a scleractinian stony branching coral *Enallopsammia* cf. *pusilla*, and a black coral *Parantipathes*. Two specimens initially identified by observers as black corals were identified as the large skeleton secreting zoanthid golden coral *Kulamanamana haumeaae* (Parazoanthidae; Zoantharia) (Figure 1). These identifications were reported here to highlight that this species is easily confused with black coral or large gorgonian octocoral taxa.

Figure 1. Dr. Frederic Sinniger from the Sesoko Marine Laboratory, Okinawa, Japan, holding a specimen of *Kulamanamana haumeaae,* the New Zealand gold coral, which can be confused with black coral.

Database updates

The *niwainvert* summary extract was provided for uploading into the Fisheries New Zealand (FNZ) Ministry of Primary Industries (MPI) (referred to throughout as FNZ), Centralised Observer Database *COD*. NIWA manages this database for FNZ and *COD* is regularly updated with revised identifications when corals are returned from sea (Tracey & Mills 2016). The *COD* extract summary is provided in Appendix B (also see Tables 1, 2 and Figure 2). The observer samples for loading into in *COD* included:

- 10 records where the initial identification matched a catch species and the expert identification differed were updated. Seven of these did not have an initial observer identification recorded in *Specify* Database *niwainvert*.

- 10 records in *COD* catch did not require updating as the FNZ species code recorded was the same as the expert identification.

Table 1. Summary of protected coral samples by Fisheries Management Area (FMA) or from high seas region (ET), for observer collected protected coral samples identified in this project reporting period.

Area	Description	Count of Samples
SOE	South-East (FMA4)	7
SUB	Sub-Antarctic (FMA6)	3
AKE	Auckland East (FMA1)	2
HOWE	Lord Howe Rise (ET)	2
SOU	Southland (FMA5)	1
AKW	Auckland West (FMA9)	1
CEE	Central East (FMA2)	1
CET	Challenger Plateau (ET)	1
CHA	Challenger/Central Plateau (FMA7)	1
LOUR	Louisville Ridge (ET)	1

Table 2. Summary of protected coral samples by fishing method and target fishery.

Target Fishery (common name)	FNZ code	Fishing Method	Count of fishing events
Orange roughy	ORH	TWL	13
Patagonian toothfish	PTO	BLL	2
Arrow squid	SQU	TWL	1
Hoki	HOK	TWL	1
Smooth oreo	SSO	TWL	1
Alfonsino	BYS	TWL	1
Alfonsino & long-finned Beryx	BYX	TWL	1

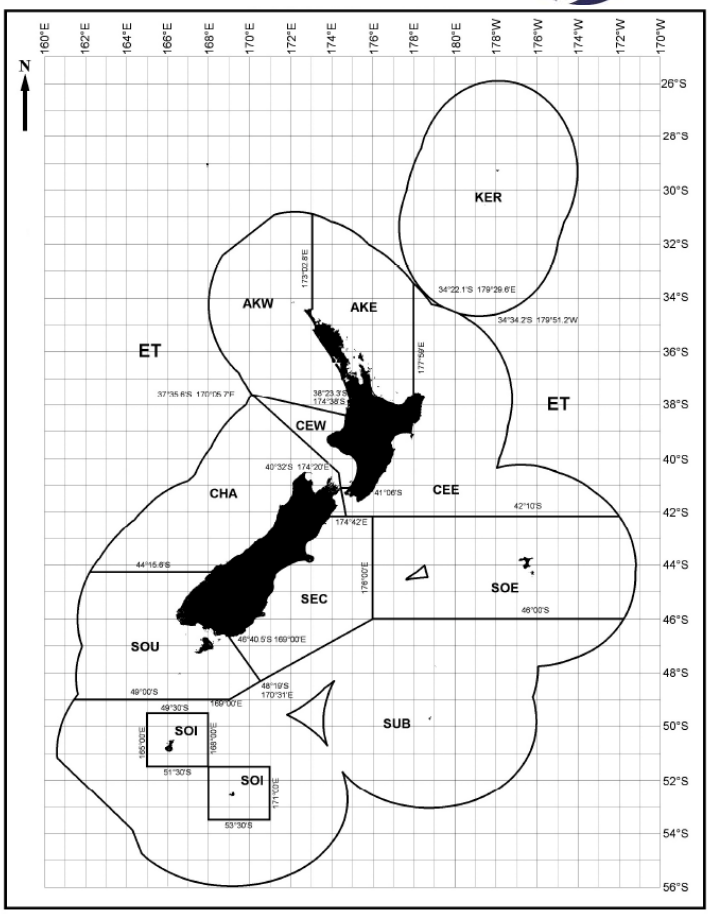

Figure 2. Location of Observer Fisheries Management Area (FMA). Taken from the FNZ Observer Manual.

Specimen Images

During the reporting period 1 July to 31 December 2018, NIWA received 506 images, 253 of which were protected coral taxa, and 242 of them were able to be georeferenced. Of these protected coral images, 162 were photographed outside of New Zealand's Exclusive Economic Zone (EEZ) from the High Seas (ET) areas CET, HOWE, WANB, TKET and LOUR. The remaining 91 within zone images were processed and 79 of these were identified during this reporting period (Appendix C).

Included in the identified images were several large and impressive colonies of bubblegum coral (*Paragorgia arborea*) up to approximately 1.3 metres in length. These specimens were taken as by-catch from bottom trawl targeting smooth oreo in the Sub-Antarctic region (FMA6; TRIP5438) (Figure 3).

Figure 3. Large bubblegum coral colonies (*Paragorgia arborea*) captured from the Sub-Antarctic region (FMA6; -47.5, 177.8) [Observer, FNZ].

Data summaries for the protected coral images are provided below and include a count by Observer Fisheries Management Areas (FMA) (Table 3, Figure 2) and a count of tows by fishing method and target fishery (Table 4). All the samples were caught in trawl fishing events.

Table 3. Summary of protected coral images by Fisheries Management Area (FMA) or from high seas region (ET).

