Report of
RV Ronald H. Brown Cruise 06-03
to the
Western Subtropical and Tropical North Atlantic
10 April to 30 April, 2006

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A
Census of Marine Zooplankton (CMarZ)
Report

Available online from the
CMarZ website,
www.cmarz.org

Acknowledgments

This was the first major CMarZ cruise in the Western North Atlantic. The success of the cruise was due to the collective efforts of Captain, Officers, Crew, and all members of the Scientific Party. Throughout the cruise there was a camaraderie and friendliness among all the participants that made this expedition a great pleasure. This cruise was supported by the NOAA Ocean Exploration Program.

RB06-03 CMarZ Cruise Participants on the RV R.H. Brown
(see facing page)

Sitting Row 1 (L-R):Chaolun Li, Saramma Panampunnayil, Silvia Watanabe, Hui Liu, Francesc Pagès, Paola Batta Lona, Tracey Sutton, Martin Angel, Dicky Allison.

Standing Row 1 (L-R): Mikiko Kuriyama, Lalithambika Devi, Brian Ortman, Russ Hopcroft, Nancy Copley, Ebru Unal, Joe Catron.

Standing Row 2 (L-R): Yurika Ujiie, Leo Blanco Bercial, Hiroyuki Matsuura, Larry Madin, Barbara Costas, Hege Øverbø Hansen.

Back Row 3: Colomban de Vargas, Astrid Cornils, Erich Horgan, Dhugal Lindsay, Rob Jennings, Peter Wiebe.

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PURPOSE OF THE CRUISE

The focus of the CMarZ program is on the development of a taxonomically comprehensive assessment of biodiversity of animal plankton throughout the world ocean. The project goal is to produce accurate and complete information on zooplankton species diversity, biomass, biogeographical distribution, genetic diversity, and community structure by 2010. Our taxonomic focus is the animals that drift with ocean currents throughout their lives (i.e., the holozooplankton). This assemblage currently includes ~6,800 described species in fifteen phyla; our expectation is that at least that many new species will be discovered as a result of our efforts. The Census of Marine Zooplankton (CMarZ) program is an ocean realm field project of the Census of Marine Life (CoML).

On this cruise, the focus was the tropical/subtropical waters of the Atlantic Ocean west of the mid-Atlantic ridge. The objective was to collect and identify the zooplankton distributed throughout the entire water column, with a particular focus on the under-sampled mesopelagic, bathypelagic, abyssopelagic zones, and then to sequence them genetically at sea. Thus, the scientific participants on this cruise include CMarZ researchers, expert taxonomists, molecular specialists, staff, and students. Sampling was conducted along a transect extending from the northern Sargasso Sea to the equatorial waters northeast of Brazil (Figure 1). At five primary stations, environmental data and zooplankton samples were collected using three Multiple Opening/Closing Nets and Environmental Sensing Systems (MOCNESS). One was a large opening/closing trawl and two were smaller multiple net systems

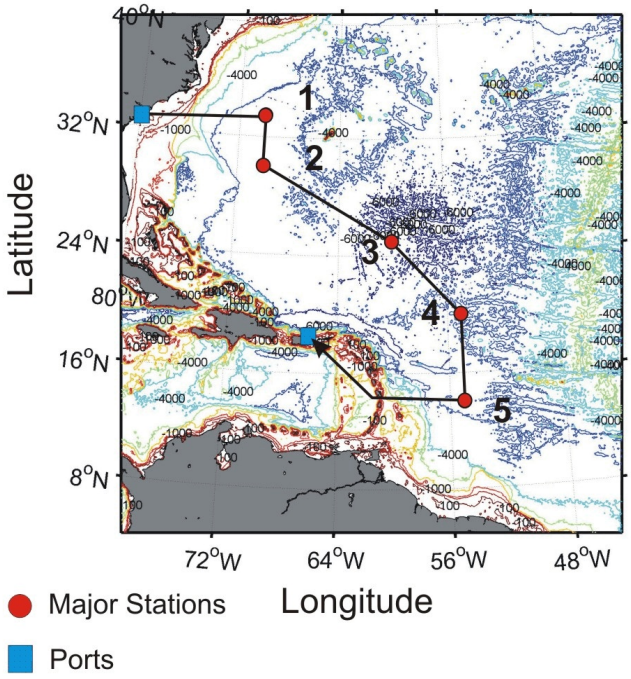


Figure 1. Trackline and station positions on CMarZ Cruise RB06-03, 10 to 30 April 2006. The cruise started in Charleston, SC and ended in San Juan, Puerto Rico.

(See MOCNESS Sampling section below for more detail). Other samples were collected with ring nets and water bottles, and by blue water SCUBA diving.

Samples were analyzed at sea using traditional taxonomic approaches and molecular systematic analysis, including DNA sequencing of a target gene portion for each species. After the cruise, follow-up molecular analysis, species counts, and expert taxonomic evaluation and description of any putative new or undescribed species will be done in association with the CMarZ Taxonomic Network. In addition to the intensive sampling of the water column, a series of lectures and workshops were conducted as part of the at-sea training in zooplankton morphological and molecular systematic approaches.

NARRATIVE

10 to 12 April 2006: The cruise got underway at 1400 on 10 April when we left the port of Charleston, South Carolina after four days of intense set-up of the equipment and laboratory spaces needed for the work at sea. Shortly after leaving the dock, the ship spent time in Charleston Harbor while a calibration of the Robertson Navigation system took place, which had undergone repairs while the ship was in port.

The R/V Ron Brown finally left the harbor and got underway for the first station located in the Northern Sargasso Sea about 1800. During the early hours of the night of the 10th, the ship's ride was comfortable, but the winds picked up to around 20 kts towards the morning of the 11th as we steamed out across the continental shelf and the Gulf Stream, and the motion of the vessel made many of the scientific party a bit seasick. The moderately rough weather continued into daylight on the 11th of April and the loading of nets onto the three Multiple Opening/Closing Nets and Environmental Sensing Systems (MOCNESS) and other work in the laboratories went slowly. The initial abandon ship and the fire and boat drill took place around 1030.

Problems with the operation of the trawl winch with 0.68" conducting cable, which was the mainstay of our sampling program, had been identified a couple of weeks before the start of the cruise and most of the repairs had taken place by the time the ship left the dock. On the evening of the 11th, 8000 meters of trawl wire was streamed to test the ability of the winch to carry out the deep MOCNESS tows. Although the winch had no difficulty in paying the cable out, there was significant difficulty bringing the wire back on board at a reasonable haul in speed. During the test, a load cell burnt out and it was replaced. A second test took place on the evening of the 12th. This test indicated that the winch could be used to tow the MOCNESS trawl to bathy- and abyssopelagic depths.

Several science meetings took place during the steaming to Station 1. On the evening of the 11th, there was an introductory meeting to discuss the cruise objectives and to review plans for work at

the stations. On the afternoon of the 12th there were two additional meetings. The first was to work out the final details of the sampling at a station and the protocols for how each of the zooplankton samples was to be processed. The second involved a number of the officers and crew and was focused on the methods of deployment of the over-the-side equipment and who would be in charge of coordinating them.

During the afternoon of the 11th, a ½-m diameter ring net was deployed to 100 m to provide a collection of zooplankton that could be used by the taxonomic experts on board to begin their work on this cruise. A number of species of copepods, ostracods, gelatinous animals, formaminifera, and other groups were picked live from the sample and a number of the species were identified. Some of these were then selected for genetic sequencing on the 12th. Earlier in this day, a first occurred when a zooplankton species (a copepod, *Disseta grandis*, caught on a previous cruise) was sequenced at sea. As far as we know, this is the first time a gene sequencer has produced a gene sequence at sea. This is a very significant early milestone for this cruise.

13/14 April 2006: Finally, waiting for arrival at the first station ended with a phone call from the bridge saying that we were on station at 0500 on 13 April. The seas were moderate and the winds were in the 10 to 15 kt range, fine for work on station. The air was about 17°C, cooler than the sea water, which had a temperature around 19°C. The science watch for the midnight to noon period was awake quickly and the first event was a 1-m MOCNESS tow. The net system was a bit late in getting into the water because the deployment through the stern A-frame required some experimentation to see how best to get it over the 10-m MOCNESS, which was positioned within the stern A-frame area. The tow went well with Larry Madin taking the lead on flying the net for the first part of the tow and Peter Wiebe taking the last part while Larry coordinated preparation of the SCUBA dive. There was lots of excitement when the net system came on board around 0930 and a flurry of activity as the samples were moved from the deck in buckets chilled with ice packs to keep the samples cool to the walk-in refrigerator. They were stored there until they could be photographed and picked for large organisms in the wet lab, and then split into fractions for additional live picking of smaller animals or preservation in either alcohol or formalin.

