RV *Investigator* Voyage Summary

Voyage #:	**IN2017_V05**		
Voyage title:	Long-term recovery of trawled marine communities 25 years after the world's largest adaptive management experiment		
Mobilisation:	Wednesday 20 September, 2017 Garden Island, Sydney, NSW		
Depart:	0800, Wednesday 11 October 2017, Broome, WA		
Return:	0800, Friday November 10, 2017, Henderson (Fremantle), WA		
Demobilisation:	Friday 10 November, 2017, Henderson (Fremantle) WA		
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Principal Investigators:	John Keesing, Roland Pitcher, Keith Sainsbury, Alan Williams, Joanna Strzelecki (CSIRO) Stephen Newman, Corey Wakefield (WA Dept. of Fisheries)		
Supplementary Projects	1. Assessment of marine biodiversity as part of determining long-term recovery of trawled communities on the NWS Dr Monika Bryce, WA Museum (monika.bryce@museum.wa.gov.au) 2. Natural iron fertilization of oceans around Australia: linking terrestrial dust and bushfires to marine biogeochemistry Dr Andrew Bowie, UTAS (andrew.bowie@utas.edu.au)		
Piggyback Projects	1. Collection of marine invertebrates, particularly sponges, and a survey of their fluorescent properties correlated to depth and chlorophyll content Prof Peter Karuso, Macquarie University (peter.karuso@mq.edu.au)		

Voyage Summary

Scientific objectives

The scientific objective was the same as the "Purpose" stated above, that is to determine the extent to which habitat forming benthic invertebrate and demersal fish assemblages of the North West Shelf (NWS) have recovered from high levels of foreign trawling effort between the 1960s and the late 1980s and to compare these with areas which have been continuously fished with lower levels of effort or completely protected from trawling within the area under management of the Pilbara Trawl Fishery since 1990.

Voyage objectives

The objectives of the voyage were to sample at 100 sites, across gradients of historical and recent fishing effort, using a demersal fish trawl and an epibenthic sled in order to contrast the diversity, abundance, biomass and size/age composition of the demersal fish community and epibenthic, habitat forming invertebrates. Other sampling of the biophysical nature of the sediment and the water column were also to be taken at a subset of these sites in order to adequately characterise environmental parameters of the study region. Details of supplementary sampling for piggy back projects is also provided later in this report.

Results

In total we undertook 584 operations in 26 days (see appended table). The number of sites at which we undertook each type of operation were as follows: trawls; 100 stations, sleds; 99 stations, CTD casts; 72 stations, turbulence probes; 77 stations, sediment grabs; 99 stations, plankton net tows; 97 stations and video tows; 8 stations. Some operations were replicated at some stations (see appended table). Detail on the types of samples and measurements made is given in following sections of this report and the data from the voyage (about 4TB), has been secured on CSIRO servers in Hobart, Brisbane and Perth. It is far too early to provide any results as considerable work on acquiring data from the video and still camera imagery remains to be carried out as does all the invertebrate identifications.

Voyage Narrative

The voyage began in Broome on 11 October 2017 and the trawl equipment was trialled enroute to the first sampling station which was reached on 12 October (refer following maps and table of stations for locations and attributed such as depth). From this point we visited 100 stations (see map) with the objective of trawling each station during the daylight hours and sledding during the night hours. Most stations required visiting twice to achieve this. We also conducted as many of the other operations (CTD, plankton tow, turbulence probe and sediment grab) as time would allow on each station. A full list of operations is appended.

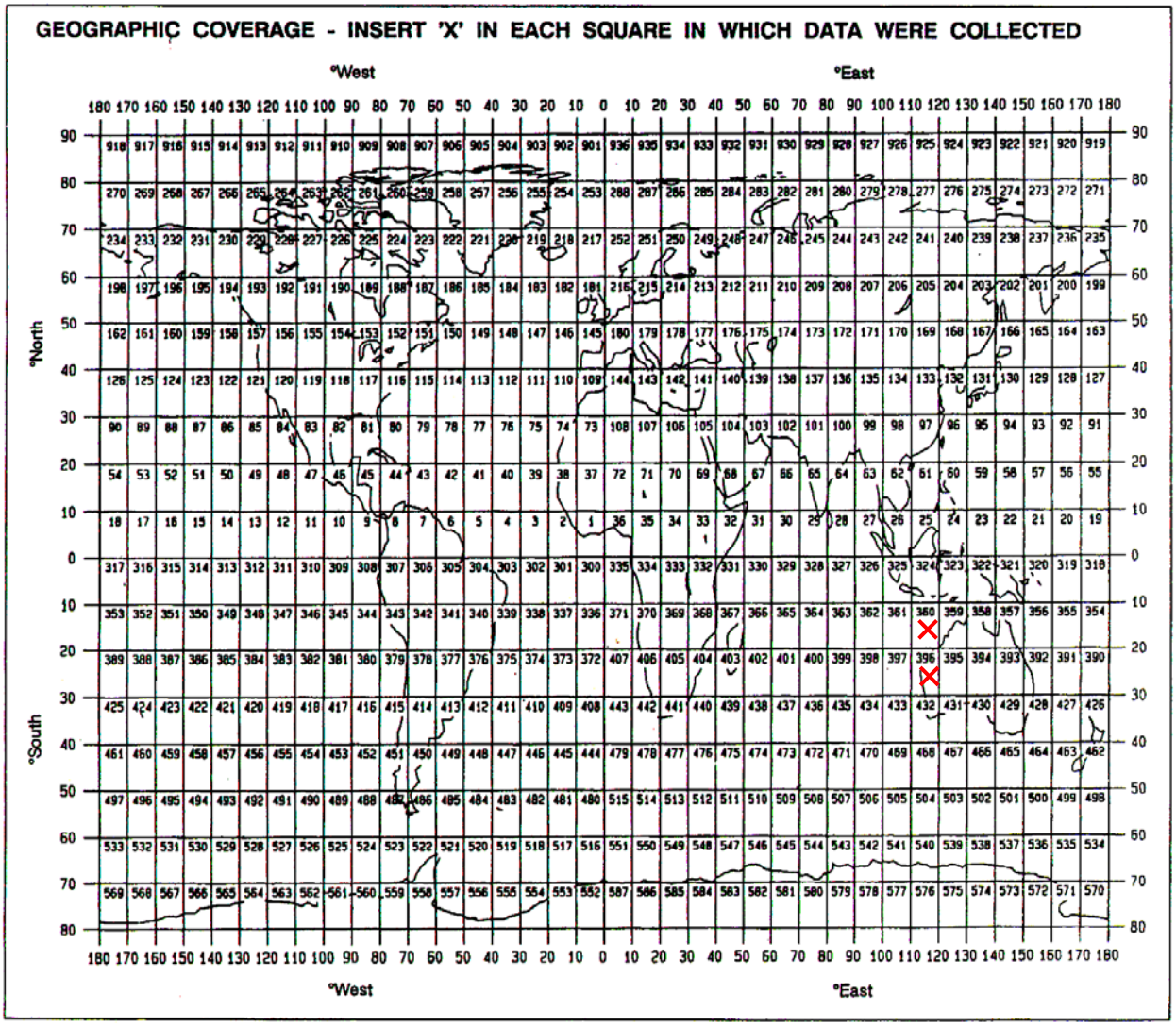
The section below on measurements and samples taken details the types of sampling equipment used, of how each operation was carried out, the types of sampling and data collected. Stations were not visited in order of station numbers, but instead in order of approximate closest proximity. The 100th and final station was visited on November 6th after which we transited to Henderson near

Fremantle arriving on 10 November. Enroute to Henderson we transited through the Ningaloo Commonwealth Marine Reserve and carried out some swath mapping align the 120 m depth contour.

Summary

The voyage had an ambitious program of deployments and set a record for the number of operations carried out on a single voyage. The voyage met most of its objectives and sufficient to address the scientific objectives. Importantly we trawled all 100 stations and had problems with net entanglement or with the trawl headline camera at just a few sites meaning that reliable data was collected from most sites. A large amount of data and samples await analysis before any conclusions can be drawn on the results.

Marsden Squares



Summary of Measurements and samples taken

In order to understand the nature of and reason for the various measurements and samples taken it is necessary to know the study design and so a description of that is also given here.

Study design and site selection methodology

Data sources

Historical trawl fishing effort

Trawl effort data for the Taiwanese pair-trawl fleet was originally sourced from AFMA logbook data compilation which contains trawl records from foreign trawlers that had been collated in the "AFZIS" data base between 1974 and1987 and in the "radio-reporting" database (1979-1990).

Prior to 1979, trawl effort had been reported on 30 minute grid cells, whereas from 1979 onwards trawl effort was reported as trawl start and end positions with trawl durations although the resolution and quality of these positions was variable (noting also that these were prior to GPS).

The start–end positions and duration data from 1979 to 1987 were linear-interpolated then gridded and aggregated at 0.01 degree by Franzis Althaus (CSIRO O&A Hobart). However, while this resolution was satisfactory for other AFMA fisheries following implementation of GPS, it was too fine for the historical Taiwanese pair-trawl effort data. Hence, these data were aggregated further to 0.05d and averaged for the period 1979-1985 inclusive. The NWS JEMS Project identified, by examination of the Taiwanese government's grid-logbook data, that the AFMA data holdings probably under-estimated the total annual Taiwanese effort — thus, ultimately these AFMA sourced gridded data will need scaling up. Nevertheless, they are believed to adequately represent the spatial distribution of effort intensity for the purposes of the Investigator 2017-05 voyage survey design.

Recent trawl fishing effort (Pilbara fish Trawl Fishery)

Trawl effort data for the domestic Pilbara Fish Trawl fleet (otter trawls) were provided by WA Fisheries and originally compiled from vessel logbook data, for the period 2005-2016. The start–end positions and tow-durations of the individual trawls were linear-interpolated then gridded and aggregated at 0.01 degree. For the purposes of the survey design, these data were averaged to give the mean annual effort in hours per grid cell. The hours of effort were re-scaled to swept-area by multiplying by average trawl-speed and swept-width between the doors, then divided by grid-cell area to give swept-area ratio.

Environmental data

A range of mapped environmental data layers had been collated by previous project (originally the CERF Marine Biodiversity Hub) and progressively updated by a series of subsequent projects, most recently FRDC 2016-039. These environmental layers include: bathymetry DEM (depth, slope, aspect, terrain topography membership); sediments (%mud, sand, gravel, carbonate); seabed shear-stress; bottom-water attributes (temperature, salinity, O_2, NO_3, PO_4, Si); ocean colour derived variables (e.g. SST, Chl k490, PAR, NPP, epoc & b_irr); with seasonal ranges where applicable — a total of 40 variables. The layers were all gridded at 0.01d and mapped for the entire EEZ; subsequently subsetted to the Pilbara shelf study area.

Biological survey data

Biological data from historical NWS Effects of Trawling (EoT) Project surveys from 1982 to 1997 were used in analyses to quantify relationships between biological composition and environmental gradients, as well as both historical and recent trawl effort. These surveys conducted trawl sampling, using a McKenna trawl on two RV Southern Surveyor voyages (SS199508: 108 stations; SS199707: 106 stations) and Frank & Bryce trawls on 11 FRV Soela voyages (SO198205 to SO198805: 1096 stations) and 2 SS voyages (SS199002: 133 stations; SS199104: 101 stations). Identification and quantification of these trawl samples focussed primarily on the fishes, with some identification of discrete invertebrates at high taxonomic levels. Sponges were quantified at the phylum level only on the two McKenna trawl voyages.

On most voyages (10 of 15), a 35 mm still film camera was fitted to the headline of many trawls and provided images of sessile benthos on the seabed ahead of the trawl net. Photos were available for 583 stations (of a total of 1544 trawls) and typically about 80 photos were available for each although this ranged widely. The photos had previously been analysed by Franzis Althaus (CSIRO O&A Hobart) to provide counts of large (>25cm), small (5-25cm) and mini (<5cm) benthos for up to about a dozen morpho-types, including: sponges (lump, cup, branching, flat), gorgonians (sea fans, whips), soft-coral and sea-pens among others.

Determination of sampling strata

The biological, environmental and trawl effort data were analysed using R package gradientForest (Ellis et al. 2012) to quantify the magnitude and shape of relationships between biological composition and gradients in the environment. These compositional turnover curves were used to transform the multi-dimensional environmental space of the study area (i.e. the mapped environmental variables) to a multi-dimensional biological space where increasing distance between points in this space reflects increasing differences in biological composition as associated with the environmental gradients. The biological space provides the basis of the stratification of the study. For example, if a representative sampling of the regions biodiversity was desired, then simply clustering the biological space into a number of groups equal to the expected number of stations would provide a suitable stratification.

However, in this study, the primary objective was to quantify the extent of recovery in sessile benthos and of fish populations. Hence, a key contrast (or strata) was in areas that had been trawled heavily by the Taiwanese but later were untrawled after the foreign trawlers ceased fishing. Other important contrasts were between such areas and those areas that continued to be trawled by the domestic fishery; as well as those areas that were not fished by either fleets. Thus the first step was to establish the effort contrasts and then determine the number of stations to be sampled in each.

The trawl effort intensity (average annual grid swept ratio: F-ratio) of both the historical and recent fishing was divided into categories representing zero, low, medium and high potential impact on benthos (i.e. F-ratio = [0,0.01] (0.01,0.5] (0.5,1.0] (1.0,2.0]) and the entire study grid of 24,371 cells was assigned into one of the 16 possible categories. Three categories did not exist (i.e. historical= zero with recent=low, medium or high) and some categories were rare (i.e. recent=medium or high; historical=high). The total number of stations planned in the survey was 100 and these initially were distributed in proportion to the number of grid cells in each categories to the power of ⅓, with some

subsequent adjustment of allocation to ensure a minimum of 3 and to up-weight the key contrast (high → zero).

The second step was to cluster each effort category into a number of groups corresponding to the number of stations to be allocated, where the clustering was based on the transformed biological space described above. These cluster groups within effort categories provided the strata for the survey. Within each strata, the medoid grid cell was identified as a candidate most typical station, where the medoid is defined as the cell having the minimum sum of distances (in biological space) to all other cells in the same strata.

Site selection

Site selection principles and rules

Having established the 0.01 degree (1111 m) grid extent for the study and determined which grid cells comprised each of the 100 strata — and the position of the medoid in each strata (as described above) — a series of rules were applied to select the actual stations to be sampled. These rules were established to enable, where possible, comparison with historical scientific trawl data collected in 1963 and 1964 (Masuda et al. 1964; Suzuki et al. 1964) and between 1982 and 1997 by CSIRO (Sainsbury 1987 [which also includes a summary of Japanese and other surveys on the NWS]; Althaus et al. 2006; Fulton et al. 2006). Firstly, if the start position for an Oshoru Maru trawl fell within the strata, it was selected as the station. If there was no corresponding Oshoru Maru station then the midpoint of the closest to medoid Southern Surveyor (SS) 1995 or 1997 trawl that fell within the strata was chosen. Priority was given to these three voyages because they had collected quantitative biomass data on sponge catches in trawls. If no SS1995 or SS1997 voyage trawl fell within the strata, then we selected the midpoint of the closest to medoid other CSIRO 1982-1991 voyage trawl for which headline camera photos of benthos were collected at the station (subject to a minimum of 40 photos). If there were no historic research trawls in the strata then the medoid cell was selected as the station.