Area	Description	Count of Images
CET	Challenger Plateau (ET)	59
HOWE	Lord Howe Rise (ET)	57
SOE	South East (FMA4)	32
WANB	Wanganella Bank (ET)	21
SUB	Sub-Antarctic (FMA6)	18
SOU	Southland (FMA5)	15
AKW	Auckland West (FMA9)	15
TKET	(ET)	14
SEC	South-East Coast (FMA3)	4
LOUR	Louisville Ridge (ET)	4
CHA	Challenger (FMA7)	3

Table 4. Summary of protected coral images by fishing method and target fishery.

Target Fishery (common name)	FNZ code	Fishing Method	Count of tows
Orange roughy	ORH	Trawl	55
Alfonsino & long-finned Beryx	BYX	Trawl	9

Smooth oreo	SSO	Trawl	5
Yellow boarfish	YBO	Trawl	4
Hoki	HOK	Trawl	5
Ling	LIN	Trawl	6
Long-finned Beryx	BYS	Trawl	4
Arrow squid	SQU	Trawl	1
White warehou	WWA	Trawl	1
Barracouta	BAR	Trawl	1

Only 84 of the 253 protected coral images contained a label showing trip or tow information in the photo, but provenance data for a further 158 images were able to be determined using the image timestamp. To determine the correct station number, the *COD* database manager references station details using trip station data, the FNZ photographic logs, and the 'Benthic Materials' form. While in previous years there were some issues in using this approach, it appears the cameras deployed on majority of the trips had their internal clocks set correctly during this period, making the geo-referencing task a little easier.

Visiting expert

New identifications for one of New Zealand's key protected coral fauna Antipatharia (black corals) are described. Funding for the international black coral expert Dr Marzia Bo to visit the NIC to identify specimens from 22 January to 1 February 2019 was provided in part by this project (DOC16307).

Dr Bo primarily works on whip black corals (species of *Stichopathes*, *Cirrhipathes* and *Pseudocirrhipathes*), which are monopodial antipatharians known to form dense forests in the deep-sea globally including in the wider New Zealand region. Their unbranched, unpinnulated skeletons, up to several metres in length, grow upward in the water column and their flexibility and resistance help them to withstand strong currents.

During her visit she focussed on an in-depth taxonomic study of the NIC whip black corals, a total of 120 specimen lots. Her analysis consisted of the morphological description of the specimens based on the main taxonomic characters for the genera, namely, the shape of the corallum, the size, shape and arrangement of polyps, and the variability of size, shape and ornamentation of the spines along the stem. Scanning Electron Microscopy (SEM) was used to assist with examining some of these characters (Figure 4).

The preliminary taxonomic survey of the collection resulted in the identification of ten taxa: two *Cirrhipathes* species, one *Pseudocirrhipathes* species, and seven *Stichopathes* species (of which two are known to form meadows). These preliminary results greatly enhance the knowledge of these genera in New Zealand and the wider south west Pacific. Final results will be included in a taxonomic monograph of all valid whip black coral species, representing the first attempt to shed light on some of the less characterised coral taxa known from shallow and deep waters.

Figure 4. Clockwise from left: The completely reidentified *Stichopathes* section in the NIC; Left to right: Di Tracey, Sadie Mills and Marzia Bo; SEM photograph of the shape and ornamentation of the spines along the stem of a whip coral specimen; microscope photograph of whip coral polyps; a *Stichopathes* sample; historical sample NIWA 19694 *Cirrhipathes* cf. *spiralis* [Marzia Bo].

Dr Bo also identified 28 black coral by-catch samples collected by observers and research trawl surveys. The NIC *Specify* database *niwainvert* records were updated with the new identifications, which were mainly attributed to families Schizopathidae and Antipathidae (Table 5).

Table 5. Summary of black coral samples collected by observers and research trawl surveys identified by Dr Bo.

Family	Identification	Sample lot count
Antipathidae	*Stichopathes cf. paucispina*	3
	Stichopathes cf. variabilis	9
Cladopathidae	*Trissopathes*	1
Leiopathidae	*Leiopathidae indet.*	1
	Leiopathes cf. secunda	1
Myriopathidae	*Antipathella*	2
	Myriopathes	1
Schizopathidae	*Schizopathidae indet.*	3
	Bathypathes	1
	Parantipathes	3
Stylopathidae	*Triadopathes*	2
	Antipatharia indet.	1

Acknowledgements

Our thanks to the coral experts who provided identifications for this project and the NIC team for providing curatorial support for the specimens.

References

Opresko, D. M.; Brugler, M. R.; Stewart, R.; Tracey, D. (in prep). New genus and species of black corals from the SW Pacific and Antarctica (Cnidaria: Anthozoa: Antipatharia: Schizopathidae).

Tracey, D.; Mills, S. (2016). Instructions to Observers when carrying out at-sea protected coral data collection. Project INT2015-03/ DOC16307. 6 p.

Appendices

Appendix A: Spreadsheet summary output from NIWA Invertebrate Collection (NIC) *Specify* Database *niwainvert*; updated with revised identifications of 20 specimen lots identified between July 2018 to March 2019.