A blue-water dive was next up and Larry Madin, Erich Horgan, James Brinkley, and Keegan Plaskon (latter two from the ship) went out in the RHIB (Rigid Hull Inflatable Boat) for about two hours of collecting of the more fragile zooplankton that are usually destroyed by collection with nets. The boat, with the divers, boat operator, and gear already on board, was launched from the 02 deck by an automated launch and recovery system that made the operation safe and efficient.

The first tow with the 1/4-m MOCNESS in the early afternoon of the 13th was not successful. A problem with the battery power in the underwater unit resulted in a loss of signal about a third of

the way through the deployment. Only a single sample was obtained, but it also proved to have a number of microzooplankton species of interest.

The final bit of rigging of the 10-m MOCNESS trawl system was completed and by 1600 it had been launched off the stern and was going down to 5000 m. It took about 4 hours to deploy it to the maximum depth and it was a very smooth deployment. Once at depth, the ship's speed was increased to get the angle of attack of the net frame up to the normal towing angle of about 45 degrees and to let the net system rise up with the increased velocity. When the winch began to haul in the towing wire at the slow rate of 10 m/min, the winch started up and then stopped. There was a lot of activity for awhile to try to determine what caused the winch problem. In the end, the winch was enabled by the ship's engineers so that it could haul in at 6 m/min. With 8000+ meters of wire out, it appeared it would take 22 hours to haul the net back in. In reality the wire was hauled in less time because the speed of retrieval increased as more wire came on board, and the net system reached the surface at 0740 on the 14th of April some 16 hours after the tow was begun. The recovery of the frame went very smoothly with a combination of the A-frame and air-tuggers pulling the frame on board and down onto a pair of stanchions used to secure the top portion of the trawl frame. Once the frame was secure, a number of individuals from the morning watch pulled in the nets, which only took about 10 minutes. The newly designed trawl nets fabricated from very fine 335 μm nylon mesh proved successful and were in fine shape after the tow. This tow also had some flaws. One cod-end bucket that did not have its fasteners taped or rubber-banded was lost (Net 2) and the tab on net bar 3 broke off during the tow. The cable and swaged fitting from this net bar was found in the cod-end of net 4. This meant that net 1 fished from 5000 to 4000, net 2 fished from 4000 to 3000, and net 4 fished from 3000 to 1000. When net 2 was closed, net 3 closed with it and never was open. When net 3 was supposed to be released, the cable and swaged fitting plus part of the tab fell into the open net 4. Because of the length of the tow and the repairs needed to get the trawl back in service, the second tow at station #1 with this system was scrubbed.

The MOC-10 catches, while not spectacular in terms of biomass caught, were very interesting in terms of the species collected. While water collection with a 30 liter Niskin bottle was being conducted, the taxonomists were bunched in the ship's wet lab processing the MOC-10 samples. It was clear that a number of animals were caught in the deep nets that had not been seen in the shallower MOC-1 tow, especially the net that sampled the 3000 to 1000 m zone. There were many shrimp and gelatinous animals including ctenophores. Martin Angel found at least two new species of ostracod, one he knew about and one he had not seen before. Tracey Sutton found a male anglerfish in very good condition - this specimen was from a group that is only known to the generic level. He also found other specimens of fish species that are rarely ever caught.

The afternoon of the 14th went quickly in calm seas, clear skies, and bright sunlight. The 1/4-m MOCNESS haul came first around 1330. The underwater unit that had failed during the first tow

was replaced with the one from the MOC-10, and it and the options case with the fluorometer attached worked very well. This tow was a bit of a bear because it was difficult to keep on the intended course and the bridge had to keep changing speed to keep the towing wire clear of the ship's starboard quarter. The net system came on board around 1600 and the catch again was of great interest to a large group of people, especially those working on the microplankton. Right after the 1/4-m MOC came on board, Russ Hopcroft put his Reeve net in for a deep (500 m) vertical tow during the dinner period to collect larvaceans and other live animals for identification and photography. Larvaceans are particularly fragile animals and rarely come up intact in the MOCNESS. The Reeve net with its very large cod-end allows the fragile animals to be collected more effectively.

A 1-m MOCNESS night tow was started about 1800 and this tow was completed in under 3 hours, which kept us on schedule and made it possible for the divers to leave the ship in choppy seas by 2130 for their night dive. They arrived back about 2315. Both the MOCNESS and the divers' collections provided additional animals that had not appeared in the earlier tows and dives.

The last activity for the first station was another 1/4-m MOCNESS tow and it also was an ill-fated tow. With about 600 m of cable out and the net at 290 m depth, the deck unit lost signal with the underwater unit and data collection ceased. Something catastrophic had happened and the only recourse was to retrieve the system. With the winds picking up sharply since early evening (they were about 17 kts around midnight, up from 8 kts before the divers went out), the decision was made to call it quits at this station and set sail for Station #2.

During this two day transit, there was tremendous activity in the forward biochemistry lab where the Applied Biosystems Hitachi gene sequencer was located. The "UCONN Team DNA" was working around the clock to prepare and sequence animals. A number of species identified by the taxonomic experts on board were placed in a queue for sequencing and a dozen or more were successfully sequenced. Of particular note is the fact that Martin Angel had identified a number of ostracods from the samples acquired so far and some of these were prepared for sequencing. These were the first sequences ever produced for marine planktonic ostracods.

15 April 2006: In the early morning of the 15th of April, there was bright sun coming through the port holes and mix of sun and clouds. The winds were from west southwest at about 25 kts. We were in the southern fringe of the gale that had been forecast for just north of our station #1 for today and there were lots of white caps on the starboard bow as we steamed south. Fortunately we were steaming away from the gale as we headed for Station #2 at 30°N; 70°W.

During the day, the main laboratory was the center of activity with the taxonomic specialists sorting through the samples collected at Station #1, identifying zooplankton species, and working with Team DNA to prepare the specimens for sequencing.

In mid-afternoon, we crossed paths with the lead boat in the Volvo Ocean Race. The leg five leader, ABN AMRO ONE was off on our starboard about 4.5 nm and was headed for Baltimore. There were seven boats in the race. In addition to ABN AMRO ONE, there was movistar, Pirates of the Caribbean, Brasil 1, Ericsson Racing Team, ABN AMRO TWO, and Brunel.

The work at Station #2 began about 1800 with the deployment of the 1/4-m MOC. It did not go well. The same problem that occurred at the previous station re-occurred. With 600m of wire out and the nets down bout 250 m, the deck unit again lost the underwater signal and it could not be re-established. There was no indication of a problem up to the time the system failed. After several hours of testing, two of the underwater units were unable to work on the CTD cable. In addition, one underwater unit suffered electronic damage as a result of the failure. Since these units worked well on the trawl wire, the suspicion was that the CTD cable was causing the problem. This ended our attempt to make a 1/4-m tow at this station.

The night dive that was scheduled for 2130 was also scrubbed because the winds (17 to 21 kts) and sea state were marginal at best. We then decided to do a 1-m MOCNESS early since the time was available. The deployment was scheduled for 2230. Leo Bercial, Chaolun Li, Paola Lona, and Joe Catron got the cod-end buckets on and set the net bar traps. Bruce Cowden, the Bosun, came out onto the deck at 2230 and started the operation by picking up the MOCNESS frame with the port crane to move it aft to the deck area underneath the A-frame. The tow signal cable, however, got caught on the support stanchion just as the frame was being lifted rapidly and the cable was stressed to the breaking point. It took about an hour and a half to re-splice and water-proof the cable. About midnight on the 15th, the 1-m MOCNESS was ready to go back into the water and indeed it did.

16 April 2006: During the wee hours of the 16th of April, the 1-m MOCNESS tow was successfully completed. While the samples were being processed and the net system being reset for another tow, 30-liter bottle casts to collect water for tintinnid analyses took place. This was followed by a pair of vertical Reeve net tows.