By this process 100 stations were selected for the study. The next step was to test the feasibility of each of these stations for ship navigation and ground gear deployments given the intensive array of undersea communications cables, oil and gas pipes, exploration wells and drill holes as well as exclusion and cautionary areas around oil and gas infrastructure at the surface and on the seabed. This feasibility assessment was undertaken by Bridge Officers from the RV Investigator and resulted in 6 of the original 100 sites being ruled invalid. These were moved sufficient to avoid the obstacle by 1 nm but always remained within the same strata. Only one other site was moved. Site 6 was moved 3.4 nm south of its original position to match a historical research trawl (SO1983_04_64) inside the proposed Dampier Commonwealth Marine Reserve (CMR) while remaining within the same strata.

Tow transect selection

Where possible the selected stations were treated as the midpoint of the trawl transect. The primary consideration in trawl and sled transect selection was to remain within strata. The trawl and sled transects were selected blind to the substrate type and bottom topography. Once a transect was selected it was swath mapped at 70-100 kHz using a Kongsberg EM710 multibeam acoustic swath mapper so that any trawl hazards could be assessed before deploying the net. Any sharp changes in

depths on hard bottom which indicated ledges greater than 1 m depth change in 10 m transect length were avoided (to minimise chance of net damage and camera loss) by changing the transect bearing. In general, tow direction was dictated by wind direction with most trawl and sled tows done with the ship heading into the wind. Some latitude around this, particularly when winds were light provided flexibility to avoid hazards (a 1 nm buffer was maintained around pipelines, abandoned well heads and drill holes) and remain in small strata or strata with complex shapes. In a few cases a curved or dog-legged trawl line had to be set to avoid oil and gas infrastructure hazards and remain within strata. All other tows were straight.

Trawl and sled operations and gear configuration

Trawl design

The CSIRO Semi V Wing trawl net (McKenna trawl net) was used for all trawls.

Trawl headline camera

The Trawl headline camera consisted of a Canon M5 mirrorless camera and a Quantum QFlash Trio QF8 flash in waterproof housings mounted on a sturdy acrylic and stainless steel frame. Two laser beams fixed at 25 cm apart were added to provide a scale to all photographs. Photograph interval was set at 3 seconds which is every 4.6 m at 3 knots. Depth activation/deactivation was programmed into the camera to avoid excessive memory or battery use during net streaming. A GoPro 5 video camera in a Nimar housing rated to 200 m was also fixed to the camera frame. Additional floats were added to the trawl headline to compensate for the mass of the camera

Trawl set up and operation

Trawl navigation lines were established which consisted of a 2 km lead in to an on bottom position and a 4 km trawl track. On approach to the trawl line, the cod end was paid out at 5 – 6 knots and when the net was off the drum the trawl headline camera frame was attached to the trawl headline with shackles along with the Marport sensors. The camera was turned on and the net was then paid out and the trawl doors attached. Depending on water depth, the net was towed with doors fixed until approximately 600 m from the on bottom position and then with the vessel slowed to 4 -5 knots, 50 m of wire was paid out. At a point calculated on the basis of vessel speed and depth, wire was then paid out at a wire:depth ratio of 3.5:1.

The net did not have its own USBL system so the following provides an estimate of the position of the doors and the net relative to the vessel position. The length of the back chains from boards (15 m), sweep length (90 m) and bridles (45 m) gives a total of 150 m, which when the doors are fully spread equates to approximately 140 m from the centre of the footrope to an imaginary line between the two boards. The position of the doors relative to the ships position was calculated using Pythagorean theorem with the depth and amount of wire out as two sides of a right angle triangle and taking into account the distance from the stern to the ships GPS (60 m). No attempt was made to compensate for the spread of the two winch wires which are 9m apart at the stern and maybe as much as 100m apart at the doors. For example in 80 m depth with 270 m of wire out, this was a distance of 318 m. When added to the distance between the boards and the net of 140 m (see above), this total distance (458 m in the above example) was recorded in the ships event logger as the layback distance from the ships position (ships GPS) to the centre of the net headline with the boards fully spread. The ships position was recorded in the ship's event logger at three times on

each trawl: the time when the doors touched the bottom, the time the boards were fully spread and at the time the boards lifted from the bottom. The timing of each of these events was provided using a Marport net monitoring system (see below). The above records make it possible to estimate the position of the boards and the net relative to the ships position at each important phase of the fishing operation.

With the boards fully spread at approximately 90 m (range is between 80 m and 100 m) and the net width at fishing about 19 m wide (as it bows back from its full length of 26 m), the effective fishing swept width for fish will be about 90m and for benthic invertebrates about 19 m. Of the 100 sites trawled major net tearing occurred at only one site (Site W3) but the catch was regarded as representative and quantitatively valid. There were compromised trawls (net tangle) at three sites, but two of these were repeated on an adjacent line offset by 200 m leaving only the catch at site W29 regarded as invalid.

Trawl net monitoring system

A Marport net monitoring system with acoustic sensors on both doors and the centre of the net headline provided a measure of board spread and net headline height above the seabed.

Sled design, set up and operation

The epibenthic sled was the same as used on previous surveys on other vessels in the Kimberley and the Pilbara (e.g. Fry et al. 2008; Pitcher et al. 2016) consisting of a galvanised steel frame with an opening measuring 1.5 m wide by 0.5 m high and 20 mm steel mesh base, top and sides with a depth of 1.0 m. A heavy nylon codend (18 mm square mesh, 30 mm stretched) was attached to the back of the sled to collect the sample. The length of the chain bridle on each side was 1.0 m. A GoPro 5 video camera in a Nimar housing rated to 200 m and lighted by a Keldan video light was mounted inside the sled to check that the sled was fishing effectively.

A sled line was plotted central and parallel to the planned trawl line offset by 100 to ensure the trawl and sled did not overlap each other. The vessel approached the start of the sled line at 2 knots the sled was lowered at 60 m per minute during which time the vessel slowed to 1 knot for the duration of the tow.

Trawl and sled distance and duration

Trawl transects were 30 minutes duration at 3 knots speed over ground (usually about 2800-3000 m depending on average speed of tow). Sleds were initially run for 200 m at 1 knot, but after only light catches were obtained in the first few stations this was increased to 400 m at 1 knot.

Handling of trawl and sled catches, sorting and vouchering

Trawl catch handling and invertebrate sorting and vouchering

The cod end was emptied into between one and four 600-800 litre “mega bins” containing AQUI-S fish anaesthetic at a concentration of 100-150mg/L n sea water, on the after deck near the stern ramp and then wheeled under cover of either the sheltered science area or a canvas gazebo on the starboard side of the after deck. Sponges and large fans were separated from fish which were allowed time to anaesthetise (usually about 20 minutes). During this time sponges and octocoral soft corals were sorted into morphotypes (massive, cup, erect for sponges and whips, fans,

dendronepthid) and size categories (<25 cm, 25-50 cm, 50-100 cm, >100 cm).). Counts and weights of each combination of morphotype and size category were recorded. Weights and counts of some soft coral and sponge species that were particularly abundant in some sites, were estimated by averaging numbers and weights of the individuals contained in 3 of the sorting baskets or bins and multiplying by the total number of full baskets. In other cases where individuals of particular species (eg. Sponge species of *Callyspongia, Amphimedon, Chondropsis*) were extremely fragmented, but still recognisable the number of individuals was estimated by dividing the total weight by the individual weight of complete individuals founded among the catch. Any fragments from broken from the main colonies of sponges and soft corals were weighed as one lot (not separated into morphotypes). Other invertebrates were sorted from the catch and sorted into groups with bulk weights and counts recorded. Cephalopods were anaesthetised in a solution of Magnesium Chloride mixed at the rate of 58.5g $MgCl_2$ per litre of sea water. The taxonomic level of these groups varied according to abundance and the amount of material to be sorted, but as a minimum, the following groups were separated: anthozoans, bryozoa, hydroids, colonial ascidians, solitary ascidians, asteroids, ophiuroids, echinoids, crinoids, holothuroids, bivalves, gastropods, squid, cuttlefish, octopus, crabs and shrimps. Vouchers of all crustaceans, echinoderms, molluscs were retained and vouchers of the most abundant sponges and octocorals were retained. Vouchers of selected specimens from unknown species and those selected for chemistry studies were also kept. All counts and weights were entered into the catch database. During the sorting process photographs were taken of the catch. Some of the individual voucher specimens were photographed separately. Most sponges and soft corals separated for vouchering were assigned a unique barcode and photographed individually. A representative fragment of the specimen was preserved in alcohol; but in few cases the whole specimen was preserved frozen. Some specimens or fragments of specimens were retained frozen for biological analyses (e.g. stable isotopes) and linked to the preserved voucher (if any) in the database. Some specimens were retained frozen for biological analyses (e.g. stable isotopes).

Sled catch handling, sorting and vouchering

Sled catches were much smaller and the cod end was emptied into 60 litre tubs and baskets on the back deck and then invertebrates were sorted, counted, weighed, photographed and vouchered as described above for trawls. Large sponges and baskets of sponges and other biota were weighed on a motion compensating POLS P-15/S-210 electronic balance (±20 g accuracy) or a Mettler spring balance. Small and individual invertebrates were weighed on a motion compensating Marel M1100 balance (0.5 g accuracy). Sleds only made incidental fish captures which were counted and weighed as a bulk lot and frozen for later identification and individual vouchering. Some specimens were retained frozen for biological analyses (e.g. stable isotopes). Where captured alive fish were anaesthetised in AQUI-S as described above.

Trawl caught fish and pharaoh's cuttlefish (*Sepia pharaonis*)

All trawl caught fish were sorted to species and identified and a count and bulk weight of each species obtained using a motion compensating POLS P-15/S-185 electronic balance (±20 g accuracy). Length and weight of up to 100 fish of each species from each trawl catch were taken using motion compensating scales (Marel M1100, ±2 g accuracy) and electronic fish measuring boards which logged directly into the catch database. Once at total of 500 individual length and weight measurements had been made, only the length of up to 100 fish from each species in each trawl

catch were taken. Large elasmobranchs (> 1m) were released alive after measuring and tissue samples were taken from the ray or the tail fin. Individual lengths and weights of Pharaoh's cuttlefish (*Sepia pharaonis*) were also made. Batches of very small fish species were individually reweighed on the more accurate Marel balance to improve precision of length-weight relationships. For some commercially significant species, additional data from a subset of the total catch on reproductive state (macroscopic scale) was recorded and histological samples were also taken from pearl perch, coral trout and yellow spot rock cod. Otoliths (approx. 2500) were retained from over 20 species and guts were also retained from a subset of these fish. Some specimens (or tissue) were retained frozen for molecular analyses and/or other biological analyses (e.g. stable isotopes).

Representatives of the vast majority of fish species were retained as taxonomic voucher specimens for the CSIRO Australian National Fish Collection (ANFC, Hobart). However, almost all large (>1m) sharks and rays landed alive were finclipped and released. One large specimen of an unidentified stingray (*Urogymnus* sp) was retained as a voucher specimen due to doubt about its' identity.

Trawl caught reptiles

The trawl captured 4 turtles and 59 seasnakes. Turtles were photographed to enable identification and returned quickly to the water alive. Seasnakes were photographed, measured (total length) and weighed (±20 g accuracy) and a tissue sample was taken from the tail for molecular analysis and frozen. Those captured alive were then released (55), those that were dead (4) were retained and frozen.

Collecting and animal ethics permits

Sampling and methods of handling fish and other animals was approved under permits from The WA Department of Fisheries, the Australian Fish Management Authority, Parks Australia, the WA Department of Biodiversity, Conservation and Attractions and the CSIRO Animal Ethics Committee.

Other sampling and equipment used

Tow video camera

In order to characterise the seabed before and after trawling a live wire real time view tow video camera was deployed along the trawl line at some stations. The tow video system consists of a large tow body with Canon 1DX digital still camera and a Canon C300 video camera in housings rated to 3000 m depth. Lighting for both video and stills was provided by four Deep Sea Power and Light 3150 Sealite video lights. A forward looking Hitachi video camera and long range altimeter (Kongsberg Mesotech 1007D) and Druck PMP 5074 pressure sensor assist the onboard winch operator keep the camera above the seabed and avoid obstacles ahead of the camera as the vessel moves at 2.5 knots.

Zooplankton sampling

Zooplankton was collected at each station with oblique bongo net tows (50 cm diameter) with 100μm mesh nets. Net was towed from 5-10 m off the bottom to the surface. All tows were done at night. Samples for biomass and species composition were preserved in 5% formalin. Samples for stable isotopes were size fractionated on board (100 – 150, 150-250, 250 – 355, 355-1000, 1000-3000 and 3000 micron) and stored in -20C.

Grab Sampling

A Smith McIntyre Grab was deployed at each station on the sled line to sample for chlorophyll, stable isotopes and sediment grain size. Three syringe core subsamples 0-2 cm depth and 2 – 5 cm depth were taken for chloropyll analyses and stored in -80 C. One syringe core 0-5 cm depth sample was taken for stable isotopes and stored in -20 C. One L scoop sample was taken for sediment grain size and stored in -20C.

CTD and water column sampling

Water samples at 70 sites were collected using a 36 x 12 L Niskin bottle rosette with profiles of conductivity and temperature (Seabird SBE 9/11 dual-sensor unit) photosynthetically active radiation (PAR 400–700 nm; Biospherical Instruments QCP-2300), fluorescence (Chelsea Instruments Aquatracka™ fluorometer), transmission (Wetlabs C–Star™), dissolved oxygen (DO; Seabird 43 series optode) and nitrate (Satlanic ISUS sensor) determined concurrently. Water samples at each station were collected from between 3 and 6 nominal depths (surface [~ 3 m], 10 m, 25 m, 50 m, the chlorophyll maximum, where present, and 5 m from bottom) and analysed for dissolved oxygen, salinity, nutrients, chlorophyll a (size fractionated), phytoplankton community structure, particulate organic carbon and particulate nitrogen, and environmental DNA.

Replicate 10 mL water samples of unfiltered seawater from each depth was analysed for dissolved inorganic nutrients (nitrate + nitrite [hereafter nitrate], ammonia, phosphate and silicate) by segmented flow injection analysis (Seal AA3HR auto-analyser) with detection by absorbance at specific wavelengths for silicate [CSIRO Method 1 V01 - Molybdate], nitrate [CSIRO Method 3 V01] and phosphate [CSIRO Method 2 V01], and by Fluorescence for ammonia (Watson et al., 2005). Detection limits were 0.02 µM for all inorganic nutrient species, with a standard error of < 0.7%.

One litre of seawater from each depth was vacuum-filtered onto a Whatman 25 mm diameter GF/F (nominal pore size of 0.7 µm) and analysed for chlorophyll-*a* (chl-*a*) and phaeopigment (represents the total chl-*a* fraction). A further 2 L of sample was filtered onto a 25 mm diameter, 5 µm Nitex mesh and analysed for chlorophyll-a (chl-a) and phaeopigment (the > 5 µm fraction). The filters and screens were stored in liquid nitrogen until analysis. Pigments were extracted in 90% acetone overnight and analysed using a calibrated Turner Designs model 10AU fluorometer and the acidification technique of Parsons et al. (1989). The < 5 µm fraction was calculated as the difference between the total and > 5 µm fractions.