TRIP	Tow No.	NIWA Cat. No.	Type Status	OSD No.	Initial OBS ID	Phylum	Class	Order	Family	Genus	Species	Determiner	Determined Date	Sample Count	Date	Latitude1	Longitude1	Depth 1	Depth 2	Observer
2832	30	70727				Cnidaria	Anthozoa	Alcyonacea	Anthothelidae	*Anthothela*		Mills, Sadie	13/02/2019	1	27/04/2009	-48.478333	171.093333	977	1037	
5220	26	125144		3765	LLP	Cnidaria	Anthozoa	Antipatharia			indet.	Bo, Marzia	04/02/2019	1	21/01/2018	-37.235	167.196667			
3142	56	65935		1088		Cnidaria	Anthozoa	Antipatharia	Antipathidae	*Stichopathes*	sp. 2	Bo, Marzia	04/02/2019	1	24/06/2010	-38.393333	-167.99	280	280	
4837	31	106591		3681	COB	Cnidaria	Anthozoa	Antipatharia	Cladopathidae	*Trissopathes*		Bo, Marzia	04/02/2019	1	29/01/2017	-51.59	161.381667	1062	1132	
5470	20	129027		4157	COB	Cnidaria	Anthozoa	Antipatharia	Leiopathidae			Bo, Marzia	04/02/2019	1	04/10/2018	-44.155	-174.52	750	853	Lucas Reed
5470	50	129017		4154	LSE	Cnidaria	Anthozoa	Antipatharia	Leiopathidae	*Leiopathes*	cf. *secunda*	Bo, Marzia	04/02/2019	1	22/10/2018	-44.508333	-175.071667	858	900	
5419	13	129013		4138	COB	Cnidaria	Anthozoa	Antipatharia	Myriopathidae			Bo, Marzia	04/02/2019	1	08/08/2018	-41.858333	170.563333	433	387	LGRA
5274	15	125196		3818		Cnidaria	Anthozoa	Antipatharia	Myriopathidae	*Antipathella*		Bo, Marzia	04/02/2019	1	04/03/2018	-46.765	165.91	226		
5117	16	106576		3665	CSB	Cnidaria	Anthozoa	Antipatharia	Myriopathidae	*Myriopathes*		Bo, Marzia	04/02/2019	1	02/09/2017	-40.668333	177.013333	228	564	
5058	37	106564		3606	LIL	Cnidaria	Anthozoa	Antipatharia	Schizopathidae			Bo, Marzia	04/02/2019	2	16/07/2017	-35.716667	176.356667	743	1224	N. BRO
5341	42	131496		4111	COB	Cnidaria	Anthozoa	Antipatharia	Schizopathidae			Bo, Marzia	04/02/2019	1	26/05/2018	-42.735	-178.841667	943		
2744	75	66321		705		Cnidaria	Anthozoa	Antipatharia	Schizopathidae	*Bathypathes*		Bo, Marzia	04/02/2019	1	30/12/2008	-43.18	-173.838333	987	1297	
3883	55	88617	HOLOTYPE	2665		Cnidaria	Anthozoa	Antipatharia	Schizopathidae	*Diplopathes*	*multipinnata*	Opresko, Dennis	2019	1	20/10/2013	-34.181667	162.661667	478	685	
4837	7	106590		3680	COB	Cnidaria	Anthozoa	Antipatharia	Schizopathidae	*Parantipathes*		Bo, Marzia	04/02/2019	1	18/01/2017	-51.425	161.585	1223	1200	
5341	42	131495		4109	PTP	Cnidaria	Anthozoa	Antipatharia	Schizopathidae	*Parantipathes*		Bo, Marzia	04/02/2019	1	26/05/2018	-42.735	-178.841667	943		
1731	16	85931				Cnidaria	Anthozoa	Antipatharia	Stylopathidae	*Triadopathes*		Bo, Marzia	04/02/2019	1	19/01/2003	-44.21166	-174.6	760	1085	
5341	42	131494		4107	LEI	Cnidaria	Anthozoa	Antipatharia	Stylopathidae	*Triadopathes*		Bo, Marzia	04/02/2019	1	26/05/2018	-42.735	-178.841667	943		Obs J. Sat and M. Ers
1355	2	81286				Cnidaria	Anthozoa	Scleractinia	Dendrophylliidae	*Enallopsammia*	cf. *pusilla*	Kitahara, Marcelo	05/11/2018	1	01/05/2000	-34.79999924	169.8333282	770		
1124	65	91269			COB	Cnidaria	Anthozoa	Zoantharia	Parazoanthidae	*Kulamanamana*	*haumeaae*	Sinniger, Frederic	14/02/2019	1	15/08/1998	-36.88466667	177.3671667	787		
3144	55	65948		1122	COB	Cnidaria	Anthozoa	Zoantharia	Parazoanthidae	*Kulamanamana*	*haumeaae*	Sinniger, Frederic	08/03/2019	1	29/06/2010	-35.62	165.223333	903	985	

Appendix B: Spreadsheet output summary from Fisheries New Zealand (FNZ) Ministry of Primary Industry (MPI), Centralised Observer database *COD*; updated with revised identifications of specimens identified between July 2018 and March 2019.