The second 1-m MOCNESS at station #2 started about 0730 on April 16th and was successfully completed by 1000. Again there was a flurry of activity as the samples came off the deck and went into the cold room. Those processing the samples were working quickly because the nets came on board just as the group was finishing up the preservation of the previous tow's samples.

Although a blue-water dive was planned for the late morning, wind (around 20 kts out of the west southwest) and sea conditions were still marginal, in spite of the fact that it was warm and sunny, and the dive was delayed until early afternoon. Then with conditions a bit worse, it was cancelled.

In the early afternoon, Erich Horgan and others on the afternoon watch worked on setting up the 10-m MOCNESS. A bracket with a new tab, made by the ship's engineers, was mounted on net bar 3 and then a cable with the swaged fitting was fixed through the tab. The nets were loaded and laid out ready to be deployed. During this tow, a series of test stops and haul backs were planned to make sure the winch could retrieved the wire and to allow the ship's engineers to make adjustments to improve the winch performance.

In spite of the preparation, the launch and towing of the MOC-10 proved to be an ordeal. The launch was for 1445. The first snag was with the cable termination rigging. When the cable was hauled up tight in the over-boarding sheave, it was clear that the electrical cable was twisted in a way that had to be fixed. So the termination rigging had to be taken apart and reconfigured so that the electrical wire was out of harm's way. Then the cod-end buckets and nets, which had been laid out so that the cod-ends could be easily deployed, were lowered into the sea. In the process, a long rent was discovered in the net with 3mm mesh that was deployed open (net zero) for the trip to depth. The launch was stopped while the net was sewn up. Starting the launch again, the tie-down straps were released, the tugger lines were slacked and unhooked, and then the winch wire was hauled in to raise the frame off the deck. Immediately it was noticed that the bar for net 1 had released from the toggle release. The launch was stopped again, the air-tugger lines hooked back onto the frame and the frame brought back down onto the stanchion. Then some agonizing time was spent trying to get the net bars up to the top of the frame so that the swaged fitting from net 1 could be inserted into the toggle and latched. This was made exceedingly difficult because the nets were streaming behind the ship and their drag was very hard to counter. Finally the fitting was secured. The tugger lines were again released and the frame was lifted up and rolled down into the water, and the tow began.

During the down-leg of this tow, the wire went out at a steady 30 m per minute until reaching 4500 meters of wire out (MWO). Then the Chief Engineer had the winch stop and haul in about 250 m to test the winch's haul-in capability and to make some adjustments. After that it went down again. But the ship was having trouble with the wire tending to starboard of the stern because it was no longer towing into the wind. In order to get the ship pointed into the wind, the bridge decided to make a slow turn to port until the ship was again steaming into the wind. That maneuver was started when the wire was out at 5000 MWO. The change in the course had a negative consequence. Towards the end of the turn, which started at 1906 and ended at 2005, the net began rapidly descending vertically, reaching speeds of 60 to 88 m/minute. Essentially the net was in free-fall. An increase in ship speed was requested, but the time lag for an effect was long

(on the order of minutes to ten minutes or more). Later when the net system was brought on board, a kink was found in the wire about 5 meters above the cable termination. The kink may have occurred when the free-fall period stopped and tension was restored on the wire. Once the ship was headed into the wind, the wire streamed straight out off the stern and the net frame stabilized. There was one more test of the wire at 5500 MWO, where the winch was stopped and the wire hauled in a few hundred meters at around 15 m/min. This worked OK. Then the wire was paid out to 6000 MWO (the limit for this tow) and the ship's speed was reduced to allow the net to fall to the desired maximum sampling depth. But this was done with limited success. The net reached a depth of 4315 m before it started to ride back up. And that is where net zero was closed and net 1 opened. Somewhat later the winch operator saw that the level-wind had malfunctioned and that there was a bad wrap on the winch. He had to stop and pay out wire to fix it. The bad wrap turned out to be around 600 MWO. The rest of the haul went fairly smoothly, although there were additional problems with the level wind.

17 April 2006: The trawl came back on board about 0400 on the 17th of April. Several of the samples from great depths appeared to be contaminated by animals living closer to the sea surface. This is a problem that often goes unnoticed when towing opening/closing nets systems shallower than 1000 m where life forms are abundant. But when sampling the bathypelagic realm where most species occur in very low abundance, even small amounts of contamination from the nets passing through the shallow waters and catching surface forms can be significant. Still the nets caught some important species of zooplankton and fish that had not been caught in previous tows. In addition, a bathypelagic fish was caught that is possibly a new species (see Pelagic Fish report below)

After the trawl was brought on board, two Reeve net and two surface ring net tows were conducted. Although a second trawl was scheduled for Station #2, it was cancelled because of the number of repairs needed to be made to the trawl and trawl wire, and also because the winds and seas were building. Winds in excess of 30 kts were forecast for the area later in the day. Around 0700 on 17 April, the ship started steaming for station #3 approximately 600 nm to the southeast [25°N; 65°W].

While the over-the-side work at Station #2 was trying, the sample collection has provided the biologists with more material from which to work and a number of species were added to the list of those already identified.

After the sampling at station #2 had been completed in the early hours of 17 April, around 0700 the Ron Brown started for station #3 some 600 nm and approximately two days steam to the southeast. It was a time to catch up on the work-up of the samples, review the performance of the sampling gear, and to repair and enhance the 10- m MOCNESS, which had suffered some damage to the nets and towing wire on the last tow.

The weather during the first day of the transit was warm (air and water temperatures about 23 C) and the winds were around 20 kts. In late afternoon, the winds had dropped to around 13 kts and the skies remained nearly cloud free.

In an examination of the second deep 10-m MOCNESS tow, the contamination issue loomed large. For reasons that are not clear, the opening/closing of the nets on this tow did not show any significant angle change, as is usual when one net is closed and the next one opened. A plot of the angle versus time data for both tow #1 and #2, clearly showed the angle change spike associated with the closure of net 1 and opening of net 2, the closure of net two (which also resulted in the closure of net 3 and opening of net 4 [because of the broken tab]) and the closure of net 4. No such spikes were associated with the commands to step the toggle on tow 2. In discussions with Martin Angel, Francesc Pagès, Tracey Sutton, and Dhugal Lindsay, all taxonomic experts on variety of zooplankton and fish groups, only net 1 on tow #2 seemed to be a true bathypelagic catch, albeit with lots of nearer surface species also present in the sample. The other nets had poor catches and few deep-sea animals. In working up the catch from net 2, Martin made the assessment that most of it was from contamination.

In looking carefully at the bars when the system was cocked and the cables were tight, there was a gap between them about 2 to 3 cm tall by 300 cm wide. Although seemingly small, when the area was computed and then multiplied by the length of a tow, a considerable volume of water could have passed through the gap and into the net, even when closed. For tow #2, the ship traveled nearly 33 nm (~61,000 m) and gap volume could have been around 4800 m^3. This is huge and could very easily explain the contamination problem. Discussion about how to reduce or eliminate the gap contamination problem took place during the day and a plan was devised to construct some net bar flaps that would hang from each net bar and cover the gap between it and the bar below. After dinner on the 17th, concerted effort began to perfect the design and then construct the flaps out of a plasticized cloth material that the Bosun provided. Eight panels were needed 147 cm long and 42 cm wide, with two panels per net bar, one on either side of the middle support for the net retaining rods. The first panel was installed and then some additional discussion took place among those concerned with the contamination about the design and possible problems. All thought the flaps would work while the bars were at the top of the frame, but they were skeptical that the flaps would stay outboard of the bars after they were released. In fact they thought they would be folded inside the net and not close the gap. So an idea to put stays made out of the stiff tie-wraps was put forth to keep the flap fairly stiff and even if they folded in, the material would likely still block the opening enough to reduce the contamination. The rest of the evening was spent making up the flaps with tie-wrap stays.

18 April 2006: During the night, the wind picked up and on the morning of the 18th velocities between 19 to 26 kts were recorded. A front went through the area around 0800 and there was a wind shift from 240° to about 210°. A rain squall line passed through, although there was no

rain on the ship. The wind shift put the wind and seas coming in on the starboard side of the vessel, causing the ship motion to increase significantly. This made it difficult for investigators to work on the samples using the microscopes and the lab was a bit empty during the morning.