Suspended particulate matter ([SPM]) samples were collected from surface and chlorophyll maximum or the bottom (if no chlorophyll maximum was present) from each of the CTD casts. Four litres of sample water was vacuum-filtered onto a pre-weighed glass fibre filter (47 mm, 0.7 µm, Whatman GF/F) and stored in the cool and dark until analysis.

Four litres of the surface water sample and chlorophyll maximum or the bottom (if no chlorophyll maximum was present) were filtered onto a 25 mm, 0.7 µm, Whatman GF/F and stored in liquid nitrogen until analysis. Phytoplankton pigments will be extracted and analysed by High Performance Liquid Chromatography (HPLC) with a Waters-Alliance system following the protocol detailed in Hooker et al., (2009).

At each CTD cast site 3 x 1 litre replicates of sample water collected 5 m from the bottom was filtered onto a 47 mm, 0.22 or 0.45 µm, Pall membrane filter using a peristaltic pump to collect samples for environmental DNA of fishes. When analysed, this will be compared directly with the fish catch species diversity from the demersal trawls.

Turbulence profiles

In order to measure the micro-scale turbulence, the Vertical Micro-structure Profiles (VMP-250) was deployed at 73 stations. Two shear probes and one FP07 thermistor are installed on VMP-250. They record data internally on a Flash card. The instrument is powered by an internal polymer lithium-ion battery of nominally 14.8V and 2.2 Ah capacity. Brushes required to achieve the desired fall rate between 0.4-0.9m/s. The instrument is turned on by attaching the magnet to the front bulkhead and waiting for confirmation that the LED 'ON'. The instrument is then lowered to below the sea surface, ensuring enough slack in the deployment rope to allow a free-fall, but ensuring the total rope length is less than the actual depth. The instrument is then released and when the rope is taut, the instrument is recovered to the sea surface. This was repeated to obtain three profiles at each station. When the instrument was back on deck the power was turned off and returned to the workroom, connect the cable to the computer, and data was downloaded to the computer.

Sponge epifluorescence

On this voyage, 1561 tissue samples of sponges were collected from 97 sites.

Sponge bycatch from the McKenna demersal trawls was sorted on deck and tissue samples (1 cm^2) from the surface of the sponge collected from each species and transferred into 1.5 mL Eppendorf tubes. Not all sites were sampled as there was sometimes insufficient time between trawls to take tissue samples. All samples were snap frozen (–25 °C) and then suspended in dimethyl sulfoxide (dmso; 800 uL), macerated and then stored for 16-24 h in the dark at –5 °C. The samples were centrifuged (13,000 rpm, 10 minutes) and the supernatant (200 uL) transferred to a clear-bottom, black, 96-well plate along with a blank (10% seawater in dmso).

Samples were analysed on a BMG Labtech CLARIOstar fluorescence plate reader and the data processed with Mars software (BMG Labtech; v 5.20 r2). Seven experiments were run:

1) absorption spectrum of the crude extract (380-750 nm)
2) Fluorescence emission spectrum (λ_{ex} 400 ± 40 nm, (λ_{em} 463-738 nm)
3) Fluorescence excitation spectrum (λ_{em} 620 ± 50 nm, (λ_{ex} 370-515 nm)
4) Fluorescence emission spectrum (λ_{ex} 380 ± 10 nm, (λ_{em} 410-740 nm)
5) Fluorescence emission spectrum (λ_{ex} 440 ± 10 nm, (λ_{em} 469-739 nm)
6) Fluorescence emission spectrum (λ_{ex} 560 ± 10 nm, (λ_{em} 588-738 nm)
7) 3D Fluorescence emission/emission spectrum (λ_{ex} 350-480 (emission 520-740 nm) and λ_{em} 520-740 nm (excitation 400-500 nm).

All data was bottom read except for 7 which was top read.

Data will be analysed to determine the chlorophyll content (from experiment 5) of each sponge sample and its correlation to depth, latitude, longitude and site number. In addition, the presence of other fluorophores will be qualitatively analysed (emission max) and quantitatively analysed (λ_{em} 480-680 in 10 nm steps). A multicomponent analysis will be used to determine any correlations between these factors.

Sponge chemistry

Samples of 200 sponges (average 1 kg each) were retained frozen (–20 °C) for later analysis at Macquarie University for fluorescent natural products. Samples will be blended in ethanol (Waring

blender) three times and the combined ethanol extracts partitioned in hexane, ethyl acetate, 1-butanol and water. Each partition will be evaporated and the residues from the ethyl acetate and butanol partitions chromatographed in Sephadex LH-20 (methanol) separately. The fractions containing fluorescence will be collected and further purified by reverse phase HPLC (water to acetonitrile (0.05% TFA). Purified compounds will be analysed by NMR, IR, UV-Vis, ECD and fluorescence spectroscopy and mass spectrometry to determine the compounds structure.

Atmospheric and seawater trace metals

As part of a supplementary project atmospheric particles monitoring and sampling was undertaken as well as aerosol leaching experiments. The aim of this project is to quantify the importance of iron-rich aerosols from Australia for marine biogeochemistry and ocean ecosystem health. The outcomes will provide a scientific basis for managing the complex role of iron in sustaining marine ecosystem biodiversity and for informing government policy on ocean fertilisation as a carbon mitigation strategy.

An aerosol sampling system was installed in the aerosol laboratory of the ship. The system consisted of 2 sampling lines (pumps, volume meters, filter holders) connected to the ship's air sampling inlet, allowing the collection of parallel (replicate) samples on 47mm diameter Whatman 41 filter papers. The sampling system is automatically switched on and off by the ship's wind sensor (speed and direction) via an electronic sector control panel to ensure sampling of clean headwind air. Samples are changed over on a 48 hours basis and frozen at -80°C for storage.

Seawater was collected from the ship's trace metal clean underway seawater supply and stored acidified for trace metal analysis back onshore. Bulk seawater sample was also collected for on-board seawater leaching experiments on the collected aerosol filter. The latter experiment aims at assessing the seawater solubility of biologically essential micro-nutrients derived from aerosols.

Aerosol and seawater sampling logsheets can be found on the Investigator voyage scientific server on the folder "Trace metal sampling".

Incidental sampling

An extensive cyanobacterial bloom at station W58 was sampled with a Bongo net (Operation 441) and a CTD cast was made (Operation 442) on 31 October 2017 (UTC). Small samples were preserved in formalin and liquid nitrogen for identification and the bulk of the sample was frozen (–20 °C) for later chemical analysis at Macquarie University.

Other underway datasets

Routine underway seawater and atmospheric chemistry data is collected by the RV Investigator way data collected by the

References

Althaus,F., K. Woolley, X. He, P. Stephenson and R. Little (2006) The spatial distribution of commercial fishery production on Australia's North West Shelf. NWSJEMS Technical Report (CSIRO. Marine and Atmospheric Research. North West Shelf Joint Environmental Management Study) No. 10. http://www.cmar.csiro.au/nwsjems/techreports.htm

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Fulton, E., B. Hatfield, F. Althaus and K. Sainsbury (2006) Benthic habitat dynamics and models on Australia's North West Shelf. NWSJEMS Technical Report (CSIRO. Marine and Atmospheric Research. North West Shelf Joint Environmental Management Study) No. 11. http://www.cmar.csiro.au/nwsjems/techreports.htm

Masuda, K., S. Nakane, S. Saito and T. Fujii (1964) Survey of trawl grounds off the north-west coast of Australia with special reference to hydrographical conditions on the grounds. Bull. Fac.Fish. Hokkaido Univ. 15-16: 77-88.

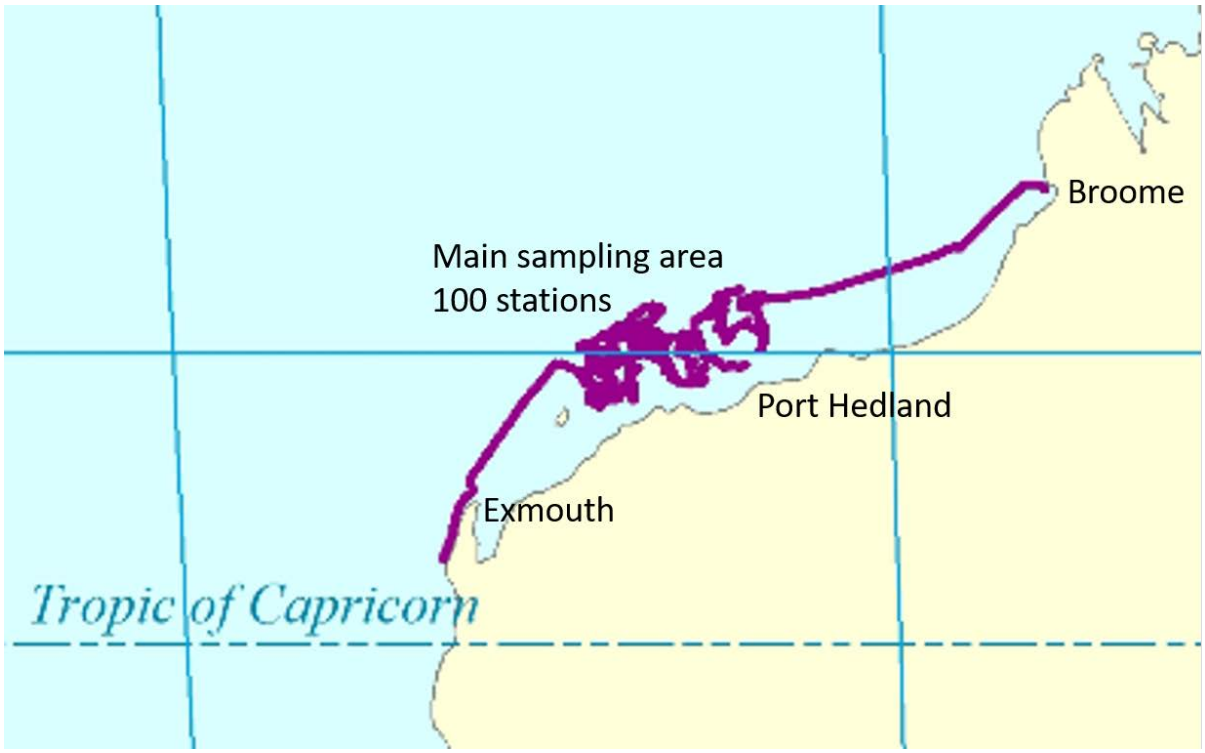
Suzuki, T., K. Masuda and S. Nakane (2964) Variations of the catches and the volume of stomach contents of medium sized "Kuchinidae" (*Lethrinus ornatus* Cuvier & Valencienna) between day and night and observed in the trawl grounds along the northwestern coast of Australia. Bull. Fac. Fish., Hokkaido Univ. 15-16: 29-44.

Sainsbury, K.J. (1987) Assessment and Management of the demersal fishery on the continental shelf of north-western Australia. pp 465-503 *in* J. J. Polovina and S.R. Ralston (eds) Tropical Snappers and Groupers: Biology and Fisheries Management. Westview Press, Boulder, Colorado.

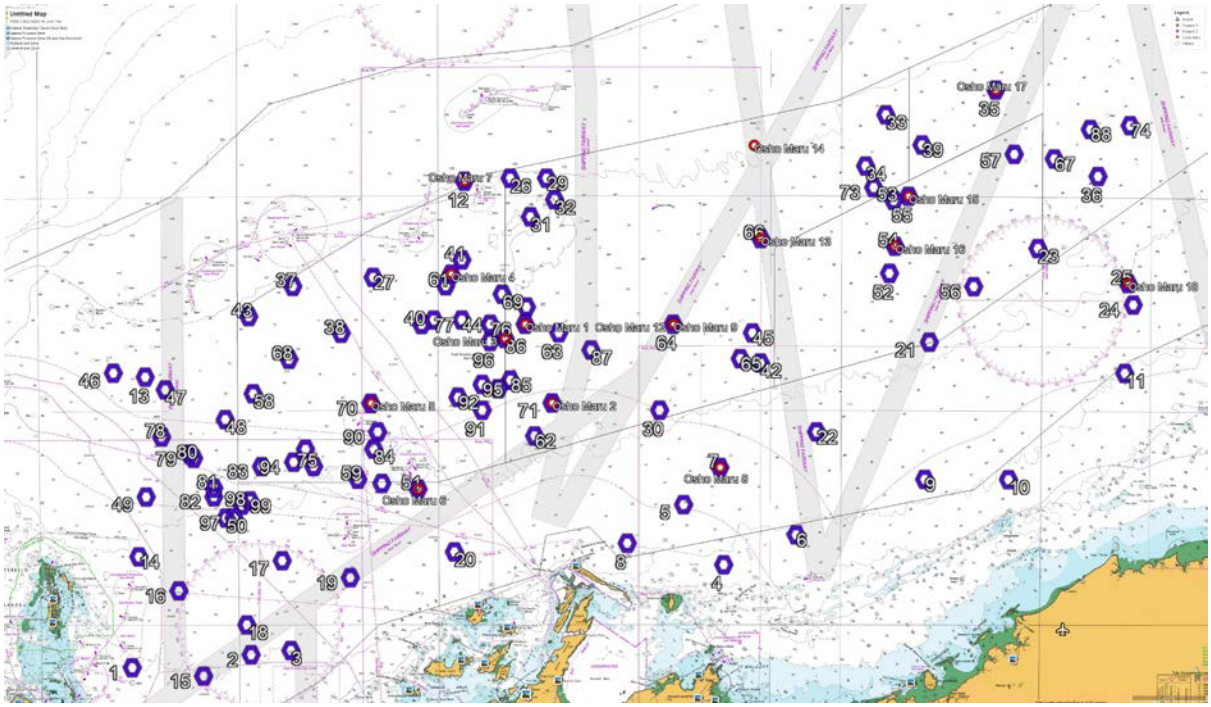
Curation Report

Item #	DESCRIPTION
1.	All taxonomic fish specimens are being archived in the Australian National Fish Collection at CSIRO in Hobart
2.	All plankton samples and all fish and invertebrate samples collected for tissue analysis will be destroyed in the process of analysis.
3.	Vouchers of marine invertebrate and seasnake specimens collected will be offered to the WA Museum for their permanent collections. Specimens they do not want will be disposed of after our analyses are completed. In the mean time they will be kept at CSIRO in Perth.
4.	All imagery (video, photographs) and sample data has been secured on CSIRO servers in Hobart, Brisbane and Perth