id	trip_number	station_number	target_species	fishing_method	event_start_date	start_obs_fma	start_seabed_depth	trunc_start_latitude	trunc_start_longitude	event_end_date	end_obs_fma	end_seabed_depth	trunc_end_latitude	trunc_end_longitude	expert_species	expert_scientific	phylum	class	order	family	genus	species	determiner	determined_date	count
557	2832	30	SSO	TWL	27/04/2009	SUB	1000	-48.4	171	27/04/2009	SUB	994	-48.4	171	SOC	Anthothela	Cnidaria	Anthozoa	Alcyonacea	Anthothelidae	Anthothela		Mills, Sadie	13/02/2019	1
559	3142	56	ORH	TWL	24/06/2010	LOUR		-38.3	192	24/06/2010	LOUR		-38.4	191.9	STI	Stichopathes sp. 2	Cnidaria	Anthozoa	Antipatharia	Antipathidae	Stichopathes	sp. 2	Bo, Marzia	4/02/2019	1
560	4837	31	PTO	BLL	29/01/2017	SUB	1062	-51.5	161.3	30/01/2017	SUB	1132	-51.6	161.2	TPT	Trissopathes	Cnidaria	Anthozoa	Antipatharia	Cladopathidae	Trissopathes		Bo, Marzia	4/02/2019	1
562	5470	50	ORH	TWL	22/10/2018	SOE	1148	-44.5	184.9	22/10/2018	SOE		-44.5	184.9	LEI	Leiopathes cf. secunda	Cnidaria	Anthozoa	Antipatharia	Leiopathidae	Leiopathes	cf. secunda	Bo, Marzia	4/02/2019	1
561	5470	20	ORH	TWL	4/10/2018	SOE	1230	-44.1	185.4	4/10/2018	SOE	1241	-44.1	185.4	COB		Cnidaria	Anthozoa	Antipatharia	Leiopathidae			Bo, Marzia	4/02/2019	1
564	5274	15	SQU	TWL	4/03/2018	SOU	220	-46.7	165.9	4/03/2018	SOU	219	-46.7	165.9	AHL	Antipathella	Cnidaria	Anthozoa	Antipatharia	Myriopathidae	Antipathella		Bo, Marzia	4/02/2019	1
565	5117	16	BYX	TWL	2/09/2017	CEE	322	-40.6	177	2/09/2017	CEE	570	-40.6	176.9	COB	Myriopathes	Cnidaria	Anthozoa	Antipatharia	Myriopathidae	Myriopathes		Bo, Marzia	4/02/2019	1
563	5419	13	HOK	TWL	8/08/2018	CHA	433	-41.8	170.5	9/08/2018	CHA	387	-41.8	170.5	COB		Cnidaria	Anthozoa	Antipatharia	Myriopathidae			Bo, Marzia	4/02/2019	1
568	2744	75	ORH	TWL	30/12/2008	SOE	1338	-43.1	186.1	30/12/2008	SOE	1270	-43.1	186.1	BTP	Bathypathes	Cnidaria	Anthozoa	Antipatharia	Schizopathidae	Bathypathes		Bo, Marzia	4/02/2019	1
569	3883	55	BYS	TWL	20/10/2013	HOWE	710	-34.1	162.6	20/10/2013	HOWE	709	-34.1	162.6	COB	Diplopathes multipinnata	Cnidaria	Anthozoa	Antipatharia	Schizopathidae	Diplopathes	multipinnata	Opresko, Dennis	2019	1
570	4837	7	PTO	BLL	18/01/2017	SUB	1223	-51.4	161.5	19/01/2017	SUB	1200	-51.5	161.4	PTP	Parantipathes	Cnidaria	Anthozoa	Antipatharia	Schizopathidae	Parantipathes		Bo, Marzia	4/02/2019	1
571	5341	42	ORH	TWL	26/05/2018	SOE		-42.7	181.1	26/05/2018	SOE		-42.7	181.1	PTP	Parantipathes	Cnidaria	Anthozoa	Antipatharia	Schizopathidae	Parantipathes		Bo, Marzia	4/02/2019	1
566	5058	37	ORH	TWL	16/07/2017	AKE	772	-35.7	176.3	16/07/2017	AKE	1454	-35.6	176.3	COB		Cnidaria	Anthozoa	Antipatharia	Schizopathidae			Bo, Marzia	4/02/2019	2
567	5341	42	ORH	TWL	26/05/2018	SOE		-42.7	181.1	26/05/2018	SOE		-42.7	181.1	COB		Cnidaria	Anthozoa	Antipatharia	Schizopathidae			Bo, Marzia	4/02/2019	1
572	1731	16	ORH	TWL	19/01/2003	SOE	760	-44.2	185.4		SOE	1085	-44.2	185.3	TDP	Triadopathes	Cnidaria	Anthozoa	Antipatharia	Stylopathidae	Triadopathes		Bo, Marzia	4/02/2019	1
573	5341	42	ORH	TWL	26/05/2018	SOE		-42.7	181.1	26/05/2018	SOE		-42.7	181.1	TDP	Triadopathes	Cnidaria	Anthozoa	Antipatharia	Stylopathidae	Triadopathes		Bo, Marzia	4/02/2019	1
558	5220	26	ORH	TWL	21/01/2018	CET	985	-37.2	167.1	21/01/2018	CET	995	-37.2	167.2	COB		Cnidaria	Anthozoa	Antipatharia				Bo, Marzia	4/02/2019	1
574	1355	2	ORH	TWL	1/05/2000	AKW	770	-34.8	169.8		AKW	1100	-34.8	169.8	SIA	Enallopsammia cf. pusilla	Cnidaria	Anthozoa	Scleractinia	Dendrophylliidae	Enallopsammia	cf. pusilla	Kitahara, Marcelo	5/11/2018	1
575	1124	65	ORH	TWL	13/08/1998	AKE	614	-37.1	177.2		AKE	648	-37.1	177.2	ZAH	Kulamanamana haumeaae	Cnidaria	Anthozoa	Zoantharia	Parazoanthidae	Kulamanamana	haumeaae	Sinniger, Frederic	14/02/2019	1
576	3144	55	ORH	TWL	29/06/2010	HOWE	963	-35.6	165.2	29/06/2010	HOWE	992	-35.6	165.2	ZAH	Kulamanamana haumeaae	Cnidaria	Anthozoa	Zoantharia	Parazoanthidae	Kulamanamana	haumeaae	Sinniger, Frederic	8/03/2019	1

Appendix C: Spreadsheet summary of digital images processed and identified for the reporting period 1 July 2018 – 31 December 2018.