During the morning Larry Madin, Leo Bercial, and Peter Wiebe installed the net bar flaps that were intended to close the gaps between the net bars and thereby reduce contamination when the nets were closed.

There was some excitement around 1030 on the 18th when the bridge sighted a small (~15 feet) overturned boat, a RHIB, drifting out in the middle of nowhere (at 26° 53.37'N; 64° 21.73'W). The ship slowed and maneuvered to bring the hull close enough for inspection. As it passed along the starboard side, some large fish were sighted swimming around it. Shortly after, we again picked up speed and headed for Station #3.

In the afternoon, the wind picked up substantially with sustained speeds between 25 and 31 kts from the southwest. With the sea abeam, the water was coming up onto the starboard deck and flooding out into the aft deck area, making working conditions on the deck more difficult.

The issue of the kink in the 0.68" trawl wire was resolved just after lunch as a result of consultations with Jeff Hill (ET), Jonathan Shannahoff (ST), and Bruce Cowden, the Bosun. All indicated that the cable should be re-terminated. Shortly after, the termination was unbolted from the trawl and carried into the staging bay where the wire was cut and the process of removing the stainless steel fitting from the wire and then re-installing it on the new end of the cable was begun. Erich Horgan did most of the work, which was completed around 2200.

During steams between stations, a seminar series of talks had been planned and the first of the series started at 1300 on the 18th. The first two lectures were by Martin Angel and Leo Bercial. Martin talked about Ostracods and the web site he has constructed to provide students and experts easy access to the literature, keys, illustrations, data about the distribution, abundance and size of some of the 200+ known species of planktonic ostracods in the world's oceans. Leo talked about the copepod genus, *Clausocalanus*, that he has been working on. He is developing a genetic method to distinguish easily between species of this genus, a number of which are exceedingly hard to distinguish morphologically.

The second of the safety drills occurred around 1500 and consisted of a ship collision drill and an abandon ship drill. For the latter, people mustered in their alternate sites inside the ship in order to have dry space to put on their survival suits.

Following the drill, the lecture series continued with Nancy Copley describing the Silhouette technique for measuring the abundance, biomass, and size distribution of zooplankton in a sample by taxa.

After dinner there was an intense period of activity to finish setting up the 10-m MOCNESS. A last addition to the frame was a pair of canvas deflector flaps that Larry Madin and Erich Horgan had made a couple of days ago. Holes were drilled in the side I-beam to attach the flaps to the frame. A check of net 1 revealed more extensive damage to the net than had been suspected and this net was replaced by the spare. The nets were then loaded, the cod-ends attached, and nets arranged for launching with all the cod-ends at the bottom of the frame. With all the nets inside the frame, the side deflector flaps were bolted onto the frame with 3/8" cap screws. Finally, grommets were installed in the corners of the deflector flaps and then bungee cord tied to the grommet on one end and a clip on the other. The top and bottom of the flap were attached to the frame with the clips so that the flap would tow streaming around the outside of the frame, thus covering the open portion of the closed nets.

While this was going on, Erich Horgan was finishing the new termination. About 2200 on the 18th, the cable was attached to the underwater unit on the trawl and tested it with the MOCNESS software. It was able to run with no problem.

The evening came to an end with the winds having died down some to between 15 and 20 kts from the southwest. Sea and air temperature remained the same at 23° C.

19 April 2006: The morning of 19 April started pleasantly with a mix of sun and clouds, an air temperature of 23.5° C, a sea-surface temperature slightly warmer at 24.2° C, and winds between 10 and 12 kts from the southwest.

The Ron Brown arrived at Station #3 about 0630 and work began with a 200 m vertical Reeve net tow to collect fragile near-surface zooplankton and provide investigators with new animals with which to work. Shortly after, a pull test to around 5000 lbs was done to ensure that the new cable termination on the conducting trawl wire was secure. During this operation, a discussion ensued about the first deep tow. It was to have been a 10-m MOCNESS tow to 5000 m, but there was a desire to have a shorter tow in the upper 1000 m, so that the taxonomic specialists could start their work at this station sooner. So the order of the two tows was reversed without remembering that the way the trawl wire was laid on the drum would dictate a much deeper tow at the start of the station.

The setup of the MOC-1 for launch took about 45 minutes and the net system went into the water about 0900. As the net reached the intended maximum depth and retrieval started, a bad wrap on the winch was reported and wire had to be paid out to fix it. In fact, there were bad wraps on a

number of the lays and it took paying out almost 5000 m of wire to get to the place where the wire was correctly laid down on the drum. A broken strand in the outer armor was also found at about the place where the wire started developing bad wraps and the loose strand had to be cut and the ends taped securely to prevent more unraveling of the strand. How the strand broke is not known, but it is suspected that it occurred because of wire, under tension, was snapping into gaps left by the level-wind failing to lay the cable evenly on the drum. Because this tow turned into a very deep one, it was decided to do 500 m intervals from 3500 m to the surface with the nets. After adjustments were made to the level-wind, the bosun reported that the level-wind was now working very well and it has done so since. So rather than coming back on board around noon, the tow was now slated to arrive at the surface around sundown.

This was an ill-fated tow, however, for another reason. When the net system arrived at the surface, only a single net bar should have been left to drop. But in fact all were still locked in the release mechanism, except for bar #1, which dropped because the cable/swaged fitting broke about 200 m below the surface (depth determined by a spurious net response at 200 m). So net zero fished down to 3300 m and back to 200 meters and then net 1 fished from 200 m to the surface. The failure of nets to release was because the cables were wrongly mounted into the toggle, so the release commands failed to release the nets. What a learning experience! The problem was magnified by the fact that nearly 5000 m of cable had to be paid out to get the wire on the drum straight. If it had been a normal tow, the problem would have been discovered a lot earlier.

In the late afternoon while the MOC-1 was still coming up, the fire alarm went off and it was not a drill. Ultimately it proved to be a false alarm in a forward area over a tank, but the response was impressive, and all scientists arrived in the main lab muster area in a timely way. An “all clear” was sounded after it was determined that no fire was present.

The early evening was spent doing near-surface (0-200m) ring net tows and 30-liter water collection for microzooplankton. Colomban de Vargas was amazed to find very few planktonic foraminifera in the net tow samples, a situation he has rarely encountered. Other larger species of interest were caught in these tows including the euphausiid, *Sylocheiron suhmii*, a lovely small transparent shrimp-like animal with elongated eyes with only 3 facets and distinct photophores designed for counter-shading. Once identified, it, along with others, was prepared for gene sequencing.

A night SCUBA dive took place later in the evening (Figure 2) and although the divers reported relatively low abundances of animals, they nonetheless came on board with a good collection of live radiolarians, siphonophores (one with a leptocephalus [eel] larvae being consumed by the gastrozoids), a pyrosome, jellyfish and associated amphipods, and other fragile species that are destroyed in the nets.

Figure 2. Larry Madin, Erich Horgan, Phil Pokorsky, and Keegan Plaskon ready to begin a night-time blue-water dive [Photo by P.Wiebe].

20 April 2006:
The first official deep tow of station #3 started around midnight on the 19th with the deployment of the 10-m MOCNESS under good sea conditions (winds in 10 to 12 kt range). The launch was a bit difficult at the start, but ultimately the frame rolled down into the water fairly smoothly and soon the net was headed down to depth. During the night there was a wind shift and light winds around 5 to 8 kts began from the north (0°). In the early morning it was cloudy with rain squalls in the area and cooler temperatures (20.73° C). It was raining lightly when the MOC-10 tow #3 came on board very nicely around 0930 on 20 April. This tow was also discovered to have problems. In pulling in the nets, it was found that the cod-end from net three had been lost in spite of the fact that the fasteners had been rubber-banded, which has been the standard way to prevent bucket loss. In addition, the tab on net bar #3 that had been fabricated by the engineers again broke, so that the net bar for net 3 dropped when net 2 was closed and it never fished. This opened net four prematurely. Later in the day, the broken tab fixture was repaired by the engineers, who made it more robust. The catch in the rest of the cod-ends, while sparse, proved to have another set of very interesting deeps sea invertebrates and vertebrates. One interesting species was a mysid in the Gnathophausia group. There are several well-known species, but this

did not appear to be any of them. In addition, there appeared to be no contamination by animals living shallower in the water column or very little. The modifications made to the system appeared to have worked.