Track Chart, site locations and sampling strata



Track chart of voyage



Detailed locations of 100 survey sites

Station	Current Fishing or Conservation Zone	Historical effort (%) swept area per year	Recent effort (%) swept area per year	Depth (r	GRD_LON	GRD_LAT	OM_Trawl_Num	SS9597_STN_ID	NWS_other_STN	MED_ID	moved_MED	Selected_stn
4	Dampier CMR	0-1 %	0-1 %	-27.94	117.21	-20.36	NA	SS199707_58	SO198304_37	117232035	NA	SS199707_58
6	Dampier CMR	0-1 %	0-1 %	-26.26	117.39	-20.29	NA	SS199508_4	SO198303_62	117432030	NA	SS199508_4
8	Dampier CMR	0-1 %	0-1 %	-33	116.97	-20.31	NA	NA	NA	116972031	NA	116972031
1	inshore of commercial trawl fishery	0-1 %	0-1 %	-28.2	115.73	-20.6	NA	NA	SS199002_164	115802062	NA	SS199002_164
2	inshore of commercial trawl fishery	0-1 %	0-1 %	-30.73	116.03	-20.57	NA	NA	SS199002_36	115982060	NA	SS199002_36
3	inshore of commercial trawl fishery	0-1 %	0-1 %	-29.93	116.13	-20.56	NA	NA	SO198805_54	116162059	NA	SO198805_54
5	inshore of commercial trawl fishery	0-1 %	0-1 %	-33.18	117.36	-20.19	NA	SS199508_7	SO198707_11	117412020	NA	SO198707_11
7	inshore of commercial trawl fishery	0-1 %	0-1 %	-40.07	117.2	-20.1333	Osho_Maru_08	NA	SO198606_15	117162017	NA	Osho_Maru_08
9	inshore of commercial trawl fishery	0-1 %	0-1 %	-33.81	117.71	-20.16	NA	SS199707_85	SO198303_63	117672014	NA	SS199707_85
10	inshore of commercial trawl fishery	0-1 %	0-1 %	-30.51	117.92	-20.16	NA	SS199508_94	SO198303_3	118012012	NA	SS199508_94
11	inshore of commercial trawl fishery	0-1 %	0-1 %	-29.95	118.21	-19.91	NA	NA	PE198904_137	118161994	NA	PE198904_137
15	inshore of commercial trawl fishery	1-50%	0-1 %	-27.94	115.91	-20.62	NA	NA	SS199002_163	115772051	NA	SS199002_163
16	inshore of commercial trawl fishery	1-50%	0-1 %	-40.41	115.85	-20.42	NA	SS199707_53	SO198707_100	115922045	NA	SS199707_53
17	inshore of commercial trawl fishery	1-50%	0-1 %	-42	116.11	-20.35	NA	SS199508_35	SO198606_59	116142031	NA	SS199508_35
18	inshore of commercial trawl fishery	1-50%	0-1 %	-34.93	116.02	-20.5	NA	SS199707_56	SO198304_69	116022050	NA	SS199707_56
19	inshore of commercial trawl fishery	1-50%	0-1 %	-37	116.28	-20.39	NA	SS199707_65	SO198304_35	116342043	NA	SS199707_65
20	inshore of commercial trawl fishery	1-50%	0-1 %	-42.38	116.86	-20.2	NA	SS199707_67	SO198303_48	116602026	NA	SS199508_57
22	inshore of commercial trawl fishery	1-50%	0-1 %	-42.77	117.44	-20.05	NA	SS199707_61	SO198805_18	117422005	NA	SS199707_61
24	inshore of commercial trawl fishery	1-50%	0-1 %	-37.26	118.23	-19.75	NA	SS199508_87	SO198606_139	118111988	NA	SS199508_87
25	inshore of commercial trawl fishery	1-50%	0-1 %	-46.93	118.2167	-19.7	Osho_Maru_18	SS199508_83	SO198304_138	118011974	NA	Osho_Maru_18
51	inshore of commercial trawl fishery	50-100%	0-1%	-48.38	116.45	-20.1833	Osho_Maru_06	NA	SO198707_67	116242022	NA	Osho_Maru_06
98	inshore of commercial trawl fishery	100-192%	0-1%	-49.67	116.01	-20.22	NA	NA	NA	116012022	NA	116012022
99	inshore of commercial trawl fishery	100-192%	0-1%	-49.22	116.03	-20.21	NA	NA	NA	116032021	NA	116032021
100	inshore of commercial trawl fishery	100-192%	0-1%	-50.66	116.36	-20.17	NA	NA	NA	116362022	NA	116362017
14	Montebello CMR	1-50%	0-1 %	-46	115.75	-20.34	NA	NA	SS199002_41	115782032	NA	SS199002_41
49	Montebello CMR	50-100%	0-1%	-55.61	115.77	-20.2	NA	NA	NA	115772020	NA	115772020
50	Montebello CMR	50-100%	0-1%	-48.79	115.97	-20.25	NA	NA	SS199002_119	115912024	NA	SS199002_119
79	Montebello CMR	100-192%	0-1%	-63.74	115.88	-20.1	NA	NA	SO198707_114	115902009	NA	SO198707_114
80	Montebello CMR	100-192%	0-1%	-61.93	115.89	-20.11	NA	NA	NA	115892013	115892011	115892011
81	Montebello CMR	100-192%	0-1%	-55.81	115.94	-20.18	NA	SS199707_31	NA	115932016	NA	SS199707_31
82	Montebello CMR	100-192%	0-1%	-52.57	115.94	-20.2	NA	NA	NA	115942020	NA	115942020
97	Montebello CMR	100-192%	0-1%	-49.13	115.99	-20.25	NA	NA	NA	115992025	NA	115992025
27	PFTF Area 1	1-50%	1-50%	-64.07	116.34	-19.69	NA	SS199707_26	SS199104_30	116291969	NA	SS199707_26
28	PFTF Area 1	1-50%	1-50%	-58.84	116.5333	-19.6833	Osho_Maru_04	SS199508_41	SO198606_102	116411975	NA	Osho_Maru_04
37	PFTF Area 1	1-50%	50-100%	-75.44	116.14	-19.71	NA	NA	NA	116141971	NA	116141971
38	PFTF Area 1	1-50%	50-100%	-68.79	116.26	-19.82	NA	NA	NA	116261980	116261982	116261982
40	PFTF Area 1	1-50%	50-100%	-61	116.46	-19.8	NA	NA	SO198606_90	116321987	NA	SO198606_90
41	PFTF Area 1	1-50%	50-100%	-57.61	116.56	-19.65	NA	SS199508_43	NA	116561963	NA	SS199508_43
43	PFTF Area 1	1-50%	100-213%	-74.14	116.03	-19.78	NA	NA	NA	116031978	NA	116031978
44	PFTF Area 1	1-50%	100-213%	-58.89	116.56	-19.79	NA	NA	SO198707_76	116561978	NA	SO198707_76
58	PFTF Area 1	50-100%	1-50%	-67.73	116.04	-19.96	NA	NA	SS199002_123	116061993	NA	SS199002_123
59	PFTF Area 1	50-100%	1-50%	-56	116.25	-20.07	NA	SS199508_51	SS199002_29	116292004	NA	SS199002_29
61	PFTF Area 1	50-100%	1-50%	-61	116.52	-19.71	NA	SS199508_42	SO198304_58	116481975	NA	SS199508_42
68	PFTF Area 1	50-100%	50-100%	-68.49	116.13	-19.88	NA	NA	SO198707_94	116141987	NA	SO198707_94
69	PFTF Area 1	50-100%	50-100%	-50.66	116.66	-19.73	NA	SS199707_14	SO198707_95	116211993	NA	SS199707_14
70	PFTF Area 1	50-100%	50-100%	-57.86	116.3333	-19.9833	Osho_Maru_05	NA	SO198805_72	116432004	NA	Osho_Maru_05
76	PFTF Area 1	50-100%	100-213%	-56.14	116.63	-19.8	NA	NA	SO198606_93	116511992	NA	SO198606_93
77	PFTF Area 1	50-100%	100-213%	-61	116.49	-19.79	NA	NA	NA	116491979	NA	116491979
83	PFTF Area 1	100-192%	1-50%	-55.36	116.06	-20.13	NA	SS199508_37	NA	116032011	NA	SS199508_37
84	PFTF Area 1	100-192%	1-50%	-50.98	116.34	-20.09	NA	NA	NA	116332010	116342009	116342009
89	PFTF Area 1	100-192%	50-100%	-55.72	116.17	-20.09	NA	NA	SO198805_64	116082011	NA	SO198805_64
90	PFTF Area 1	100-192%	50-100%	-53	116.35	-20.05	NA	NA	SS199104_37	116362011	NA	SS199104_37
91	PFTF Area 1	100-192%	50-100%	-59.24	116.61	-20	NA	NA	SO198606_95	116572000	NA	SO198606_95
92	PFTF Area 1	100-192%	50-100%	-59	116.55	-19.97	NA	SS199508_50	SS199104_48	116581994	NA	SS199508_50
93	PFTF Area 1	100-192%	50-100%	-60.13	116.65	-19.95	NA	NA	NA	116651995	NA	116651995
94	PFTF Area 1	100-192%	100-213%	-54.91	116.14	-20.12	NA	NA	NA	116142012	NA	116142012
95	PFTF Area 1	100-192%	100-213%	-58.36	116.61	-19.94	NA	NA	NA	116611994	NA	116611994
96	PFTF Area 1	100-192%	100-213%	-57.89	116.63	-19.87	NA	NA	NA	116631984	116631987	116631987
26	PFTF Area 2	1-50%	1-50%	-85.83	116.68	-19.46	NA	NA	SS199002_138	116321961	NA	SS199002_138
29	PFTF Area 2	1-50%	1-50%	-79.1	116.77	-19.46	NA	SS199707_12	SS199002_107	117031956	NA	SS199707_12
30	PFTF Area 2	1-50%	1-50%	-57.25	117.05	-20	NA	SS199707_2	SO198304_150	117121997	NA	SS199707_2
31	PFTF Area 2	1-50%	1-50%	-54.46	116.73	-19.55	NA	SS199707_13	SS199104_61	116691960	NA	SS199707_13
32	PFTF Area 2	1-50%	1-50%	-61.03	116.79	-19.51	NA	NA	NA	116791951	NA	116791951
33	PFTF Area 2	1-50%	1-50%	-85.61	117.61	-19.31	NA	SS199508_79	PE198904_115	117741930	NA	SS199508_79
34	PFTF Area 2	1-50%	1-50%	-86.44	117.56	-19.43	NA	NA	SO198304_82	117601943	NA	SO198304_82
42	PFTF Area 2	1-50%	50-100%	-57.68	117.3	-19.89	NA	NA	NA	117301989	NA	117301989
45	PFTF Area 2	1-50%	100-213%	-60.09	117.29	-19.82	NA	NA	NA	117281982	117291982	117291982
60	PFTF Area 2	50-100%	1-50%	-61.92	116.7167	-19.8	Osho_Maru_01	NA	SO198304_57	116731972	NA	Osho_Maru_01
62	PFTF Area 2	50-100%	1-50%	-52.81	116.74	-20.06	NA	SS199508_48	SO198303_53	116722001	NA	SS199508_48
63	PFTF Area 2	50-100%	1-50%	-70.11	116.8	-19.82	NA	SS199707_5	SO198805_76	116911980	NA	SS199707_5
64	PFTF Area 2	50-100%	1-50%	-65.93	117.0833	-19.8	Osho_Maru_09	NA	SO198304_42	117091971	NA	Osho_Maru_09
65	PFTF Area 2	50-100%	1-50%	-61	117.25	-19.88	NA	NA	SO198707_14	117211987	NA	SO198707_14
66	PFTF Area 2	50-100%	1-50%	-69.68	117.3	-19.6	Osho_Maru_13	SS199508_65	PE198904_66	117231965	NA	Osho_Maru_13
71	PFTF Area 2	50-100%	50-100%	-58.89	116.7833	-19.9833	Osho_Maru_02	NA	SS199104_49	116521989	NA	Osho_Maru_02
72	PFTF Area 2	50-100%	50-100%	-55	116.72	-19.76	NA	NA	NA	116721976	NA	116721976
73	PFTF Area 2	50-100%	50-100%	-75.79	117.58	-19.48	NA	SS199508_80	SO198606_87	117161974	NA	SS199508_80
75	PFTF Area 2	50-100%	100-213%	-53	116.19	-20.13	NA	NA	NA	116192013	NA	116192013
85	PFTF Area 2	100-192%	1-50%	-59.27	116.68	-19.93	NA	NA	NA	116681993	NA	116681993
86	PFTF Area 2	100-192%	1-50%	-58.74	116.6667	-19.8333	Osho_Maru_03	SS199508_47	NA	116721984	NA	Osho_Maru_03
87	PFTF Area 2	100-192%	1-50%	-69.7	116.88	-19.86	NA	NA	NA	116881986	NA	116881986
35	PFTF Area 4	1-50%	1-50%	-87	117.8833	-19.25	Osho_Maru_17	NA	SO198805_99	118081924	NA	Osho_Maru_17
36	PFTF Area 4	1-50%	1-50%	-67.63	118.14	-19.45	NA	NA	SO198606_73	118201947	NA	SO198606_73
39	PFTF Area 4	1-50%	50-100%	-83.27	117.7	-19.38	NA	NA	NA	117701938	NA	117701938
67	PFTF Area 4	50-100%	1-50%	-70.32	118.03	-19.41	NA	SS199508_111	SO198606_72	118071942	NA	SS199508_111
74	PFTF Area 4	50-100%	50-100%	-77.25	118.22	-19.33	NA	NA	SS199002_69	118221934	NA	SS199002_69
88	PFTF Area 4	100-192%	1-50%	-74.61	118.12	-19.34	NA	NA	SO198805_101	118111936	NA	SO198805_101
12	PFTF Area 6	1-50%	0-1 %	-93.17	116.5667	-19.4667	Osho_Maru_07	NA	NA	115961978	NA	Osho_Maru_07
21	PFTF Closed Area 3	1-50%	0-1 %	-53	117.72	-19.84	NA	SS199707_89	SS199104_72	117591995	NA	SS199707_89
23	PFTF Closed Area 3	1-50%	0-1 %	-60.24	117.99	-19.62	NA	SS199707_83	SO198303_6	117641980	NA	SS199707_83
52	PFTF Closed Area 3	50-100%	0-1%	-66.31	117.62	-19.68	NA	SS199707_81	SO198707_59	117601974	NA	SS199707_81
53	PFTF Closed Area 3	50-100%	0-1%	-71.26	117.63	-19.51	NA	NA	SO198303_67	117461959	NA	SO198303_67
54	PFTF Closed Area 3	50-100%	0-1%	-68.83	117.6333	-19.6167	Osho_Maru_16	NA	SS199104_74	117641965	NA	Osho_Maru_16
55	PFTF Closed Area 3	50-100%	0-1%	-68	117.6667	-19.5	Osho_Maru_15	NA	SO198303_68	117771955	NA	Osho_Maru_15
56	PFTF Closed Area 3	50-100%	0-1%	-55.06	117.83	-19.71	NA	SS199707_102	SO198303_69	117781968	NA	SS199707_102
57	PFTF Closed Area 3	50-100%	0-1%	-70.24	117.93	-19.4	NA	NA	SO198304_23	117941938	NA	SO198304_23
13	west of commercial trawl fishery	1-50%	0-1 %	-75.45	115.77	-19.92	NA	NA	SO198707_109	115761987	NA	SO198707_109
46	west of commercial trawl fishery	50-100%	0-1%	-78.83	115.69	-19.91	NA	SS199707_39	SO198707_125	115701990	NA	SS199707_39
47	west of commercial trawl fishery	50-100%	0-1%	-72.41	115.82	-19.95	NA	NA	SO198707_124	115801998	NA	SO198707_124
48	west of commercial trawl fishery	50-100%	0-1%	-64.13	115.97	-20.02	NA	NA	SO198707_121	115922000	NA	SO198707_121
78	west of commercial trawl fishery	100-192%	0-1%	-66.95	115.81	-20.06	NA	NA	NA	115812006	NA	115812006

List of station locations and attributes. MED is the location of the medoid of the relevant sampling strata. The station location may not be on the medoid. Note that the exact location of each operation at each station may differ slightly from the positions in this table and are recorded with the volume of data from the voyage.