TRIP	Tow	NIWA Cat. No.	OSD No.	Initial OBS ID	Target species	Start FMA	Fishing method	Phylum	Class	Order	Family	Genus	Species	Determiner	Determined Date	Event start	Start latitude	Start longitude	Start depth	End depth	Observer	Image title	Image timestamp	Image rating
5346	22				ORH	CHA	TWL	Cnidaria	Anthozoa	Scleractinia	Caryophylliidae	Stephanocyathus	platypus	Di Tracey	3/07/2019	7/06/2018 14:54	-39.9	168.1	860	909		TRIP5346_P6070135_a	7/06/2018 22:00	3
5346	22				ORH	CHA	TWL	Cnidaria	Anthozoa	Scleractinia	Caryophylliidae	Stephanocyathus	platypus	Di Tracey	3/07/2019	7/06/2018 14:54	-39.9	168.1	860	909		TRIP5346_P6070136_b	7/06/2018 22:00	3
5346	119				ORH	AKW	TWL	Cnidaria	Anthozoa	Alcyonacea	Isididae	Acanella		Di Tracey	3/07/2019	9/07/2018 2:25	-36	173.1	886	903		TRIP5346_P7090293	9/07/2018 11:58	3
5346	119				ORH	AKW	TWL	Cnidaria	Anthozoa	Alcyonacea				Di Tracey	3/07/2019	9/07/2018 2:25	-36	173.1	886	903		TRIP5346_P7090294	9/07/2018 11:58	3
5346	121				ORH	AKW	TWL	Cnidaria	Anthozoa	Alcyonacea	Isididae			Di Tracey	3/07/2019	10/07/2018 16:56	-36	173	884	851		TRIP5346_P7100312	10/07/2018 20:22	4
5404	43				ORH	SOE	TWL	Cnidaria	Anthozoa	Scleractinia	Caryophylliidae	Stephanocyathus	platypus	Di Tracey	3/07/2019	9/08/2018 13:35	-42.8	179.3	1073	1035		TRIP5404_P8090056	9/08/2018 19:07	3
5404	50				ORH	SOE	TWL	Cnidaria	Anthozoa	Scleractinia	Caryophylliidae	Solenosmilia	variabilis	Di Tracey	3/07/2019	11/08/2018 1:18	-42.6	180		1362		TRIP5404_P8110059	11/08/2018 2:39	3
5426	33			STP	HOK	CHA	TWL	Cnidaria	Anthozoa	Scleractinia	Caryophylliidae	Stephanocyathus	platypus	Di Tracey	3/07/2019	26/08/2018 19:40	-41.6	170.3	685	644		TRIP5426_033_P8270090	27/08/2018 7:54	2
5438	97				SSO	SUB	TWL	Cnidaria	Anthozoa	Scleractinia	Oculinidae	Madrepora	oculata	Di Tracey	3/07/2019	5/10/2018 5:38	-47.5	177.8		977	R. Guild	TRIP5438_097_P1010829	5/10/2018 6:30	4
5438	97	129022	4152	ISI	SSO	SUB	TWL	Cnidaria	Anthozoa	Alcyonacea	Isididae	Keratoisis		Di Tracey	3/07/2019	5/10/2018 5:38	-47.5	177.8		977	R. Guild	TRIP5438_097_P1010832_NIWA129022_c	5/10/2018 6:31	4
5438	97	129022	4152	ISI	SSO	SUB	TWL	Cnidaria	Anthozoa	Alcyonacea	Isididae	Keratoisis		Di Tracey	3/07/2019	5/10/2018 5:38	-47.5	177.8		977	R. Guild	TRIP5438_097_P1010835_NIWA129022_a	5/10/2018 6:46	2
5438	97	129022	4152	ISI	SSO	SUB	TWL	Cnidaria	Anthozoa	Alcyonacea	Isididae	Keratoisis		Di Tracey	3/07/2019	5/10/2018 5:38	-47.5	177.8		977	R. Guild	TRIP5438_097_P1010836_NIWA129022_b	5/10/2018 6:46	2
5438	97			PAB	SSO	SUB	TWL	Cnidaria	Anthozoa	Alcyonacea	Paragorgiidae	Paragorgia	arborea	Di Tracey	3/07/2019	5/10/2018 5:38	-47.5	177.8		977	R. Guild	TRIP5438_097_P1010837_a	5/10/2018 6:46	2
5438	97			PAB	SSO	SUB	TWL	Cnidaria	Anthozoa	Alcyonacea	Paragorgiidae	Paragorgia	arborea	Di Tracey	3/07/2019	5/10/2018 5:38	-47.5	177.8		977	R. Guild	TRIP5438_097_P1010838_b	5/10/2018 6:47	2
5438	97	129023	4153	SIA	SSO	SUB	TWL	Cnidaria	Anthozoa	Scleractinia	Oculinidae	Madrepora	oculata	Di Tracey	3/07/2019	5/10/2018 5:38	-47.5	177.8		977	R. Guild	TRIP5438_097_P1010839_NIWA129023_a	5/10/2018 6:51	3
5438	97	129023	4153	SIA	SSO	SUB	TWL	Cnidaria	Anthozoa	Scleractinia	Oculinidae	Madrepora	oculata	Di Tracey	3/07/2019	5/10/2018 5:38	-47.5	177.8		977	R. Guild	TRIP5438_097_P1010840_NIWA129023_b	5/10/2018 6:52	3
5438	97	129023	4153	SIA	SSO	SUB	TWL	Cnidaria	Anthozoa	Scleractinia	Oculinidae	Madrepora	oculata	Di Tracey	3/07/2019	5/10/2018 5:38	-47.5	177.8		977	R. Guild	TRIP5438_097_P1010841_NIWA129023_c	5/10/2018 6:52	3
5438	97	129023; 129022; 129021	4153; 4152; 4151	SIA, ISI, UMB	SSO	SUB	TWL	Cnidaria	Anthozoa	Alcyonacea	Isididae	Keratoisis		Di Tracey	3/07/2019	5/10/2018 5:38	-47.5	177.8		977	R. Guild	TRIP5438_097_P1010843	5/10/2018 7:46	3