The 1-m MOCNESS was next up. It went into the water about 1130, but at 70 m depth, the deck unit lost connection with the underwater unit and nothing would bring it back. So the system was brought back on board. After a series of tests that determined that the cable was OK, the underwater unit was switched with the one on the MOC-10. The tow was started again about an hour later. This time the underwater unit worked fine and a complete set of samples was obtained in the upper 1000 m. The net came on deck about 1600. Such were the gremlins out there, that when the unit that failed was bench-tested, it worked.

Larry Madin, Erich Horgan, and the two crew divers left the ship about 1630 for the next in a series of blue-water dives, as the afternoon watch processed the MOC-1 samples. While the divers were away from the ship in the zodiac, some surface ring net tows were taken by hand. All went well with the dive and the divers returned with more wonderful animals around 1730.

The last events at station #3 were night 1-m and 10-m MOCNESS tows to 1000 m and 5000 m respectively, and a ring-net tow to 200 m. All of these tows were accomplished successfully. The 1–m system was towed early in the evening followed by the ring net tow. The 10-m system, which was deployed at midnight, came up at 1130 on the 21st. This time all the nets fished their intended depths (5000 to 4000, 4000 to 3000, 3000 to 2000, and 2000 to 1000 meters) and the samples showed little or no contamination. This was a perfect ending to a station that started off poorly.

The Ron Brown got underway for station #4 just after noon on the 21st of April in light winds, calm seas, warm air temperatures, and clear skies. Because diving conditions were extremely good and the animal collections were going very well with this technique, a blue-water dive was scheduled for 1330. The divers returned about 1500 and reported that while animals were sparse, they again collected some interesting radiolarians and siphonophores. The remainder of 21 April was spent steaming under very nice sea conditions. The work on board in the laboratories continued unabated.

22 April 2006: The steam to Station #4 (20° N; 55°W) took about 32 hours under mostly clear skies with only a few clouds. In the early morning of 22 April, winds 10 to 15 kts were from the northeast, the sea surface temperature (SST) was 25.56° C, and the air temperature was slightly cooler (24.1° C).

Throughout the day, the investigators worked in the main lab identifying zooplankton and in the sequencing lab they continued to prepare and sequence identified species. During the afternoon

of the 23th, the second session in the seminar series was held with Larry Madin, Hege Hansen, and Tracey Sutton giving the talks. Larry talked about the Liquid Jungle Laboratory, which is a new tropical laboratory for marine and terrestrial research on the Pacific side of Panama. There is a shore-side wet lab in addition to lab space in the main building up on an island hillside, small boats for access to the coastal waters, and a newly installed cabled underwater observatory just offshore. Hege talked about the deep-sea shrimps that were collected on the Mar-Eco cruise to the mid-Atlantic ridge on the R/V GeoSars in summer 2004. She compared the species caught on that cruise with those collected on this one. So far she has found only one species additional to those collected on the ridge cruise and only a single northern species is currently lacking from our current collections. Tracey gave an overview of the groups of deep-sea fish that exist and talked about those that he was finding in our samples. He has found several rare species and one or two that are probably novel. The talks were split into two sessions because the ship's personnel had a safety meeting at 1415 that went until about 1515.

After dinner, the 10-m MOCNESS was made ready for the next watch to launch and tow. The cod-end buckets were attached to the nets and the nets arranged so that they could be deployed off the stern easily. In addition, some repairs to the newly fashioned trawl deflector flaps were made.

23 April 2006: We arrived at Station #4 about 0035 on 23 April and started the work with a vertical Reeve net tow to 200 m. This was followed by a 10-m MOCNESS tow. The bottom of the tow was at 4500 m instead of 5000 m because of the very rough topography in the area. The SeaBeam bathymetry data showed that there were substantial ridges and valleys in the area and our tow line cut across them. The broken strand of 0.68" conducting cable at about 4700 m that was taped after the last tow, came loose after the tape had worn off going through the traction winch and had to be re-taped when it came past that spot going out and coming back in, but this did not interfere with the haul. The system came up and on board at 1245. As the nets were being hauled in, the catch in the buckets were initially examined. There was a spontaneous "OOOOH!!" as a large dragonfish was found in the bucket of net 4 (2000-1000 m). After examining it carefully in the laboratory Tracey Sutton concluded it was probably a new species, and might even represent a new genus. The catch also contained some lovely large red prawns. Not only was this an excitingly spectacular haul, but also once again the nets had fished properly.

A daylight blue-water dive took place in the early afternoon under light winds (~8 kts) from the northeast and sunny skies. The divers returned with only a few animals. The dominant organisms were phytoplankton, the nitrogen fixer *Trichodesmium* and mats of *Rhizoselenia*. The zooplankton were sparse.

While the divers were out, the 1-m MOCNESS was set up for a tow. The cable termination was changed from the MOC-10 to the MOC-1 and then the underwater unit moved to the MOC-1.

About 1520, after a deck check to make sure the electronics and sensors were operational, the net entered the water and the tow began. This tow went fine, except that a collar came off of net 3 and the catch was lost along with the bucket.

Russ Hopcroft and Barbara Costas did a series of net tows and water collection casts, while the 1-m MOCNESS was prepared for a second evening tow. The net system went in smoothly from its position within the back of the MOC-10 frame. The tow, which came on board around 0130 on the 24th, concluded successfully with more interesting animals in the catch. These included a small tropical squid in the surface sample that Dhugal Lindsay knew existed, but had not seen before.

24 April 2006: In the wee hours of 24 April, the divers went out in the RHIB for a night dive in waters that were now around 26.5° C. Again the take was sparse, reflecting the oligotrophic nature of the station area, but they did collect two very interesting delicate ctenophores, *Beroe mitrata*, and *Thalassocalyce inconstans*. Larry Madin and Richard Harbison discovered and named the latter species some time ago. The genus means "cup of the sea" after its shape and *inconstans* because it is in constant motion. Both individuals were still alive in the evening of the 24th and were the subject of observation and photography, prior to being submitted for sequencing.

A 1/4-m MOCNESS tow was scheduled as the last item to be done at Station #4, but the underwater unit again proved to be unreliable on the deck and so the tow was scrubbed. The ship got underway for the last station (#5) about 0400.

Steaming during the day again gave the investigators an opportunity to catch up on the laboratory investigations of the samples collected at the previous station. There was also a concerted effort to update the CMarZ web site and to add additional photos of people and gear at work on the cruise. It was pleasant steaming weather with sunny skies sprinkled with puffy clouds, winds from the east (90°) at about 15 kts giving rise to some white caps and choppy seas on top of an underlying swell. Both the sea and air temperature was around 26° C.

At 1400 on the 24th, a subset of the scientific party (Martin Angel, Larry Madin, Rob Jennings, Russ Hopcroft, Tracey Sutton, and Peter Wiebe) met in the Chief Scientist's cabin to take part in a press conference call organized by Fred Gorell of NOAA. In preparation for the call, two photos were put on the web of two of the first zooplankton (the copepod, *Paraeucalanus attenuatus* and the pteropod, *Clio pyramidata*) collected on the cruise that were in the first group sequenced at sea. In addition, a photo of Paola Batta Lona "operating" the sequencer was also posted on the web. Reporters on the call included Christina Reed, a freelance science writer, Peter Spotts of the Christian Science Monitor, Warren Wise of the Charleston (SC) Post & Courier, and Noel Anenberg, who writes a children's / educational series for LA Times. In

addition, there were several others taking part in the conference call including Ann Bucklin, the CMarZ lead investigator and a co-PI on this OE project, responsible for the shipboard sequencing activities. The conference call lasted about 75 minutes and covered the overall rationale for CMarZ and the cruise objectives. Questions from the reporters then framed the remarks made by our group of scientists about what we had already learned and how the sequencing information would ultimately be used. The session was tape-recorded by NOAA.gov and would be used for production of a story to be podcast. Coincident with the press conference was the third and last Fire and Emergency Drill, from which the participants were excused.

A schedule of MOCNESS tows, blue-water dives, and other net tows and water collections was prepared in the late afternoon for the first day and a half at Station #5. The early evening was spent setting up the 1-m MOCNESS for a tow after the ship arrived on station the next morning.