Personnel List

	Name	Organisation	Role
1.	Max McGuire	CSIRO	Voyage Manager
2.	Brett Muir	CSIRO	SIT Support
3.	Nicole Morgan	CSIRO	SIT Support
4.	Hugh Barker	CSIRO	DAP Support
5.	Peter Shanks	CSIRO	DAP Support
6.	Peter Hughes	CSIRO	Hydrochemistry Support
7.	Jamie Derrick	CSIRO	Mechanical Technician
8.	Jason Fazey	CSIRO	Mechanical Technician
9.	Amy Nau	CSIRO	GSM Support
10.	Frances Cooke	CSIRO	GSM Support
11.	John Wakeford	ASP	Fishing Manager
12.	Fishing Crew 1	ASP	Fishing Crew 1
13.	Fishing Crew 2	ASP	Fishing Crew 2
14.	John Keesing	CSIRO	Chief Scientist + Fish trawl - sorting
15.	Matt Lansdell	CSIRO	Fish trawl (fish and invertebrate sort, identify, weigh, count, measure
16.	Keith Sainsbury	CSIRO	Fish trawl (fish and invertebrate sort, identify, weigh, count, measure)
17.	Alan Williams / Frank Coman	CSIRO	Dep. Chief Sci. Day shift Ops room Manager - Fish trawl - fish and invertebrate sorting
18.	John Pogonoski	CSIRO	Fish trawl (fish sort, identify)
19.	Alistair Graham	CSIRO	Fish trawl (fish sort, identify)
20.	Sue Cheers/ Hector Lozano-Montes	CSIRO	Epibenthic sled and trawl - Invertebrate and plant sorting, size measurement and stable isotopes
21.	Brett Chrisafulli /Christopher Dowling	WA Fisheries	Fish trawl (fish sort, identify, weigh, count, measure)
22.	Dion Boddington/ Craig Skepper	WA Fisheries	Fish trawl (fish sort, identify, weigh, count, measure)
23.	Margaret Miller	CSIRO	Fish trawl (database and sorting)
24.	Nick Mortimer	CSIRO	Night shift Ops room Manager -
25.	Joanna Strzelecki	CSIRO	Plankton net and Smith McIntyre grab ops – sorting, filtering, biomass
26.	Huabin Mao	Chinese Academy of Sciences	Hydrodynamics expert (turbulence probe and ADCP data)
27.	James McLaughlin	CSIRO	Phytoplankton expert (water filtering tasks – chlorophyll, POM, bacteria)
28.	Morgane Perron	UTAS	Atmospheric monitoring
29.	Mark Green	CSIRO	Fish Trawl sorting and identification.
30.	Maylene Loo	CSIRO	Epibenthic sled – database and sorting
31.	Camilla Novaglio	CSIRO	Fish trawl (fish and invertebrate sort, identify, weigh, count, measure
32.	Belinda Glasby	CSIRO	Fish Trawl - Sponge expert – Invertebrate and plant sorting and identification

	Name	Organisation	Role
33.	Tracee Nguyen	CSIRO	Fish Trawl - Invertebrate sorting, size measurement and stable isotopes, voyage promotion and comms
34.	Peter Karuso	Macquarie University	Fish Trawl -Invertebrate sorting, sponge chemistry supplementary project
35.	Kate Naughton	Museum of Victoria	Fish Trawl – Echinoderm Expert – Invertebrate and plant sorting and identification
36.	Tonya Van Der Velde*	CSIRO	Epibenthic sled - Invertebrate and plant sorting, and stable isotopes
37.	Gary Fry*	CSIRO	Epibenthic sled - Invertebrate and plant sorting, size measurement and stable isotopes Sled Ops Leader (night)
38.	Monika Bryce	CSIRO	Epibenthic sled – Octocoral Expert – Invertebrate and plant sorting and identification
39.	Qingxi Han	Ningbo University	Epibenthic sled - Crustacean expert – Invertebrate and plant sorting and identification
40.	Christiano Giordani	University of Columbia	Epibenthic sled - Invertebrate and plant sorting, size measurement and stable isotopes, sponge chemistry

Marine Crew

Name	Role
Mike Watson	Master
Rod Quinn	Chief Mate
Adrian Koolhof	Second Mate
Andrew Roebuck	Third Mate
Genna Gervasiev	Chief Engineer
Mark Elliot	First Engineer
Ian McDonald	Second Engineer
Ryan Agnew	Third Engineer
Shane Kromcamp	Electrical Engineer
Alan Martin	Chief Caterer
Emma Lade	Caterer
Keith Shepherd	Chief Cook
Paul Stanley	Cook
Jonathon Lumb	Chief Integrated Rating
Dean Hingston	Integrated Rating
Ryan Drennan	Integrated Rating
Murray Lord	Integrated Rating
Chris Dorling	Integrated Rating
Kel Lewis	Integrated Rating
Darren Capon	Integrated Rating

Acknowledgements

FRDC and Parks Australia contributed funding to the project

Signature

Your name	John Keesing
Title	Chief Scientist
Signature	
Date:	14 January 2018

List of operations by date, site and gear type

Operation	Station name	Date	Time (UTC)	Type	Depth (m)	Equipment
1	0	11-Oct-17	6:08	Catch	50	McKenna demersal fish trawl nets
2	OM20	11-Oct-17	13:09	Catch	50	McKenna demersal fish trawl nets
3	W74	12-Oct-17	4:48	Catch	85	McKenna demersal fish trawl nets
4	W74	12-Oct-17	6:28	CTD Cast	76	CTD - Seabird 911 with 36 Bottle Rosette
5	W74	12-Oct-17	6:51	Turbulence probe	76	VMP Microstructure profiler
6	W88	12-Oct-17	8:54	Catch	84	McKenna demersal fish trawl nets
7	W67	12-Oct-17	11:30	Benthos	74	WHOI epibenthic Biological sled
8	W67	12-Oct-17	12:52	Sediment Grab	74	Smith McIntyre grab
9	W67	12-Oct-17	13:18	Plankton		Bongo Nets
10	W57	12-Oct-17	14:44	Benthos	76	WHOI epibenthic Biological sled
11	W57	12-Oct-17	15:28	Sediment Grab	76	Smith McIntyre grab
12	W88	12-Oct-17	17:01	Benthos	80	WHOI epibenthic Biological sled
13	W88	12-Oct-17	17:47	Sediment Grab	80	Smith McIntyre grab
14	W74	12-Oct-17	18:41	Benthos	82	WHOI epibenthic Biological sled
15	W74	12-Oct-17	19:15	Sediment Grab	80	Smith McIntyre grab
16	W74	12-Oct-17	19:47	Plankton		Bongo Nets
17	W67	12-Oct-17	21:48	Catch		McKenna demersal fish trawl nets
18	W67	13-Oct-17	0:00	CTD Cast	73	CTD - Seabird 911 with 36 Bottle Rosette
19	W67	13-Oct-17	0:35	Turbulence probe	73	VMP Microstructure profiler
20	W57	13-Oct-17	2:00	Catch	76	McKenna demersal fish trawl nets
21	W57	13-Oct-17	3:12	CTD Cast	74	CTD - Seabird 911 with 36 Bottle Rosette
22	W57	13-Oct-17	3:28	Turbulence probe	74	VMP Microstructure profiler
23	W36	13-Oct-17	5:45	Catch	73	McKenna demersal fish trawl nets
24	W25	13-Oct-17	8:55	Catch		McKenna demersal fish trawl nets
25	W25	13-Oct-17	10:08	CTD Cast		CTD - Seabird 911 with 36 Bottle Rosette
26	W25	13-Oct-17	10:30	Turbulence probe	43	VMP Microstructure profiler
27	W25	13-Oct-17	11:01	Benthos	52	WHOI epibenthic Biological sled
28	W25	13-Oct-17	11:32	Sediment Grab		Smith McIntyre grab
29	W25	13-Oct-17	12:09	Plankton		Bongo Nets
30	W36	13-Oct-17	13:50	Plankton		Bongo Nets
31	W36	13-Oct-17	14:15	Benthos		WHOI epibenthic Biological sled
32	W36	13-Oct-17	14:44	Sediment Grab		Smith McIntyre grab
33	W24	13-Oct-17	16:58	Benthos		WHOI epibenthic Biological sled
34	W24	13-Oct-17	17:47	Sediment Grab		Smith McIntyre grab
35	W24	13-Oct-17	17:59	Plankton		Bongo Nets
36	W11	13-Oct-17	18:40	Plankton	39	Bongo Nets
37	W11	13-Oct-17	19:30	Benthos	36	WHOI epibenthic Biological sled
38	W11	13-Oct-17	21:01	Sediment Grab	36	Smith McIntyre grab
39	W11	13-Oct-17	22:00	Catch	38	McKenna demersal fish trawl nets
40	W11	14-Oct-17	0:15	CTD Cast	37	CTD - Seabird 911 with 36 Bottle Rosette
41	W11	14-Oct-17	0:45	Turbulence probe	35	VMP Microstructure profiler
42	W24	14-Oct-17	0:56	Catch		McKenna demersal fish trawl nets
43	W23	14-Oct-17	5:03	Catch	63	McKenna demersal fish trawl nets
44	W56	14-Oct-17	8:04	Catch	60	McKenna demersal fish trawl nets
45	W56	14-Oct-17	9:44	CTD Cast		CTD - Seabird 911 with 36 Bottle Rosette
46	W56	14-Oct-17	10:13	Turbulence probe		VMP Microstructure profiler
47	W56	14-Oct-17	10:24	Sediment Grab	60	Smith McIntyre grab
48	W56	14-Oct-17	10:33	Plankton		Bongo Nets
49	W56	14-Oct-17	11:04	Benthos		WHOI epibenthic Biological sled
50	W21	14-Oct-17	13:44	Benthos		WHOI epibenthic Biological sled

Operation	Station name	Date	Time (UTC)	Type	Depth (m)	Equipment
51	W21	14-Oct-17	14:19	Sediment Grab		Smith McIntyre grab
52	W21	14-Oct-17	14:37	Plankton		Bongo Nets
53	W52	14-Oct-17	16:12	Plankton		Bongo Nets
54	W52	14-Oct-17	16:52	Benthos		WHOI epibenthic Biological sled
55	W52	14-Oct-17	17:14	Sediment Grab		Smith McIntyre grab
56	W54	14-Oct-17	18:18	Benthos	70	WHOI epibenthic Biological sled
57	W54	14-Oct-17	19:00	Sediment Grab	70	Smith McIntyre grab
58	W54	14-Oct-17	19:22	Plankton	70	Bongo Nets
59	W54	14-Oct-17	21:54	Catch	70	McKenna demersal fish trawl nets
60	W21	15-Oct-17	0:49	Catch	60	McKenna demersal fish trawl nets
61	W21	15-Oct-17	2:12	CTD Cast	55	CTD - Seabird 911 with 36 Bottle Rosette
62	W21	15-Oct-17	2:52	Turbulence probe	55	VMP Microstructure profiler
63	W52	15-Oct-17	4:22	Catch	67	McKenna demersal fish trawl nets
64	W52	15-Oct-17	5:41	CTD Cast		CTD - Seabird 911 with 36 Bottle Rosette
65	W52	15-Oct-17	5:57	Turbulence probe		VMP Microstructure profiler
66	W53	15-Oct-17	6:59	Catch		McKenna demersal fish trawl nets
67	W53	15-Oct-17	8:38	CTD Cast		CTD - Seabird 911 with 36 Bottle Rosette
68	W53	15-Oct-17	9:01	Turbulence probe		VMP Microstructure profiler
69	W53	15-Oct-17	9:39	Sediment Grab	75	Smith McIntyre grab
70	W53	15-Oct-17	9:50	Benthos		WHOI epibenthic Biological sled
71	W53	15-Oct-17	10:43	Plankton		Bongo Nets
72	W55	15-Oct-17	11:00	Plankton		Bongo Nets
73	W55	15-Oct-17	11:44	Benthos		WHOI epibenthic Biological sled
74	W55	15-Oct-17	12:15	Sediment Grab		Smith McIntyre grab
75	W33	15-Oct-17	15:02	Benthos		WHOI epibenthic Biological sled
76	W33	15-Oct-17	15:45	Sediment Grab		Smith McIntyre grab
77	W33	15-Oct-17	16:00	Plankton		Bongo Nets
78	W33	15-Oct-17	16:39	CTD Cast		CTD - Seabird 911 with 36 Bottle Rosette
79	W35	15-Oct-17	18:33	Plankton	90	Bongo Nets
80	W35	15-Oct-17	19:00	Benthos	92	WHOI epibenthic Biological sled
81	W35	15-Oct-17	20:16	Sediment Grab	91	Smith McIntyre grab
82	W35	15-Oct-17	20:37	Benthos	92	WHOI epibenthic Biological sled
83	W35	15-Oct-17	21:05	Plankton	91	Bongo Nets
84	W35	15-Oct-17	22:17	Catch	1164	McKenna demersal fish trawl nets
85	W33	16-Oct-17	1:01	Catch	95	McKenna demersal fish trawl nets
86	W33	16-Oct-17	1:57	CTD Cast	94	CTD - Seabird 911 with 36 Bottle Rosette
87	W33	16-Oct-17	2:44	Turbulence probe	94	VMP Microstructure profiler
88	W39	16-Oct-17	4:11	Catch	46	McKenna demersal fish trawl nets
89	W39	16-Oct-17	5:32	CTD Cast	86	CTD - Seabird 911 with 36 Bottle Rosette
90	W39	16-Oct-17	5:59	Turbulence probe	86	VMP Microstructure profiler
91	W55	16-Oct-17	7:00	Catch	70	McKenna demersal fish trawl nets
92	W55	16-Oct-17	8:20	CTD Cast		CTD - Seabird 911 with 36 Bottle Rosette
93	W55	16-Oct-17	8:48	Turbulence probe		VMP Microstructure profiler
94	W66	16-Oct-17	11:14	Benthos		WHOI epibenthic Biological sled
95	W66	16-Oct-17	12:17	Sediment Grab		Smith McIntyre grab
96	W66	16-Oct-17	12:41	Plankton		Bongo Nets
97	W39	16-Oct-17	15:15	Plankton		Bongo Nets
98	W39	16-Oct-17	15:32	Benthos		WHOI epibenthic Biological sled
99	W39	16-Oct-17	16:18	Sediment Grab		Smith McIntyre grab
100	W34	16-Oct-17	17:51	Benthos		WHOI epibenthic Biological sled
101	W34	16-Oct-17	18:25	Sediment Grab		Smith McIntyre grab
102	W34	16-Oct-17	18:35	Plankton		Bongo Nets