5438	97	129023; 129022; 129021	4153; 4152; 4151	SIA, ISI, UMB	SSO	SUB	TWL	Cnidaria	Anthozoa	Scleractinia	Oculinidae	Madrepora	oculata	Di Tracey	3/07/2019	5/10/2018 5:38	-47.5	177.8		977	R. Guild	TRIP5438_097_P1010843	5/10/2018 7:46	3
5438	97	129023; 129022; 129021	4153; 4152; 4151	SIA, ISI, UMB	SSO	SUB	TWL	Echinodermata	Crinoidea					Di Tracey	3/07/2019	5/10/2018 5:38	-47.5	177.8		977	R. Guild	TRIP5438_097_P1010843	5/10/2018 7:46	3
5438	100			PMN	SSO	SUB	TWL	Cnidaria	Anthozoa	Alcyonacea	Primnoidae	Primnoa	notialis	Di Tracey	3/07/2019	5/10/2018 12:17	-47.3	178.1		935	R. Guild	TRIP5438_100_P1010844_a	5/10/2018 13:33	2
5438	100			PMN	SSO	SUB	TWL	Cnidaria	Anthozoa	Alcyonacea	Primnoidae	Primnoa	notialis	Di Tracey	3/07/2019	5/10/2018 12:17	-47.3	178.1		935	R. Guild	TRIP5438_100_P1010845_b	5/10/2018 13:34	3
5440	30				HOK	SEC	TWL	Cnidaria	Anthozoa	Scleractinia	Caryophylliidae	Desmophyllum	dianthus	Di Tracey	3/07/2019	8/09/2018 7:38	-43.3	173.8	468			TRIP5440_P1030727_a	8/09/2018 19:36	3
5440	30				HOK	SEC	TWL	Cnidaria	Anthozoa	Scleractinia	Caryophylliidae	Desmophyllum	dianthus	Di Tracey	3/07/2019	8/09/2018 7:38	-43.3	173.8	468			TRIP5440_P1030728_b	8/09/2018 19:36	3
5440	30				HOK	SEC	TWL	Cnidaria	Anthozoa	Scleractinia	Caryophylliidae	Desmophyllum	dianthus	Di Tracey	3/07/2019	8/09/2018 7:38	-43.3	173.8	468			TRIP5440_P1030729_c	8/09/2018 19:37	3
5440	30				HOK	SEC	TWL	Cnidaria	Anthozoa	Scleractinia	Caryophylliidae	Desmophyllum	dianthus	Di Tracey	3/07/2019	8/09/2018 7:38	-43.3	173.8	468			TRIP5440_P1030731_d	8/09/2018 19:37	3
5440	47				HOK	SOE	TWL	Cnidaria	Anthozoa	Scleractinia	Caryophylliidae	Solenosmilia	variabilis	Di Tracey	3/07/2019	14/09/2018 11:53	-43.7	177.2	478	610		TRIP5440_P1030767	14/09/2018 23:31	3
5440	47				HOK	SOE	TWL	Cnidaria	Hydrozoa	Anthoathecata	Stylasteridae	Lepidotheca		Di Tracey	3/07/2019	14/09/2018 11:53	-43.7	177.2	478	610		TRIP5440_P1030771_a	14/09/2018 23:34	3
5440	47				HOK	SOE	TWL	Cnidaria	Hydrozoa	Anthoathecata	Stylasteridae	Lepidotheca		Di Tracey	3/07/2019	14/09/2018 11:53	-43.7	177.2	478	610		TRIP5440_P1030772_b	14/09/2018 23:34	3
5440	47				HOK	SOE	TWL	Cnidaria	Hydrozoa	Anthoathecata	Stylasteridae	Lepidotheca		Di Tracey	3/07/2019	14/09/2018 11:53	-43.7	177.2	478	610		TRIP5440_P1030773_c	14/09/2018 23:35	3
5440	47				HOK	SOE	TWL	Cnidaria	Anthozoa	Scleractinia	Caryophylliidae	Desmophyllum	dianthus	Di Tracey	3/07/2019	14/09/2018 11:53	-43.7	177.2	478	610		TRIP5440_P1030778	14/09/2018 23:41	3
5440	47				HOK	SOE	TWL	Cnidaria	Anthozoa	Scleractinia	Caryophylliidae	Desmophyllum	dianthus	Di Tracey	3/07/2019	14/09/2018 11:53	-43.7	177.2	478	610		TRIP5440_P1030779	14/09/2018 23:41	3
5451	9			COF	LIN	SUB	TWL	Cnidaria	Anthozoa	Scleractinia	Flabellidae	Flabellum	knoxi	Di Tracey	3/07/2019	12/09/2018 6:35	-49.7	168	590	528		TRIP5451_009_P1010148	12/09/2018 13:28	2
5451	17			COF	LIN	SUB	TWL	Cnidaria	Anthozoa	Scleractinia	Flabellidae	Flabellum	knoxi	Di Tracey	3/07/2019	17/09/2018 5:31	-49.7	168	598	571		TRIP5451_017_P1010175	17/09/2018 22:33	2
5451	32			COF	LIN	SUB	TWL	Cnidaria	Anthozoa	Scleractinia	Flabellidae	Flabellum	knoxi	Di Tracey	3/07/2019	24/09/2018 6:31	-49.7	168	626	640		TRIP5451_032_P1010200	24/09/2018 20:02	3
5451	38			COF	LIN	SUB	TWL	Cnidaria	Anthozoa	Scleractinia	Flabellidae	Flabellum	knoxi	Di Tracey	3/07/2019	27/09/2018 19:03	-49.7	168	616	623		TRIP5451_038_P1010209	28/09/2018 8:00	3
5467	116				ORH	AKW	TWL	Cnidaria	Anthozoa	Scleractinia	Flabellidae	Flabellum	knoxi	Di Tracey	3/07/2019	21/10/2018 3:34	-34.7	171.6	1063			TRIP5467_PA211278	21/10/2018 9:39	3
5467	116				ORH	AKW	TWL	Cnidaria	Anthozoa	Alcyonacea	Chrysogorgiidae	Iridogorgia		Di Tracey	3/07/2019	21/10/2018 3:34	-34.7	171.6	1063			TRIP5467_PA211284	21/10/2018 9:40	3