Then late in the evening around 2300, the third in the seminar series took place. This late hour was chosen because this was when most of the scientists from both watches, *i.e.* the midnight to noon and noon to midnight, were awake. With the last station quickly approaching and the end of the cruise in sight, there was an increased impetus to make the most of the time remaining. Barbara Costas provided an introduction to the ciliates and in particular the groups that include tintinnids, oligotrichs, and other choreotrichs. She described her work on tintinnids (small ciliate microzooplankton) and the difficulties involved in using the classical methods to preserve and identify them . She has been developing molecular methods to determine species identities, and has found that a number of forms previously described as distinct species appear to have very similar genetics and may not be separate species. A library of ciliate genetics is being built and is at the point in some areas where bulk DNA analysis can be used to track the presence and perhaps the abundance of the different species. Rob Jennings described the steps carried out by Team DNA in the processing of the animals in the sequencing lab. This involved extracting the DNA, amplifying it, running the sequencing reactions, and then running the product on the sequencer. He described how to resolve the data from noise in the reaction by sequencing a forward strand and a reverse strand. Once the sequence has been finalized, the next step was to compare it to known sequences in the bank of sequences to see if the sequence matches one for a known species. Since the cruise began, about 500 species have been submitted to the lab for sequencing and there have been 775 specimen extractions. [Note: These numbers have gone up since station #5 was not included in the estimates]. Russ Hopcroft gave a tutorial on larvacean diversity and ecology. Like the tintinnids, the larvaceans are extremely fragile animals and are difficult to collect intact. They make an elaborate external feeding structure that they use and then discard when it gets clogged up. This may happen as often as 14 times per day. Russ described the house structure, which is unique to each species and therefore can be used to identify the species. There are 3 families, 15 genera, and 69 known species. On this cruise, he has collected fewer larvaceans than expected.

25 April 2006: The Ron Brown arrived at Station #5 around 0830 on 25 April with the decks wet from some early morning rain showers. Unlike the previous few days, the skies were cloud covered. Still the winds were light (5 to 8 kts from the east southeast) and the air warm (25.9° C) and humid. The sea surface temperature was the warmest experienced on this cruise (27.147° C).

Almost immediately there was a net in the water. Russ Hopcroft deployed his Reeve net for a tow to collect larvaceans. In this tow were several larger species of larvaceans that he was expecting to encounter, but had not done so until now. The 1-m MOCNESS went in about 0915.

In the area of station 5, there are physical structures in the water column between 200 and 500 m known as "thermohaline staircases". When a plot of temperature or salinity versus depth is made, distinct steps in the profile are visible wherein there are zones of ten meters or more of isothermal and isohaline water and then narrow transition zones where both temperature and salinity change abruptly until there is another step. The zones of constant temperature and salinity are active mixing zones as demonstrated by work that Ray Schmitt and colleagues had done in this area some years ago. The staircase structure might also be an area of unique biology, but this has not been previously studied. Knowing that there was the possibility that the staircase structure might be present, we looked carefully at the data from the first tow as it was in progress. The tow went smoothly and during the downcast a plot of the temperature and salinity structure showed that indeed there was a staircase structure in the same depth zone that Schmitt had observed in 1985.

At the end of the tow, while the net was approaching 25 m depth, the winch overheated and shut down. It took a relatively short time for the engineers to investigate the problem and to start the winch operating again. The last net then sampled the upper 25 meters and the net came on board about 1238.

The divers went in around 1300 with winds in the 12 to 15 kts range. They came back with a real beauty of a collection of jellyfish, siphonophores, and salps. This station was very different from the previous two because of the rich surface life they encountered.

In the late afternoon, ring net towing primarily for larvaceans and foraminifera, and water collection for microzooplankton (tintinnids) were carried out. At dusk, the second 1-m MOCNESS was started. This tow was very successful. All the nets opened and closed where intended and the catches were quite good. There were no problems with the winch this time. Once the 1-m net was secured, the cable termination and underwater unit from the 1-m system were moved to the MOC-10, the buckets installed, and the nets arranged for deployment. This took about an hour. By 2200 the MOC-10 was heading down to depth.

26 April 2006: Some twelve hours later at 1000 on 26 April, the trawl re-appeared at the surface. It had caught a wonderful assortment of animals, especially fish. Tracey Sutton was particularly pleased. Martin Angel was busy trying to increase his inventory of ostracod species and exceed his previous inventory compiled for the Eastern Atlantic. Already at the start of this station he had identified nearly a third of the known species of planktonic ostracods. Net one, the first to be fished as the system returned from 5000 m to the surface, was ripped up a bit on the starboard side and a support rope was ripped off the seam to which it had been attached. It is a mystery how this happened.

Shortly after, the 1/4- m MOCNESS was returned to service by using an old 16-bit electronics unit that was brought on the cruise in case other units failed to operate properly. This tow to 500 m went OK, except that the flowmeter stopped working during the net system's return to the surface. Water filtered for some nets will thus have to be calculated by time the net was open and distance traveled These samples caught with very fine mesh nets (64 um) were primarily used by those investigators interested in microzooplankton.

The second 10-m MOCNESS tow of station #5 started in the early afternoon under fair skies with winds a steady 12 to 15 kts from the east northeast (82°) and tropical air (26.22° C) and water (27.19° C) temperatures. Around 1900, the MOC-10 reached within 200 m of the bottom (~5200 m) with more than 7000 meters of wire out. The rest of the evening was spent flying the MOC-10 up from 5000 m. The tow took longer than expected. The net came up too fast on its own accord to haul wire in quickly, so a good portion of the tow was spent coming in at 10 or 15 m/min.. The first net fished from 5000 to 4000 m. On this last MOC-10 tow, it was decided to use the last net to fish the upper 1000 m and use the other three to cover the 5000 to 1000 m range. The group was really interested to see what large-ish animals might be captured in the near-surface zone with the big fine-meshed nets.

27 April 2006: At midnight on the 26th, when the science watch changed, Larry Madin came in to take over the "flying" of the MOC-10. There was some discussion about whether the nets had opened and closed where intended because no significant angle change had been observed when the net system was sent the command to close one net and open the next. When the net system finally came on board about 0330 on the 27th, the concern disappeared. All evidence suggested that the nets opened and closed where intended and the catches were pretty spectacular. Contamination was minimal. Francesc Pagès was excited because previously he had been catching a particular transparent jellyfish about 5 cm in diameter in the 1-m MOCNESS collections that had very few distinguishing characteristics and was an undescribed species as far as he could tell. In the 1000 to 0 net, a much larger individual was caught and it had characteristics that he could now use to make a description. Also Dhugal Lindsay was happy with the squid collection. Several species that had not been caught earlier were in the sample including a *Vampyroteuthys*. Martin Angel also found specimens of a species that he had been

looking for. In addition, Russ Hopcroft gave Martin another ostracod not yet seen on the cruise from a Reeve net collection made soon after the trawl was on board (from 0415 to 0445). So the last station was ending with a flourish.

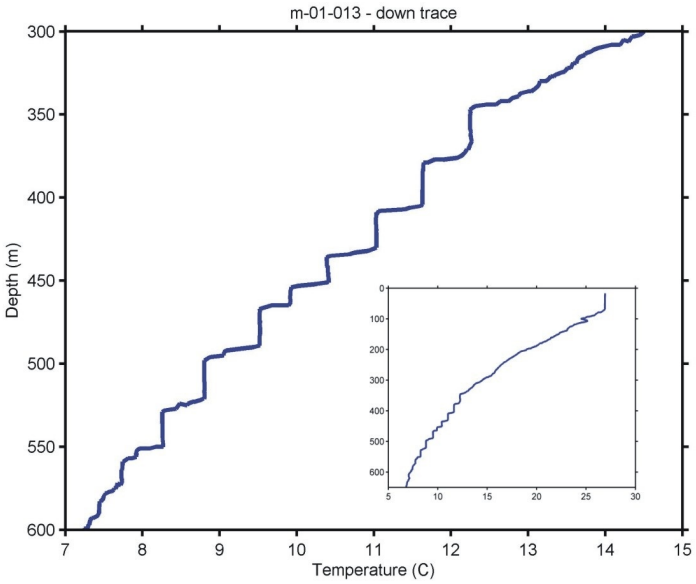


Figure 3. The temperature profile from the last 1-m MOCNESS tow of the CMarZ cruise showing the staircase structure.