Operation	Station name	Date	Time (UTC)	Type	Depth (m)	Equipment
103	W34	16-Oct-17	19:59	CTD Cast		CTD - Seabird 911 with 36 Bottle Rosette
104	W73	16-Oct-17	20:00	Plankton	86	Bongo Nets
105	W73	16-Oct-17	21:11	Benthos	80	WHOI epibenthic Biological sled
106	W73	16-Oct-17	21:55	Sediment Grab	79	Smith McIntyre grab
107	W73	16-Oct-17	22:44	Catch Failed	60	McKenna demersal fish trawl nets
108	W73	17-Oct-17	0:26	Catch	86	McKenna demersal fish trawl nets
109	W34	17-Oct-17	1:52	Catch	89	McKenna demersal fish trawl nets
110	W66	17-Oct-17	5:15	Catch	75	McKenna demersal fish trawl nets
111	W65	17-Oct-17	8:11	Catch	61	McKenna demersal fish trawl nets
112	W65	17-Oct-17	10:02	Turbulence probe		VMP Microstructure profiler
113	W65	17-Oct-17	10:14	CTD Cast		CTD - Seabird 911 with 36 Bottle Rosette
114	W65	17-Oct-17	11:06	Benthos		WHOI epibenthic Biological sled
115	W65	17-Oct-17	11:26	Sediment Grab		Smith McIntyre grab
116	W65	17-Oct-17	11:55	Plankton		Bongo Nets
117	W22	17-Oct-17	14:24	Plankton		Bongo Nets
118	W22	17-Oct-17	14:53	Benthos		WHOI epibenthic Biological sled
119	W22	17-Oct-17	15:23	Sediment Grab		Smith McIntyre grab
120	W9	17-Oct-17	17:30	Benthos		WHOI epibenthic Biological sled
121	W9	17-Oct-17	18:07	Sediment Grab		Smith McIntyre grab
122	W9	17-Oct-17	18:19	Plankton		Bongo Nets
123	W10	17-Oct-17	19:54	Plankton	30	Bongo Nets
124	W10	17-Oct-17	20:08	Benthos	31	WHOI epibenthic Biological sled
125	W10	17-Oct-17	20:38	Sediment Grab	32	Smith McIntyre grab
126	W10	17-Oct-17	22:02	Catch	33	McKenna demersal fish trawl nets
127	W9	18-Oct-17	0:33	Catch	39	McKenna demersal fish trawl nets
128	W9	18-Oct-17	1:36	CTD Cast	40	CTD - Seabird 911 with 36 Bottle Rosette
129	W9	18-Oct-17	1:53	Turbulence probe	40	VMP Microstructure profiler
130	W22	18-Oct-17	4:07	Catch	50	McKenna demersal fish trawl nets
131	W22	18-Oct-17	4:58	CTD Cast	49	CTD - Seabird 911 with 36 Bottle Rosette
132	W22	18-Oct-17	5:34	Turbulence probe	57	VMP Microstructure profiler
133	W45	18-Oct-17	7:45	Catch	57	McKenna demersal fish trawl nets
134	W45	18-Oct-17	8:57	CTD Cast	57	CTD - Seabird 911 with 36 Bottle Rosette
135	W45	18-Oct-17	9:20	Turbulence probe	57	VMP Microstructure profiler
136	W45	18-Oct-17	9:56	Benthos	65	WHOI epibenthic Biological sled
137	W45	18-Oct-17	10:26	Sediment Grab	61	Smith McIntyre grab
138	W45	18-Oct-17	11:03	Plankton	61	Bongo Nets
139	W42	18-Oct-17	12:17	Plankton	61	Bongo Nets
140	W42	18-Oct-17	12:42	Benthos	61	WHOI epibenthic Biological sled
141	W42	18-Oct-17	13:18	Sediment Grab	62	Smith McIntyre grab
142	W64	18-Oct-17	15:25	Benthos	71	WHOI epibenthic Biological sled
143	W64	18-Oct-17	15:54	Sediment Grab	70	Smith McIntyre grab
144	W64	18-Oct-17	16:02	Plankton	57	Bongo Nets
145	W30	18-Oct-17	17:57	Plankton	56	Bongo Nets
146	W30	18-Oct-17	18:26	Benthos	56	WHOI epibenthic Biological sled
147	W30	18-Oct-17	19:09	Sediment Grab	56	Smith McIntyre grab
148	W30	18-Oct-17	19:13	CTD Cast	56	CTD - Seabird 911 with 36 Bottle Rosette
149	W42	18-Oct-17	21:46	Catch	59	McKenna demersal fish trawl nets
150	W64	19-Oct-17	1:15	Catch	70	McKenna demersal fish trawl nets
151	W64	19-Oct-17	2:28	CTD Cast	70	CTD - Seabird 911 with 36 Bottle Rosette
152	W64	19-Oct-17	2:49	Turbulence probe	69	VMP Microstructure profiler
153	W30	19-Oct-17	4:15	Catch	57	McKenna demersal fish trawl nets

Operation	Station name	Date	Time (UTC)	Type	Depth (m)	Equipment
154	W30	19-Oct-17	5:26	CTD Cast	57	CTD - Seabird 911 with 36 Bottle Rosette
155	W30	19-Oct-17	5:59	Turbulence probe	56	VMP Microstructure profiler
156	W7	19-Oct-17	6:03	Catch	44	McKenna demersal fish trawl nets
157	W7	19-Oct-17	8:41	CTD Cast	44	CTD - Seabird 911 with 36 Bottle Rosette
158	W7	19-Oct-17	9:02	Turbulence probe	44	VMP Microstructure profiler
159	W7	19-Oct-17	10:36	Benthos	46	WHOI epibenthic Biological sled
160	W7	19-Oct-17	10:55	Sediment Grab	46	Smith McIntyre grab
161	W7	19-Oct-17	11:10	Plankton	46	Bongo Nets
162	W4	19-Oct-17	13:23	Plankton	34	Bongo Nets
163	W4	19-Oct-17	13:41	Benthos	32	WHOI epibenthic Biological sled
164	W4	19-Oct-17	14:43	Sediment Grab	34	Smith McIntyre grab
165	W6	19-Oct-17	16:49	Benthos	30	WHOI epibenthic Biological sled
166	W6	19-Oct-17	17:13	Sediment Grab	30	Smith McIntyre grab
167	W6	19-Oct-17	17:32	Plankton	30	Bongo Nets
168	W5	19-Oct-17	19:35	Plankton	38	Bongo Nets
169	W5	19-Oct-17	20:12	Benthos	38	WHOI epibenthic Biological sled
170	W5	19-Oct-17	20:41	Sediment Grab	37	Smith McIntyre grab
171	W5	19-Oct-17	21:58	Catch	65	McKenna demersal fish trawl nets
172	W6	20-Oct-17	0:46	CTD Cast	31	CTD - Seabird 911 with 36 Bottle Rosette
173	W6	20-Oct-17	1:02	Turbulence probe	31	VMP Microstructure profiler
174	W6	20-Oct-17	1:40	Catch	64	McKenna demersal fish trawl nets
175	W4	20-Oct-17	4:19	CTD Cast	33	CTD - Seabird 911 with 36 Bottle Rosette
176	W4	20-Oct-17	4:35	Turbulence probe	33	VMP Microstructure profiler
177	W4	20-Oct-17	5:24	Catch	57	McKenna demersal fish trawl nets
178	W8	20-Oct-17	8:14	CTD Cast	35	CTD - Seabird 911 with 36 Bottle Rosette
179	W8	20-Oct-17	8:27	Turbulence probe	35	VMP Microstructure profiler
180	W71	20-Oct-17	11:12	Plankton	63	Bongo Nets
181	W71	20-Oct-17	11:44	Benthos	71	WHOI epibenthic Biological sled
182	W71	20-Oct-17	12:07	Sediment Grab	71	Smith McIntyre grab
183	W87	20-Oct-17	14:08	Benthos	71	WHOI epibenthic Biological sled
184	W87	20-Oct-17	14:36	Sediment Grab	71	Smith McIntyre grab
185	W87	20-Oct-17	15:02	Plankton	71	Bongo Nets
186	W63	20-Oct-17	16:17	Plankton	75	Bongo Nets
187	W63	20-Oct-17	16:30	Benthos	74	WHOI epibenthic Biological sled
188	W63	20-Oct-17	17:14	Sediment Grab	73	Smith McIntyre grab
189	W72	20-Oct-17	18:44	Benthos	59	WHOI epibenthic Biological sled
190	W72	20-Oct-17	19:22	Sediment Grab	58	Smith McIntyre grab
191	W72	20-Oct-17	19:31	Plankton	58	Bongo Nets
192	W71	20-Oct-17	21:45	Catch	62	McKenna demersal fish trawl nets
193	W87	20-Oct-17	23:44	Catch	56	McKenna demersal fish trawl nets
194	W87	21-Oct-17	2:31	CTD Cast	70	CTD - Seabird 911 with 36 Bottle Rosette
195	W63	21-Oct-17	4:38	Catch	73	McKenna demersal fish trawl nets
196	W63	21-Oct-17	5:42	CTD Cast	73	CTD - Seabird 911 with 36 Bottle Rosette
197	W63	21-Oct-17	6:07	Turbulence probe	72	VMP Microstructure profiler
198	W72	21-Oct-17	7:54	Catch	47	McKenna demersal fish trawl nets
199	W72	21-Oct-17	8:58	CTD Cast	55	CTD - Seabird 911 with 36 Bottle Rosette
200	W72	21-Oct-17	9:18	Turbulence probe	59	VMP Microstructure profiler
201	W60	21-Oct-17	11:25	Benthos	66	WHOI epibenthic Biological sled
202	W60	21-Oct-17	11:48	Sediment Grab	66	Smith McIntyre grab
203	W60	21-Oct-17	12:11	Turbulence probe	65	VMP Microstructure profiler
204	W60	21-Oct-17	12:27	Plankton	65	Bongo Nets

Operation	Station name	Date	Time (UTC)	Type	Depth (m)	Equipment
205	W76	21-Oct-17	13:25	Plankton	60	Bongo Nets
206	W76	21-Oct-17	13:48	Benthos	61	WHOI epibenthic Biological sled
207	W76	21-Oct-17	14:05	Turbulence probe	62	VMP Microstructure profiler
208	W76	21-Oct-17	14:25	Sediment Grab	62	Smith McIntyre grab
209	W86	21-Oct-17	16:06	Benthos	67	WHOI epibenthic Biological sled
210	W86	21-Oct-17	16:28	Sediment Grab	67	Smith McIntyre grab
211	W86	21-Oct-17	16:37	Turbulence probe	68	VMP Microstructure profiler
212	W86	21-Oct-17	16:59	Plankton	68	Bongo Nets
213	W85	21-Oct-17	18:57	Plankton	63	Bongo Nets
214	W85	21-Oct-17	19:14	Turbulence probe	59	VMP Microstructure profiler
215	W85	21-Oct-17	19:33	Benthos	62	WHOI epibenthic Biological sled
216	W85	21-Oct-17	20:17	Sediment Grab	64	Smith McIntyre grab
217	W85	21-Oct-17	20:29	CTD Cast	64	CTD - Seabird 911 with 36 Bottle Rosette
218	W85	21-Oct-17	20:37	Turbulence probe	64	VMP Microstructure profiler
219	W85	21-Oct-17	22:02	Catch	47	McKenna demersal fish trawl nets
220	W85	21-Oct-17	23:55	CTD Cast	64	CTD - Seabird 911 with 36 Bottle Rosette
221	W85	22-Oct-17	0:02	Turbulence probe	64	VMP Microstructure profiler
222	W86	22-Oct-17	2:06	Catch	49	McKenna demersal fish trawl nets
223	W76	22-Oct-17	4:08	CTD Cast	60	CTD - Seabird 911 with 36 Bottle Rosette
224	W76	22-Oct-17	4:43	Turbulence probe	60	VMP Microstructure profiler
225	W76	22-Oct-17	4:43	CTD Cast	60	CTD - Seabird 911 with 36 Bottle Rosette
226	W76	22-Oct-17	5:06	Catch	51	McKenna demersal fish trawl nets
227	W60	22-Oct-17	7:50	Catch	54	McKenna demersal fish trawl nets
228	W60	22-Oct-17	9:05	CTD Cast	61	CTD - Seabird 911 with 36 Bottle Rosette
229	W60	22-Oct-17	9:49	Turbulence probe	61	VMP Microstructure profiler
230	W69	22-Oct-17	11:44	Benthos	54	WHOI epibenthic Biological sled
231	W69	22-Oct-17	12:13	Sediment Grab	58	Smith McIntyre grab
232	W69	22-Oct-17	12:14	Turbulence probe	58	VMP Microstructure profiler
233	W69	22-Oct-17	12:35	Plankton	55	Bongo Nets
234	W44	22-Oct-17	14:14	Plankton	63	Bongo Nets
235	W44	22-Oct-17	14:25	Benthos	63	WHOI epibenthic Biological sled
236	W44	22-Oct-17	14:51	Turbulence probe	64	VMP Microstructure profiler
237	W44	22-Oct-17	15:08	Sediment Grab	64	Smith McIntyre grab
238	W77	22-Oct-17	16:43	Benthos	66	WHOI epibenthic Biological sled
239	W77	22-Oct-17	17:13	Sediment Grab	66	Smith McIntyre grab
240	W77	22-Oct-17	17:26	Turbulence probe	66	VMP Microstructure profiler
241	W77	22-Oct-17	17:41	Plankton	65	Bongo Nets
242	W40	22-Oct-17	18:54	Plankton	66	Bongo Nets
243	W40	22-Oct-17	19:16	Benthos	65	WHOI epibenthic Biological sled
244	W40	22-Oct-17	19:44	Sediment Grab	65	Smith McIntyre grab
245	W40	22-Oct-17	19:51	Turbulence probe	65	VMP Microstructure profiler
246	W69	22-Oct-17	22:07	Catch	54	McKenna demersal fish trawl nets
247	W69	22-Oct-17	23:49	CTD Cast	60	CTD - Seabird 911 with 36 Bottle Rosette
248	W69	23-Oct-17	0:27	Turbulence probe	60	VMP Microstructure profiler
249	W44	23-Oct-17	1:48	Catch	55	McKenna demersal fish trawl nets
250	W44	23-Oct-17	2:47	CTD Cast	66	CTD - Seabird 911 with 36 Bottle Rosette
251	W44	23-Oct-17	3:19	Turbulence probe	66	VMP Microstructure profiler
252	W77	23-Oct-17	4:08	Catch	55	McKenna demersal fish trawl nets
253	W77	23-Oct-17	5:17	CTD Cast	66	CTD - Seabird 911 with 36 Bottle Rosette
254	W77	23-Oct-17	5:46	Turbulence probe	66	VMP Microstructure profiler
255	W92	23-Oct-17	10:31	Turbulence probe	62	VMP Microstructure profiler