TRIP	Tow	NIWA Cat. No.	OSD No.	Initial OBS ID	Target species	Start FMA	Fishing method	Phylum	Class	Order	Family	Genus	Species	Determiner	Determined Date	Event start	Start latitude	Start longitude	Start depth	End depth	Observer	Image title	Image timestamp	Image rating
5467	118				ORH	AKW	TWL	Cnidaria	Anthozoa	Alcyonacea	Isididae	Keratoisis		Di Tracey	3/07/2019	21/10/2018 9:20	-34.8	171.6	986			TRIP5467_PA211286	21/10/2018 11:02	3
5467	118				ORH	AKW	TWL	Cnidaria	Anthozoa	Alcyonacea	Isididae	Keratoisis		Di Tracey	3/07/2019	21/10/2018 9:20	-34.8	171.6	986			TRIP5467_PA211287	21/10/2018 11:02	3
5467	121				ORH	AKW	TWL	Cnidaria	Anthozoa	Alcyonacea	Isididae			Di Tracey	3/07/2019	21/10/2018 19:02	-34.7	171.6	920			TRIP5467_PA211299	21/10/2018 20:01	3
5467	121				ORH	AKW	TWL	Cnidaria	Anthozoa	Alcyonacea	Isididae	Keratoisis		Di Tracey	3/07/2019	21/10/2018 19:02	-34.7	171.6	920			TRIP5467_PA211303	21/10/2018 20:02	3
5467	129				ORH	AKW	TWL	Cnidaria	Anthozoa	Alcyonacea				Di Tracey	3/07/2019	22/10/2018 17:28	-34.7	171.6	926			TRIP5467_PA221313	22/10/2018 18:34	3
5467	129				ORH	AKW	TWL	Cnidaria	Anthozoa	Alcyonacea	Isididae	Keratoisis		Di Tracey	3/07/2019	22/10/2018 17:28	-34.7	171.6	926			TRIP5467_PA221314	22/10/2018 18:34	3
5467	133				ORH	AKW	TWL	Cnidaria	Anthozoa	Alcyonacea	Primnoidae			Di Tracey	3/07/2019	23/10/2018 3:36	-34.7	171.6	905			TRIP5467_PA231322	23/10/2018 5:17	4
5467	141				ORH	AKW	TWL	Cnidaria	Anthozoa	Alcyonacea	Primnoidae			Di Tracey	3/07/2019	24/10/2018 8:12	-34.7	171.6	914			TRIP5467_PA241340	24/10/2018 10:20	4
5470	20	129027	4157	COB	ORH	SOE	TWL	Cnidaria	Anthozoa	Antipatharia	Leiopathidae			Marzia Bo	4/02/2019	4/10/2018 18:21	-44.1	185.4	1230	1241	L. Reed	TRIP5470_020_Leiopathidae_NIWA129027_a	5/10/2018 13:32	2
5470	20	129027	4157	COB	ORH	SOE	TWL	Cnidaria	Anthozoa	Antipatharia	Leiopathidae			Marzia Bo	4/02/2019	4/10/2018 18:21	-44.1	185.4	1230	1241	L. Reed	TRIP5470_020_Leiopathidae_NIWA129027_b	4/10/2018 20:58	3
5470	20				ORH	SOE	TWL	Cnidaria	Anthozoa	Scleractinia	Caryophylliidae	Goniocorella	dumosa	Di Tracey	3/07/2019	4/10/2018 18:21	-44.1	185.4	1230	1241		TRIP5470_PA042508	4/10/2018 20:57	3
5470	50	129017	4154	LSE	ORH	SOE	TWL	Cnidaria	Anthozoa	Antipatharia	Leiopathidae	Leiopathes	cf. secunda	Marzia Bo	4/02/2019	22/10/2018 13:59	-44.5	184.9	1148			TRIP5470_050_Leiopathes-secunda_NIWA129017_a	22/10/2018 16:41	2
5470	50	129017	4154	LSE	ORH	SOE	TWL	Cnidaria	Anthozoa	Antipatharia	Leiopathidae	Leiopathes	cf. secunda	Marzia Bo	4/02/2019	22/10/2018 13:59	-44.5	184.9	1148			TRIP5470_050_Leiopathes-secunda_NIWA129017_b	22/10/2018 15:02	3
5470	50				ORH	SOE	TWL	Cnidaria	Anthozoa	Scleractinia	Caryophylliidae	Solenosmilia	variabilis	Di Tracey	3/07/2019	22/10/2018 13:59	-44.5	184.9	1148			TRIP5470_PA222597	22/10/2018 15:04	3
5470	50				ORH	SOE	TWL	Cnidaria	Anthozoa	Scleractinia	Caryophylliidae	Solenosmilia	variabilis	Di Tracey	3/07/2019	22/10/2018 13:59	-44.5	184.9	1148			TRIP5470_PA222598	22/10/2018 15:04	3
5470	50				ORH	SOE	TWL	Cnidaria	Anthozoa	Scleractinia	Caryophylliidae	Solenosmilia	variabilis	Di Tracey	3/07/2019	22/10/2018 13:59	-44.5	184.9	1148			TRIP5470_PA222599	22/10/2018 15:04	3
5476	35			GOC	LIN	SOU	TWL	Cnidaria	Anthozoa	Alcyonacea				Di Tracey	3/07/2019	28/10/2018 6:30	-47	165.6	445	558		TRIP5476_035_PA280140	28/10/2018 21:35	2
5476	40			THO	WWA	SOU	TWL	Cnidaria	Anthozoa	Alcyonacea	Primnoidae	Thouarella		Di Tracey	3/07/2019	30/10/2018 11:54	-48.7	166.4	478	617		TRIP5476_040_PA310151_a	31/10/2018 9:41	3
5476	40			THO	WWA	SOU	TWL	Cnidaria	Anthozoa	Alcyonacea	Primnoidae	Thouarella		Di Tracey	3/07/2019	30/10/2018 11:54	-48.7	166.4	478	617		TRIP5476_040_PA310151_b	31/10/2018 9:43	3
5476	40			THO	WWA	SOU	TWL	Cnidaria	Anthozoa	Alcyonacea	Primnoidae	Thouarella		Di Tracey	3/07/2019	30/10/2018 11:54	-48.7	166.4	478	617		TRIP5476_040_PA310151_c	31/10/2018 9:43	3
5494	42				LIN	SOU	TWL	Cnidaria	Anthozoa	Scleractinia	Caryophylliidae	Desmophyllum	dianthus	Di Tracey	3/07/2019	27/11/2018 5:15	-48.9	166.5	450	461		TRIP5494_PB270092	27/11/2018 12:15	3
5494	42				LIN	SOU	TWL	Cnidaria	Hydrozoa	Anthoathecata	Stylasteridae	Errina ?		Di Tracey	3/07/2019	27/11/2018 5:15	-48.9	166.5	450	461		TRIP5494_PB270093_a	27/11/2018 14:16	4