The 1/4-m MOCNESS tow began around 0600, under cloudy conditions and winds 13 to 18 kts from the east. A few rain squalls moved through the area. This tow was used to sample a special series of depths for Colomban de Vargas and Yurika Ujiie to look at how the vertical salinity and temperature structure in the upper 300 m might be affecting the foraminifera. This targeted depth sampling was based on the information from the down trace and from earlier tows. The 1/4-m tow came back on board about 0900 with samples that were a bit disappointing to Colomban because the catches were fairly sparse and there were few foraminifera.

The last tow of the cruise was made with the 1-m system. It was targeted at the staircase structure mentioned above, which showed prominently on every tow at this station that went below 300 m (Figure 3). Nets were opened and closed so that one fished in an isothermal/isohaline (mixed) zone and then the next in the interface between it and the mixed zone just above. We successfully fished 4 mixed zones and 4 transition regions starting about 550 m below the surface and ending about 400 m.

Over the last three days, Team DNA received more identified specimens for sequencing and also a few more unidentified forms that might be undescribed. The total number of identified specimens in the bank topped 1000. More than 400 sequences had been run and it was anticipated that there would be more than 100 good species sequences by the end of the cruise. Many of the other sequences may turn out to be usable or may need more work to make them good. The nature of the sequence would determine what additional steps might need to be taken, like running an additional PCR under different conditions to optimize the sequence reaction. There is more work to sequencing than simply extracting the DNA, amplifying it, and then running it through the sequencer to get the sequence. Having to repeat steps with different conditions is typical.

With the last over-the-side sampling completed around 1500 on the 27th of April, the R/V Ron Brown set sail for San Juan, Puerto Rico.

28/29 April 2006: During the two day trip to San Juan, the activity of the science party focused on packing up all the gear and getting it ready for off-loading and shipping on the day the ship reached port. In addition, the investigators wrote up sections of the cruise report.

At 1030 on the 28th, there was a conference call with CoML media relations lead, Terry Collins. Included in the call were Martin Angel, Larry Madin, Rob Jennings, Tracey Sutton, Russ Hopcroft, and Peter Wiebe. Also Ann Bucklin and Fred Gorell were present from a distance. Discussion centered on what was going to be the focus of the CoML press release about the cruise and its findings.

During the morning of the 29th (around 0900), there was a final 45 minute blue-water dive involving all of the authorized divers on board to inspect the hull of the Ron Brown. Later in the evening after we arrived back in the US EEZ a net tow was taken to obtain live zooplankton for video imaging by Russ Hopcroft to be used as part of the press material package on the CoML web site.

The 20' shipping container van on the ship was loaded by mid-afternoon on the 29th of April and the remaining gear was assembled in totes and boxes for off-loading and packing in a second van that was to be on the Coast Guard dock in San Juan.

30 April 2006: The R/V Ron Brown entered San Juan, Puerto Rico harbor about 0800 on 30 April. With the tying of the lines on the Coast Guard dock in the Old Town area of San Juan, this CMarZ cruise came to an end. Off-loading of the science gear began shortly after the ship was tied up. By noon, the second van was loaded and ready for shipment back to Woods Hole, Ma.

Summary

This CMarZ cruise was a remarkable expedition that brought together classical taxonomists and gene sequencing experts to collaborate at sea and produce impressive results in just three weeks. Zooplankton and fish samples were obtained from 5000 m to the surface at five stations distributed from 33.5 N to 14 N in the western North Atlantic Ocean. From these samples, the investigators identified between 500 and a 1000 species, and they provided more than a 1000 specimens to the DNA lab on board the ship for sequencing. For several taxonomic groups, a significant fraction of the known species were collected and identified. For example, 65 species of ostracod were identified by Martin Angel, representing nearly half of all 140 known ostracod species in the North Atlantic Ocean. Six of the ostracod species are not yet described in scientific literature. Nearly all of them were submitted for sequencing and the first DNA barcode for a

planktonic ostracod was obtained on this cruise. More than 40 species of molluscs (pteropods, heteropods, etc.) were identified and more than 100 species of jellyfish, several of which may be undescribed. Several hundred species of copepods were identified and more than 100 species of fish, many rarely caught, and two of which may be undescribed. In addition, several groups brought photographic equipment on the cruise that enabled hundreds of high resolution digital photographs to be made of many of the zooplankton species identified and submitted for sequencing. Russ Hopcroft in particular made many photos that were put up on the web site during the cruise.

Having a gene sequencer and associated DNA laboratory equipment and personnel on board made it possible for a level of interaction between taxonomic specialists and molecular biologists that is seldom achieved in any other setting. The high productivity in terms of the identification and sequencing of known and unidentified specimens was the result of the very positive interactions that occurred while at sea. In spite of the difficulties encountered in MOCNESS sampling, the goals of the cruise were met and overall results were successful.

MOCNESS and OTHER SAMPLING, and SAMPLE PROTOCOLS

1.0 Zooplankton Collections

Zooplankton and micronekton were quantitatively sampled throughout the water column using a 1/4-m, a 1-m, and a 10-m MOCNESS (Multiple Opening/Closing Net and Environmental Sensing System; Wiebe *et al.*, 1985; Figure 4). The MOCNESS telemetered data continuously to the ship, including depth, temperature, salinity, horizontal speed, and volume filtered. This allowed on-the-fly adjustment of sampling depths or times, and completion of a continuous series of stratified hauls in a relatively short time. All data were recorded electronically for subsequent analysis.

The MOC-10 carried 5 separate nets; the mesh size of the nets was a combination of 3 mm and 335 µm mesh. Net 0 had 3 mm mesh and nets 1 to 4 had 335 µm mesh nets of special design that were fabricated for this cruise. In addition, during the cruise, deflector side flaps and net bar flaps were constructed to prevent contamination of the deep samples from plankton in other strata, especially those closer to the surface (Figure 4). The MOC-10 was launched, towed, and recovered through a stern A-frame with the ship maintaining a speed of 1.5 to 2.5 kts. The trawl was deployed with the first net open (3mm mesh) down to the deepest depth desired, normally 5000 m. It was closed at that point, and subsequent nets (335 um) were opened at desired depths as the trawl was hauled obliquely toward the surface. Thus, one MOC-10 net sampled from the surface to the bottom and the other nets normally sampled ~1000 m intervals from the bottom up to a depth of 1000 m (Figure 5).

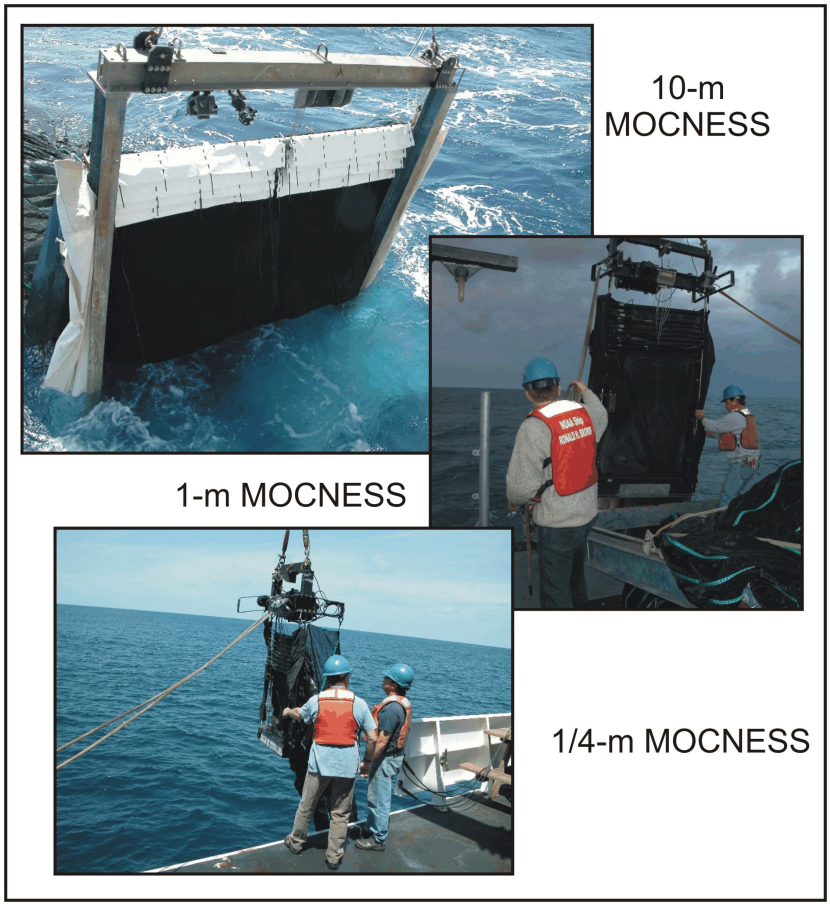


Figure 4. The three MOCNESS's used on the CMarZ RB06-03 cruise to the Northwestern Atlantic Ocean. Note the net bar and deflector flaps on the MOC-10 developed on the cruise to prevent contamination of the samples.