Operation	Station name	Date	Time (UTC)	Type	Depth (m)	Equipment
256	W92	23-Oct-17	11:01	Benthos	62	WHOI epibenthic Biological sled
257	W92	23-Oct-17	11:22	Sediment Grab	62	Smith McIntyre grab
258	W92	23-Oct-17	11:43	Plankton	62	Bongo Nets
259	W62	23-Oct-17	13:26	Plankton	59	Bongo Nets
260	W62	23-Oct-17	13:51	Benthos	59	WHOI epibenthic Biological sled
261	W62	23-Oct-17	14:10	Sediment Grab	59	Smith McIntyre grab
262	W62	23-Oct-17	14:23	Turbulence probe	59	VMP Microstructure profiler
263	W20	23-Oct-17	16:34	Benthos	49	WHOI epibenthic Biological sled
264	W20	23-Oct-17	17:02	Sediment Grab	49	Smith McIntyre grab
265	W20	23-Oct-17	17:09	Turbulence probe	49	VMP Microstructure profiler
266	W20	23-Oct-17	17:26	Plankton	49	Bongo Nets
267	W8	23-Oct-17	18:51	Turbulence probe	37	VMP Microstructure profiler
268	W8	23-Oct-17	19:01	Plankton	37	Bongo Nets
269	W8	23-Oct-17	19:19	Benthos	37	WHOI epibenthic Biological sled
270	W8	23-Oct-17	19:42	Sediment Grab	36	Smith McIntyre grab
271	W8	23-Oct-17	21:27	Catch	37	McKenna demersal fish trawl nets
272	W20	24-Oct-17	0:18	Catch	46	McKenna demersal fish trawl nets
273	W20	24-Oct-17	1:50	CTD Cast	46	CTD - Seabird 911 with 36 Bottle Rosette
274	W20	24-Oct-17	2:10	Turbulence probe	47	VMP Microstructure profiler
275	W62	24-Oct-17	3:31	Catch	58	McKenna demersal fish trawl nets
276	W62	24-Oct-17	4:39	CTD Cast	58	CTD - Seabird 911 with 36 Bottle Rosette
277	W62	24-Oct-17	5:14	Turbulence probe	58	VMP Microstructure profiler
278	W92	24-Oct-17	6:36	Catch	64	McKenna demersal fish trawl nets
279	W92	24-Oct-17	7:44	CTD Cast	62	CTD - Seabird 911 with 36 Bottle Rosette
280	W92	24-Oct-17	8:15	Turbulence probe	62	VMP Microstructure profiler
281	W84	24-Oct-17	10:41	Benthos	56	WHOI epibenthic Biological sled
282	W84	24-Oct-17	11:18	Sediment Grab	56	Smith McIntyre grab
283	W84	24-Oct-17	11:30	Plankton	56	Bongo Nets
284	W90	24-Oct-17	12:27	Plankton	58	Bongo Nets
285	W90	24-Oct-17	12:38	Benthos	56	WHOI epibenthic Biological sled
286	W90	24-Oct-17	13:21	Sediment Grab	56	Smith McIntyre grab
287	W100	24-Oct-17	15:10	Benthos	56	WHOI epibenthic Biological sled
288	W100	24-Oct-17	15:37	Sediment Grab	57	Smith McIntyre grab
289	W100	24-Oct-17	15:49	Plankton	57	Bongo Nets
290	W19	24-Oct-17	17:52	Plankton	44	Bongo Nets
291	W19	24-Oct-17	18:01	Benthos	44	WHOI epibenthic Biological sled
292	W19	24-Oct-17	18:36	Sediment Grab	43	Smith McIntyre grab
293	W51	24-Oct-17	20:20	Benthos	52	WHOI epibenthic Biological sled
294	W51	24-Oct-17	21:19	Plankton	51	Bongo Nets
295	W51	24-Oct-17	21:21	Sediment Grab	52	Smith McIntyre grab
296	W51	24-Oct-17	21:56	Catch	51	McKenna demersal fish trawl nets
297	W19	25-Oct-17	0:16	Catch	40	McKenna demersal fish trawl nets
298	W100	25-Oct-17	4:52	Catch	56	McKenna demersal fish trawl nets
299	W100	25-Oct-17	6:43	CTD Cast	56	CTD - Seabird 911 with 36 Bottle Rosette
300	W100	25-Oct-17	7:13	Turbulence probe	56	VMP Microstructure profiler
301	W84	25-Oct-17	8:03	Catch	57	McKenna demersal fish trawl nets
302	W84	25-Oct-17	10:17	CTD Cast	55	CTD - Seabird 911 with 36 Bottle Rosette
303	W84	25-Oct-17	10:22	Turbulence probe	55	VMP Microstructure profiler
304	W91	25-Oct-17	12:20	Benthos	62	WHOI epibenthic Biological sled
305	W91	25-Oct-17	12:46	Sediment Grab	63	Smith McIntyre grab
306	W91	25-Oct-17	13:08	Turbulence probe	63	VMP Microstructure profiler
307	W91	25-Oct-17	13:23	Plankton	63	Bongo Nets
308	W91	25-Oct-17	14:05	Video	63	Deep Towed Camera System

Operation	Station name	Date	Time (UTC)	Type	Depth (m)	Equipment
309	W93	25-Oct-17	16:06	Plankton	66	Bongo Nets
310	W93	25-Oct-17	16:38	Benthos	66	WHOI epibenthic Biological sled
311	W93	25-Oct-17	16:58	Sediment Grab	66	Smith McIntyre grab
312	W93	25-Oct-17	17:13	Turbulence probe	66	VMP Microstructure profiler
313	W96	25-Oct-17	18:36	Benthos	64	WHOI epibenthic Biological sled
314	W96	25-Oct-17	19:07	Sediment Grab	62	Smith McIntyre grab
315	W96	25-Oct-17	19:31	Turbulence probe	62	VMP Microstructure profiler
316	W96	25-Oct-17	19:31	Plankton	62	Bongo Nets
317	W95	25-Oct-17	21:09	Plankton	61	Bongo Nets
318	W95	25-Oct-17	21:14	Benthos	61	WHOI epibenthic Biological sled
319	W95	25-Oct-17	22:27	Catch	59	McKenna demersal fish trawl nets
320	W95	26-Oct-17	0:07	CTD Cast	62	CTD - Seabird 911 with 36 Bottle Rosette
321	W95	26-Oct-17	0:31	Turbulence probe	62	VMP Microstructure profiler
322	W95	26-Oct-17	0:48	Sediment Grab	61	Smith McIntyre grab
323	W91	26-Oct-17	1:32	Catch	62	McKenna demersal fish trawl nets
324	W91	26-Oct-17	2:51	Turbulence probe	62	VMP Microstructure profiler
325	W93	26-Oct-17	4:09	Catch	80	McKenna demersal fish trawl nets
326	W40	26-Oct-17	6:39	Catch	79	McKenna demersal fish trawl nets
327	W40	26-Oct-17	8:11	CTD Cast	68	CTD - Seabird 911 with 36 Bottle Rosette
328	W40	26-Oct-17	8:25	Turbulence probe	67	VMP Microstructure profiler
329	W70	26-Oct-17	10:55	Benthos	58	WHOI epibenthic Biological sled
330	W70	26-Oct-17	11:26	Sediment Grab	56	Smith McIntyre grab
331	W70	26-Oct-17	11:40	Plankton	57	Bongo Nets
332	W61	26-Oct-17	14:15	Benthos	64	WHOI epibenthic Biological sled
333	W61	26-Oct-17	14:39	Sediment Grab	64	Smith McIntyre grab
334	W61	26-Oct-17	14:49	Plankton	65	Bongo Nets
335	W28	26-Oct-17	16:26	Plankton	64	Bongo Nets
336	W28	26-Oct-17	16:37	Benthos	64	WHOI epibenthic Biological sled
337	W28	26-Oct-17	17:08	Sediment Grab	64	Smith McIntyre grab
338	W41	26-Oct-17	18:18	Benthos	63	WHOI epibenthic Biological sled
339	W41	26-Oct-17	18:43	Sediment Grab	63	Smith McIntyre grab
340	W41	26-Oct-17	18:55	Plankton	63	Bongo Nets
341	W31	26-Oct-17	20:52	Benthos	57	WHOI epibenthic Biological sled
342	W31	26-Oct-17	21:21	Sediment Grab	57	Smith McIntyre grab
343	W31	26-Oct-17	21:49	Catch	80	McKenna demersal fish trawl nets
344	W41	27-Oct-17	0:14	Catch	80	McKenna demersal fish trawl nets
345	W41	27-Oct-17	1:29	CTD Cast	62	CTD - Seabird 911 with 36 Bottle Rosette
346	W41	27-Oct-17	1:50	Turbulence probe	62	VMP Microstructure profiler
347	W28	27-Oct-17	2:42	Catch	80	McKenna demersal fish trawl nets
348	W28	27-Oct-17	4:02	CTD Cast	64	CTD - Seabird 911 with 36 Bottle Rosette
349	W28	27-Oct-17	4:35	Turbulence probe	65	VMP Microstructure profiler
350	W61	27-Oct-17	5:00	Catch	81	McKenna demersal fish trawl nets
351	W61	27-Oct-17	6:15	CTD Cast	66	CTD - Seabird 911 with 36 Bottle Rosette
352	W61	27-Oct-17	6:45	Turbulence probe	66	VMP Microstructure profiler
353	W12	27-Oct-17	11:55	Benthos	104	WHOI epibenthic Biological sled
354	W12	27-Oct-17	12:43	Sediment Grab	100	Smith McIntyre grab
355	W12	27-Oct-17	12:55	Turbulence probe	100	VMP Microstructure profiler
356	W12	27-Oct-17	13:21	Plankton	100	Bongo Nets
357	W26	27-Oct-17	14:55	Plankton	115	Bongo Nets
358	W26	27-Oct-17	15:24	Benthos	103	WHOI epibenthic Biological sled
359	W26	27-Oct-17	15:57	Sediment Grab	83	Smith McIntyre grab
360	W26	27-Oct-17	16:04	Turbulence probe	94	VMP Microstructure profiler
361	W29	27-Oct-17	17:56	Benthos	84	WHOI epibenthic Biological sled

Operation	Station name	Date	Time (UTC)	Type	Depth (m)	Equipment
362	W29	27-Oct-17	18:24	Sediment Grab	81	Smith McIntyre grab
363	W29	27-Oct-17	18:34	Turbulence probe	81	VMP Microstructure profiler
364	W29	28-Oct-17	6:48	Plankton	80	Bongo Nets
365	W32	27-Oct-17	19:56	Plankton	69	Bongo Nets
366	W32	27-Oct-17	20:16	Benthos	69	WHOI epibenthic Biological sled
367	W32	27-Oct-17	20:36	Sediment Grab	70	Smith McIntyre grab
368	W32	27-Oct-17	20:47	Turbulence probe	70	VMP Microstructure profiler
369	W32	27-Oct-17	21:48	Catch	81	McKenna demersal fish trawl nets
370	W29	28-Oct-17	0:16	CTD Cast	103	CTD - Seabird 911 with 36 Bottle Rosette
371	W29	28-Oct-17	0:41	Turbulence probe	103	VMP Microstructure profiler
372	W29	28-Oct-17	1:21	Catch Failed	60	McKenna demersal fish trawl nets
373	W26	28-Oct-17	3:39	Catch	82	McKenna demersal fish trawl nets
374	W26	28-Oct-17	4:59	CTD Cast	84	CTD - Seabird 911 with 36 Bottle Rosette
375	W26	28-Oct-17	5:45	Turbulence probe	85	VMP Microstructure profiler
376	W12	28-Oct-17	6:19	Catch	82	McKenna demersal fish trawl nets
377	W12	28-Oct-17	7:52	CTD Cast	95	CTD - Seabird 911 with 36 Bottle Rosette
378	W12	28-Oct-17	8:19	Turbulence probe	95	VMP Microstructure profiler
379	W27	28-Oct-17	10:55	Benthos	72	WHOI epibenthic Biological sled
380	W27	28-Oct-17	11:25	Sediment Grab	72	Smith McIntyre grab
381	W27	28-Oct-17	11:35	Turbulence probe	71	VMP Microstructure profiler
382	W27	28-Oct-17	12:02	Plankton	72	Bongo Nets
383	W37	28-Oct-17	14:02	Plankton	83	Bongo Nets
384	W37	28-Oct-17	14:23	Benthos	80	WHOI epibenthic Biological sled
385	W37	28-Oct-17	14:51	Sediment Grab	80	Smith McIntyre grab
386	W37	28-Oct-17	14:53	Turbulence probe	80	VMP Microstructure profiler
387	W38	28-Oct-17	16:33	Benthos	74	WHOI epibenthic Biological sled
388	W38	28-Oct-17	16:59	Sediment Grab	74	Smith McIntyre grab
389	W38	28-Oct-17	17:12	Turbulence probe	74	VMP Microstructure profiler
390	W38	28-Oct-17	17:27	Plankton	75	Bongo Nets
391	W38	28-Oct-17	17:48	Turbulence probe	75	VMP Microstructure profiler
392	W96	28-Oct-17	20:47	Turbulence probe	63	VMP Microstructure profiler
393	W96	28-Oct-17	21:01	CTD Cast	63	CTD - Seabird 911 with 36 Bottle Rosette
394	W96	28-Oct-17	21:59	Catch	57	McKenna demersal fish trawl nets
395	W38	29-Oct-17	1:23	Catch	79	McKenna demersal fish trawl nets
396	W38	29-Oct-17	2:56	CTD Cast	74	CTD - Seabird 911 with 36 Bottle Rosette
397	W38	29-Oct-17	3:14	Turbulence probe	74	VMP Microstructure profiler
398	W27	29-Oct-17	4:36	Catch	57	McKenna demersal fish trawl nets
399	W37	29-Oct-17	7:37	Catch	58	McKenna demersal fish trawl nets
400	W37	29-Oct-17	9:15	CTD Cast	80	CTD - Seabird 911 with 36 Bottle Rosette
401	W37	29-Oct-17	9:17	Turbulence probe	80	VMP Microstructure profiler
402	W43	29-Oct-17	10:53	Benthos	78	WHOI epibenthic Biological sled
403	W43	29-Oct-17	11:19	Sediment Grab	79	Smith McIntyre grab
404	W43	29-Oct-17	11:28	Plankton	79	Bongo Nets
405	W68	29-Oct-17	13:47	Plankton	75	Bongo Nets
406	W68	29-Oct-17	14:07	Benthos	74	WHOI epibenthic Biological sled
407	W68	29-Oct-17	14:32	Sediment Grab	74	Smith McIntyre grab
408	W89	29-Oct-17	16:41	Benthos	61	WHOI epibenthic Biological sled
409	W89	29-Oct-17	17:12	Sediment Grab	62	Smith McIntyre grab
410	W89	29-Oct-17	17:20	Plankton	62	Bongo Nets
411	W59	29-Oct-17	18:21	Benthos	60	WHOI epibenthic Biological sled
412	W59	29-Oct-17	18:54	Sediment Grab	60	Smith McIntyre grab
413	W90	29-Oct-17	19:57	Video	57	Deep Towed Camera System
414	W90	29-Oct-17	21:43	Catch	57	McKenna demersal fish trawl nets