5494	42				LIN	SOU	TWL	Cnidaria	Hydrozoa	Anthoathecata	Stylasteridae	Errina ?		Di Tracey	3/07/2019	27/11/2018 5:15	-48.9	166.5	450	461		TRIP5494_PB270094_b	27/11/2018 14:16	4
5503	76				HOK	SOE	TWL	Cnidaria	Anthozoa	Scleractinia	Flabellidae	Flabellum	knoxi	Di Tracey	3/07/2019	3/12/2018 8:34	-43.8	178.3	603	596		TRIP5503_P1010176_a	3/12/2018 16:06	3
5503	76				HOK	SOE	TWL	Cnidaria	Anthozoa	Scleractinia	Flabellidae	Flabellum	knoxi	Di Tracey	3/07/2019	3/12/2018 8:34	-43.8	178.3	603	596		TRIP5503_P1010177_b	3/12/2018 16:06	4
5503	90	129059	4202	COF	HOK	SOE	TWL	Cnidaria	Anthozoa	Scleractinia	Flabellidae	Flabellum		Di Tracey	3/07/2019	7/12/2018 1:32	-44.2	182.5	502	512		TRIP5503_090_P1010215_NIWA129059	7/12/2018 7:41	3
5515	24				ORH	SOE	TWL	Cnidaria	Anthozoa	Alcyonacea	Isididae	Keratoisis		Di Tracey	3/07/2019	30/11/2018 4:58	-42.9	185.5	1108	1223		TRIP5515_024_PB300035_a	30/11/2018 12:11	3
5515	24				ORH	SOE	TWL	Cnidaria	Anthozoa	Alcyonacea	Isididae	Keratoisis		Di Tracey	3/07/2019	30/11/2018 4:58	-42.9	185.5	1108	1223		TRIP5515_024_PB300036_b	30/11/2018 12:11	3
5515	24				ORH	SOE	TWL	Cnidaria	Anthozoa	Scleractinia	Caryophylliidae	Solenosmilia	variabilis	Di Tracey	3/07/2019	30/11/2018 4:58	-42.9	185.5	1108	1223		TRIP5515_024_PB300037_a	30/11/2018 12:12	3
5515	24				ORH	SOE	TWL	Cnidaria	Anthozoa	Scleractinia	Caryophylliidae	Solenosmilia	variabilis	Di Tracey	3/07/2019	30/11/2018 4:58	-42.9	185.5	1108	1223		TRIP5515_024_PB300039_b	30/11/2018 12:13	3
5515	63				ORH	SOE	TWL	Cnidaria	Anthozoa	Alcyonacea	Primnoidae	Primnoa		Di Tracey	3/07/2019	6/12/2018 6:18	-44.2	185.5	1206	1239		TRIP5515_063_PC060083_a	6/12/2018 10:25	3
5515	63				ORH	SOE	TWL	Cnidaria	Anthozoa	Alcyonacea	Primnoidae	Primnoa		Di Tracey	3/07/2019	6/12/2018 6:18	-44.2	185.5	1206	1239		TRIP5515_063_PC060086_b	6/12/2018 10:25	3
5515	63				ORH	SOE	TWL	Cnidaria	Anthozoa	Alcyonacea	Primnoidae	Primnoa		Di Tracey	3/07/2019	6/12/2018 6:18	-44.2	185.5	1206	1239		TRIP5515_063_PC060088_c	6/12/2018 10:26	3
5536	7				SSO	SOU	TWL	Cnidaria	Anthozoa	Scleractinia	Caryophylliidae	Solenosmilia	variabilis	Di Tracey	3/07/2019	21/12/2018 17:42	-47.3	165.7	1456			TRIP5536_007_PC220009_a	22/12/2018 10:00	3
5536	7				SSO	SOU	TWL	Cnidaria	Anthozoa	Scleractinia	Caryophylliidae	Solenosmilia	variabilis	Di Tracey	3/07/2019	21/12/2018 17:42	-47.3	165.7	1456			TRIP5536_007_PC220010_b	22/12/2018 10:00	3
5536	7				SSO	SOU	TWL	Cnidaria	Anthozoa	Scleractinia	Caryophylliidae	Solenosmilia	variabilis	Di Tracey	3/07/2019	21/12/2018 17:42	-47.3	165.7	1456			TRIP5536_007_PC220013_c	22/12/2018 10:01	3
5536	8				SSO	SOU	TWL	Cnidaria	Anthozoa	Alcyonacea	Primnoidae	Perissogorgia		Di Tracey	3/07/2019	21/12/2018 21:15	-47.3	165.8	925			TRIP5536_008_PC220014_a	22/12/2018 16:34	3
5536	8				SSO	SOU	TWL	Cnidaria	Anthozoa	Alcyonacea	Primnoidae	Perissogorgia		Di Tracey	3/07/2019	21/12/2018 21:15	-47.3	165.8	925			TRIP5536_008_PC220016_b	22/12/2018 16:35	3
5536	11				SQU	SOU	TWL	Cnidaria	Hydrozoa	Anthoathecata	Stylasteridae	Stylaster ?		Di Tracey	3/07/2019	23/12/2018 6:32	-48.6	167.8	146	237		TRIP5536_011_PC230017_a	23/12/2018 17:55	3
5536	11				SQU	SOU	TWL	Cnidaria	Hydrozoa	Anthoathecata	Stylasteridae	Stylaster ?		Di Tracey	3/07/2019	23/12/2018 6:32	-48.6	167.8	146	237		TRIP5536_011_PC230022_b	23/12/2018 17:57	3

TRIP	Tow	NIWA Cat. No.	OSD No.	Initial OBS ID	Target species	Start FMA	Fishing method	Phylum	Class	Order	Family	Genus	Species	Determiner	Determined Date	Event start	Start latitude	Start longitude	Start depth	End depth	Observer	Image title	Image timestamp	Image rating
5536	11				SQU	SOU	TWL	Cnidaria	Hydrozoa	Anthoathecata	Stylasteridae	Stylaster ?		Di Tracey	3/07/2019	23/12/2018 6:32	-48.6	167.8	146	237		TRIP5536_011_PC230024_c	23/12/2018 17:57	3
5536	49				SSO	SUB	TWL	Cnidaria	Anthozoa	Alcyonacea	Paragorgiidae	Paragorgia	arborea	Di Tracey	3/07/2019	2/01/2019 0:20	-48.3	174	745			TRIP5536_049_P102005 4_a	2/01/2019 9:20	3
5536	49				SSO	SUB	TWL	Cnidaria	Anthozoa	Alcyonacea	Paragorgiidae	Paragorgia	arborea	Di Tracey	3/07/2019	2/01/2019 0:20	-48.3	174	745			TRIP5536_049_P102006 1_b	2/01/2019 9:22	3