Operation	Station name	Date	Time (UTC)	Type	Depth (m)	Equipment
415	W89	30-Oct-17	0:08	CTD Cast	58	CTD - Seabird 911 with 36 Bottle Rosette
416	W89	30-Oct-17	0:35	Turbulence probe	59	VMP Microstructure profiler
417	W89	30-Oct-17	1:48	Catch	58	McKenna demersal fish trawl nets
418	W59	30-Oct-17	4:05	Catch	59	McKenna demersal fish trawl nets
419	W59	30-Oct-17	5:21	CTD Cast	58	CTD - Seabird 911 with 36 Bottle Rosette
420	W59	30-Oct-17	5:33	Turbulence probe	59	VMP Microstructure profiler
421	W70	30-Oct-17	7:11	Catch	55	McKenna demersal fish trawl nets
422	W70	30-Oct-17	8:25	CTD Cast	55	CTD - Seabird 911 with 36 Bottle Rosette
423	W70	30-Oct-17	8:51	Turbulence probe	57	VMP Microstructure profiler
424	W90	30-Oct-17	9:28	Video	57	Deep Towed Camera System
425	W59	30-Oct-17	11:44	Plankton	60	Bongo Nets
426	W75	30-Oct-17	13:03	Plankton	60	Bongo Nets
427	W75	30-Oct-17	13:20	Benthos	60	WHOI epibenthic Biological sled
428	W75	30-Oct-17	13:44	Sediment Grab	59	Smith McIntyre grab
429	W75	30-Oct-17	13:56	Turbulence probe	59	VMP Microstructure profiler
430	W94	30-Oct-17	15:30	Benthos	61	WHOI epibenthic Biological sled
431	W94	30-Oct-17	15:58	Sediment Grab	61	Smith McIntyre grab
432	W94	30-Oct-17	16:09	Turbulence probe	61	VMP Microstructure profiler
433	W94	30-Oct-17	16:19	Catch	60	Bongo Nets
434	W58	30-Oct-17	18:17	Plankton	71	Bongo Nets
435	W58	30-Oct-17	18:37	Benthos	72	WHOI epibenthic Biological sled
436	W58	30-Oct-17	19:00	Sediment Grab	74	Smith McIntyre grab
437	W48	30-Oct-17	20:56	Benthos	74	WHOI epibenthic Biological sled
438	W48	30-Oct-17	21:21	Benthos	73	Smith McIntyre grab
439	W48	30-Oct-17	21:59	Catch	73	McKenna demersal fish trawl nets
440	W58	31-Oct-17	0:35	Catch	73	McKenna demersal fish trawl nets
441	W58	31-Oct-17	1:43	Plankton	82	Bongo Nets
442	W58	31-Oct-17	2:36	CTD Cast	71	CTD - Seabird 911 with 36 Bottle Rosette
443	W58	31-Oct-17	2:52	Turbulence probe	71	VMP Microstructure profiler
444	W68	31-Oct-17	3:53	Catch	73	McKenna demersal fish trawl nets
445	W68	31-Oct-17	5:16	CTD Cast	73	CTD - Seabird 911 with 36 Bottle Rosette
446	W68	31-Oct-17	5:39	Turbulence probe	73	VMP Microstructure profiler
447	W43	31-Oct-17	7:09	Catch	89	McKenna demersal fish trawl nets
448	W43	31-Oct-17	8:39	CTD Cast	89	CTD - Seabird 911 with 36 Bottle Rosette
449	W43	31-Oct-17	9:07	Turbulence probe	87	VMP Microstructure profiler
450	W47	31-Oct-17	11:18	Catch	78	WHOI epibenthic Biological sled
451	W47	31-Oct-17	12:05	Catch	78	Smith McIntyre grab
452	W47	31-Oct-17	12:24	Plankton	78	Bongo Nets
453	W13	31-Oct-17	14:02	Plankton	81	Bongo Nets
454	W13	31-Oct-17	14:24	Benthos	83	WHOI epibenthic Biological sled
455	W13	31-Oct-17	14:46	Benthos	81	Smith McIntyre grab
456	W46	31-Oct-17	16:16	Benthos	83	WHOI epibenthic Biological sled
457	W46	31-Oct-17	16:44	Benthos	84	Smith McIntyre grab
458	W46	31-Oct-17	16:56	Plankton	84	Bongo Nets
459	W48	31-Oct-17	18:26	Plankton	74	Bongo Nets
460	W78	31-Oct-17	19:51	Plankton	73	Bongo Nets
461	W78	31-Oct-17	20:06	Benthos	72	WHOI epibenthic Biological sled
462	W78	31-Oct-17	20:32	Benthos	72	Smith McIntyre grab
463	W78	31-Oct-17	21:38	Catch	72	McKenna demersal fish trawl nets
464	W46	1-Nov-17	0:35	Catch	84	McKenna demersal fish trawl nets
465	W46	1-Nov-17	1:54	Catch	83	CTD - Seabird 911 with 36 Bottle Rosette
466	W46	1-Nov-17	2:14	Turbulence probe	84	VMP Microstructure profiler

Operation	Station name	Date	Time (UTC)	Type	Depth (m)	Equipment
467	W13	1-Nov-17	4:05	Catch	80	McKenna demersal fish trawl nets
468	W13	1-Nov-17	5:14	CTD Cast	81	CTD - Seabird 911 with 36 Bottle Rosette
469	W13	1-Nov-17	5:40	Turbulence probe	81	VMP Microstructure profiler
470	W47	1-Nov-17	6:52	Catch	76	McKenna demersal fish trawl nets
471	W47	1-Nov-17	7:54	Catch	76	CTD - Seabird 911 with 36 Bottle Rosette
472	W47	1-Nov-17	8:27	Turbulence probe	76	VMP Microstructure profiler
473	W79	1-Nov-17	10:49	Benthos	70	WHOI epibenthic Biological sled
474	W79	1-Nov-17	11:15	Benthos	67	Smith McIntyre grab
475	W79	1-Nov-17	11:25	Turbulence probe	67	VMP Microstructure profiler
476	W79	1-Nov-17	11:46	Plankton	69	Bongo Nets
477	W80	1-Nov-17	12:28	Plankton	67	Bongo Nets
478	W80	1-Nov-17	12:40	Catch	67	WHOI epibenthic Biological sled
479	W80	1-Nov-17	13:17	Benthos	68	Smith McIntyre grab
480	W80	1-Nov-17	13:26	Turbulence probe	68	VMP Microstructure profiler
481	W83	1-Nov-17	15:29	Catch	62	WHOI epibenthic Biological sled
482	W83	1-Nov-17	15:53	Benthos	62	Smith McIntyre grab
483	W83	1-Nov-17	16:03	Turbulence probe	62	VMP Microstructure profiler
484	W83	1-Nov-17	16:13	Plankton	62	Bongo Nets
485	W81	1-Nov-17	17:48	Catch	60	Bongo Nets
486	W81	1-Nov-17	18:05	Benthos	61	WHOI epibenthic Biological sled
487	W81	1-Nov-17	18:30	Catch	61	Smith McIntyre grab
488	W81	1-Nov-17	18:34	Catch	61	VMP Microstructure profiler
489	W82	1-Nov-17	19:50	Catch	59	WHOI epibenthic Biological sled
490	W82	1-Nov-17	20:13	Benthos	59	Smith McIntyre grab
491	W82	1-Nov-17	20:27	Plankton	59	Bongo Nets
492	W82	1-Nov-17	21:01	Turbulence probe	60	VMP Microstructure profiler
493	W82	1-Nov-17	21:46	Catch	60	McKenna demersal fish trawl nets
494	W81	1-Nov-17	23:31	CTD Cast	66	CTD - Seabird 911 with 36 Bottle Rosette
495	W81	1-Nov-17	23:49	Turbulence probe	66	VMP Microstructure profiler
496	W81	2-Nov-17	0:26	Catch Failed	60	McKenna demersal fish trawl nets
497	W81	2-Nov-17	2:19	Catch	63	McKenna demersal fish trawl nets
498	W80	2-Nov-17	4:40	Catch	65	McKenna demersal fish trawl nets
499	W80	2-Nov-17	5:47	Catch	65	VMP Microstructure profiler
500	W79	2-Nov-17	6:33	Catch	66	McKenna demersal fish trawl nets
501	W79	2-Nov-17	7:49	Catch	68	CTD - Seabird 911 with 36 Bottle Rosette
502	W79	2-Nov-17	8:10	Catch	68	VMP Microstructure profiler
503	W50	2-Nov-17	11:41	Photo	55	Deep Towed Camera System
504	W50	2-Nov-17	12:48	Benthos	55	WHOI epibenthic Biological sled
505	W50	2-Nov-17	13:15	Benthos	55	Smith McIntyre grab
506	W50	2-Nov-17	13:28	Plankton	55	Bongo Nets
507	W97	2-Nov-17	14:27	Catch	56	Bongo Nets
508	W97	2-Nov-17	14:44	Benthos	56	WHOI epibenthic Biological sled
509	W97	2-Nov-17	15:09	Benthos	55	Smith McIntyre grab
510	W98	2-Nov-17	16:12	Catch	57	WHOI epibenthic Biological sled
511	W98	2-Nov-17	16:50	Catch	56	Smith McIntyre grab
512	W98	2-Nov-17	17:02	Catch	56	Bongo Nets
513	W99	2-Nov-17	18:01	Plankton	55	Bongo Nets
514	W99	2-Nov-17	18:19	Benthos	55	WHOI epibenthic Biological sled
515	W99	2-Nov-17	18:45	Catch	54	Smith McIntyre grab
516	W75	2-Nov-17	20:21	Catch	59	WHOI epibenthic Biological sled
517	W75	2-Nov-17	21:02	Catch	57	CTD - Seabird 911 with 36 Bottle Rosette
518	W75	2-Nov-17	21:36	Catch	57	McKenna demersal fish trawl nets
519	W94	2-Nov-17	23:57	Catch	61	McKenna demersal fish trawl nets

Operation	Station name	Date	Time (UTC)	Type	Depth (m)	Equipment
520	W94	3-Nov-17	2:03	CTD Cast	57	CTD - Seabird 911 with 36 Bottle Rosette
521	W94	3-Nov-17	2:23	Turbulence probe	60	VMP Microstructure profiler
522	W83	3-Nov-17	2:54	Catch	61	McKenna demersal fish trawl nets
523	W83	3-Nov-17	4:12	CTD Cast	63	CTD - Seabird 911 with 36 Bottle Rosette
524	W83	3-Nov-17	4:40	Turbulence probe	60	VMP Microstructure profiler
525	W99	3-Nov-17	5:08	Catch	54	McKenna demersal fish trawl nets
526	W98	3-Nov-17	7:13	Catch	48	McKenna demersal fish trawl nets
527	W98	3-Nov-17	8:52	CTD Cast	53	CTD - Seabird 911 with 36 Bottle Rosette
528	W98	3-Nov-17	9:12	Turbulence probe	53	VMP Microstructure profiler
529	W17	3-Nov-17	11:41	Catch	47	WHOI epibenthic Biological sled
530	W17	3-Nov-17	12:09	Catch	48	Smith McIntyre grab
531	W17	3-Nov-17	12:23	Catch	47	Bongo Nets
532	W3	3-Nov-17	14:57	Plankton	36	Bongo Nets
533	W3	3-Nov-17	15:06	Benthos	35	WHOI epibenthic Biological sled
534	W3	3-Nov-17	15:54	Benthos	35	Smith McIntyre grab
535	W18	3-Nov-17	18:26	Benthos	38	WHOI epibenthic Biological sled
536	W18	3-Nov-17	18:53	Benthos	38	Smith McIntyre grab
537	W18	3-Nov-17	19:02	Catch	37	Bongo Nets
538	W17	3-Nov-17	20:34	Video	46	Deep Towed Camera System
539	W17	3-Nov-17	21:55	Catch	45	McKenna demersal fish trawl nets
540	W18	4-Nov-17	0:50	CTD Cast	37	CTD - Seabird 911 with 36 Bottle Rosette
541	W18	4-Nov-17	1:07	Turbulence probe	37	VMP Microstructure profiler
542	W18	4-Nov-17	1:20	Catch Failed	42	McKenna demersal fish trawl nets
543	W18	4-Nov-17	3:13	Catch	37	McKenna demersal fish trawl nets
544	W97	4-Nov-17	6:23	Catch	52	McKenna demersal fish trawl nets
545	W50	4-Nov-17	8:07	Catch	54	McKenna demersal fish trawl nets
546	W17	4-Nov-17	10:37	Catch	46	Deep Towed Camera System
547	W3	4-Nov-17	12:39	Photo	35	Deep Towed Camera System
548	W2	4-Nov-17	15:24	Benthos	36	WHOI epibenthic Biological sled
549	W2	4-Nov-17	16:04	Sediment Grab	32	Smith McIntyre grab
550	W2	4-Nov-17	16:18	Plankton	35	Bongo Nets
551	W15	4-Nov-17	17:50	Plankton	32	Bongo Nets
552	W15	4-Nov-17	18:04	Catch	30	WHOI epibenthic Biological sled
553	W15	4-Nov-17	18:29	Benthos	30	Smith McIntyre grab
554	W1	4-Nov-17	20:41	Catch	34	WHOI epibenthic Biological sled
555	W1	4-Nov-17	21:51	Benthos	38	Smith McIntyre grab
556	W1	4-Nov-17	22:02	Catch	36	McKenna demersal fish trawl nets
557	W15	4-Nov-17	23:49	Catch	33	McKenna demersal fish trawl nets
558	W15	5-Nov-17	2:30	CTD Cast	33	CTD - Seabird 911 with 36 Bottle Rosette
559	W15	5-Nov-17	2:39	Turbulence probe	35	VMP Microstructure profiler
560	W2	5-Nov-17	3:05	Catch	36	McKenna demersal fish trawl nets
561	W2	5-Nov-17	5:04	CTD Cast	35	CTD - Seabird 911 with 36 Bottle Rosette
562	W2	5-Nov-17	6:03	Turbulence probe	35	VMP Microstructure profiler
563	W3	5-Nov-17	6:05	CTD Cast	35	CTD - Seabird 911 with 36 Bottle Rosette
564	W3	5-Nov-17	7:01	Turbulence probe	34	VMP Microstructure profiler
565	W16	5-Nov-17	10:34	Benthos	43	WHOI epibenthic Biological sled
566	W16	5-Nov-17	11:32	Benthos	43	Smith McIntyre grab
567	W16	5-Nov-17	11:45	Plankton	43	Bongo Nets
568	W16	5-Nov-17	12:28	Catch	45	Deep Towed Camera System
569	W14	5-Nov-17	15:23	Catch	51	Deep Towed Camera System
570	W14	5-Nov-17	16:30	Catch	50	Bongo Nets
571	W14	5-Nov-17	17:07	Benthos	50	WHOI epibenthic Biological sled

Operation	Station name	Date	Time (UTC)	Type	Depth (m)	Equipment
572	W14	5-Nov-17	17:44	Catch	50	Smith McIntyre grab
573	W49	5-Nov-17	19:10	Benthos	61	WHOI epibenthic Biological sled
574	W49	5-Nov-17	19:35	Catch	61	Smith McIntyre grab
575	W49	5-Nov-17	19:42	Catch	61	Bongo Nets
576	W49	5-Nov-17	20:09	CTD Cast	59	CTD - Seabird 911 with 36 Bottle Rosette
577	W49	5-Nov-17	20:40	Catch	61	VMP Microstructure profiler
578	W49	5-Nov-17	21:56	Catch	57	McKenna demersal fish trawl nets
579	W14	5-Nov-17	23:32	Catch	45	McKenna demersal fish trawl nets
580	W16	6-Nov-17	2:42	Catch	37	McKenna demersal fish trawl nets
581	W3	6-Nov-17	4:54	Catch	37	McKenna demersal fish trawl nets
582	W3	6-Nov-17	6:54	Video	31	Deep Towed Camera System
583	W16	6-Nov-17	10:54	Video	43	Deep Towed Camera System
584	W14	6-Nov-17	12:41	Catch	49	Deep Towed Camera System