Above 1000 m, vertically-stratified sampling was done using a 1-m MOCNESS equipped with 9 nets with 335 µm mesh. In addition, a ¼-m MOCNESS with 0.64 µm mesh was used to collect foraminifera and other micro-zooplankton in the upper 500 m (Figure 5). The use of the large trawl below 1000 m enabled large volumes of water to be sampled (tens of thousands of cubic meters) to compensate for the very low abundance of species that occur at bathy- and abyssopelagic depths. The smaller 1-m and 1/4- m MOCNESS's provided adequate sample sizes in the upper 1000 m.

Several other nets were used for surface or near surface zooplankton collections. A Reeve Net consisting of a ½-m ring net attached to a large-volume cod-end was used to

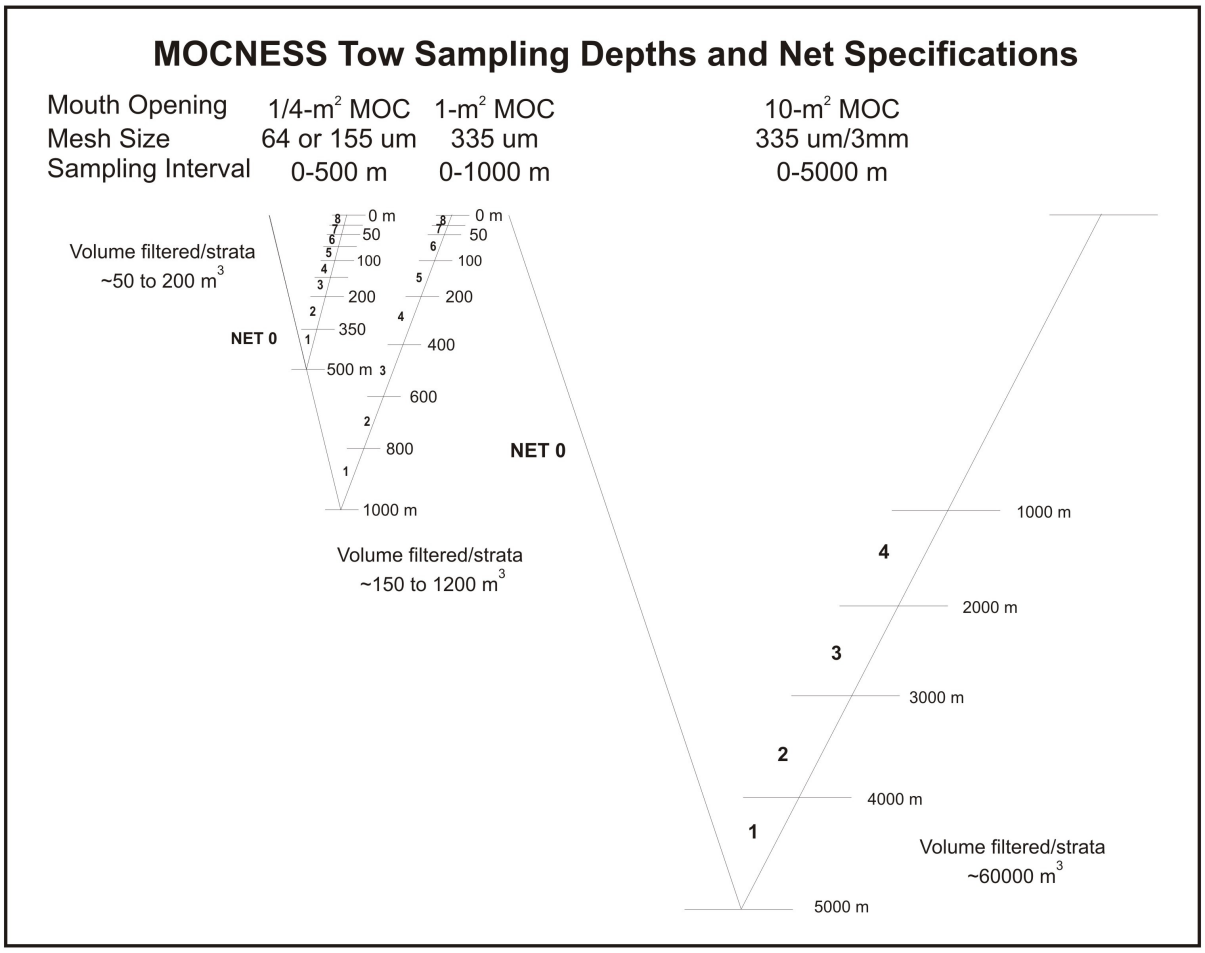


Figure 5. The general towing and sampling strategies used for the MOCNESS's.

collect fragile gelatinous animals and microzooplankton in the upper few hundred meters. These tows were made opportunistically. Other very fine mesh (5µ and 10µ) ring nets deployed by hand were used to collect microzooplankton during periods when the blue-water dives were taking place.

2.0 Blue-water SCUBA diving for gelatinous zooplankton.

Collection of living or intact specimens of gelatinous zooplankton is difficult with nets or trawls because the organisms are usually damaged and sometimes destroyed. During the last 30 years, the technique of blue-water diving to make observations and collections of these fragile animals by SCUBA has been developed and this technique was used on this cruise. A group of (usually) 4 divers worked from a small inflatable boat launched from the ship. They were connected by 10 m long tether lines to a central line hanging down from the inflatable and manned by a safety-diver

who watched over the others. Each diver moved about within a 10 m radius to locate, observe, and collect free-swimming gelatinous animals. The technique was only semi-quantitative, but allowed collection of live and undamaged specimens, as well as in-situ photos of behavior. Organisms were collected in simple wide-mouth jars and returned to the ship for further study. The same technique was used at night, with the addition of underwater flashlights or headlamps. During this cruise a day and a night dive was planned for each station.

3.0 Water Collection.

A thirty-liter Niskin bottle was used to collect water for tintinnid analysis and for use with other work with microplankton. The depths selected for sampling were generally based on the water column temperature and salinity structure.

4.0 Sampling on Station.

An idealized scheme for sampling at each station was approximated that enabled replicate tows with each MOCNESS to be made during an approximately 48 hr period (Figure 6). MOC-10 tows generally took 10 to 12 hours to complete, MOC-1 tows took about 3.5 hours, and MOC-1/4 tows took about 2 hours. In addition, a 2-hour time block was allocated for two blue-water dives. Not shown on this scheme was time for opportunistic sampling with ring nets or water collection with the Niskin bottle. In reality, neither replicate samples with all net systems nor blue-water dives were obtained at all the stations, because of time and weather limitations, and gear malfunctions.

5.0 Sample Processing Protocol.

Samples collected with the MOCNESS's were processed using a standard protocol (Figure 7).

On Deck: With completion of the tow, the nets were immediately washed with seawater as they were pulled on deck and the plankton still in the nets carefully moved into the cod-end. The cod-ends were placed in buckets with ice packs to cool the samples and moved expeditiously into the walk-in cold room to await analysis.

Ship-board laboratory processing:

Specimen removal: One by one the cod-ends were taken into the wet lab for digital photographing, and the picking and removal of large individuals of 1) gelatinous forms, 2) fish, and 3) macrozooplankton/nekton. Pickers described what was being removed and a recorder logged the information. The specimens removed were placed in numbered jars, shell vials, or dishes and the recorder wrote down all specimen information on the data sheets provided, linking the container number to specimen and collection data. This was done so that the actual taxonomic composition and species count for each sample can be reconstructed. The removed specimens were subject to a variety of procedures including further identification, dissection, preservation (in alcohol, frozen nitrogen, or formalin as appropriate), or taken for photographic imaging prior to preservation.

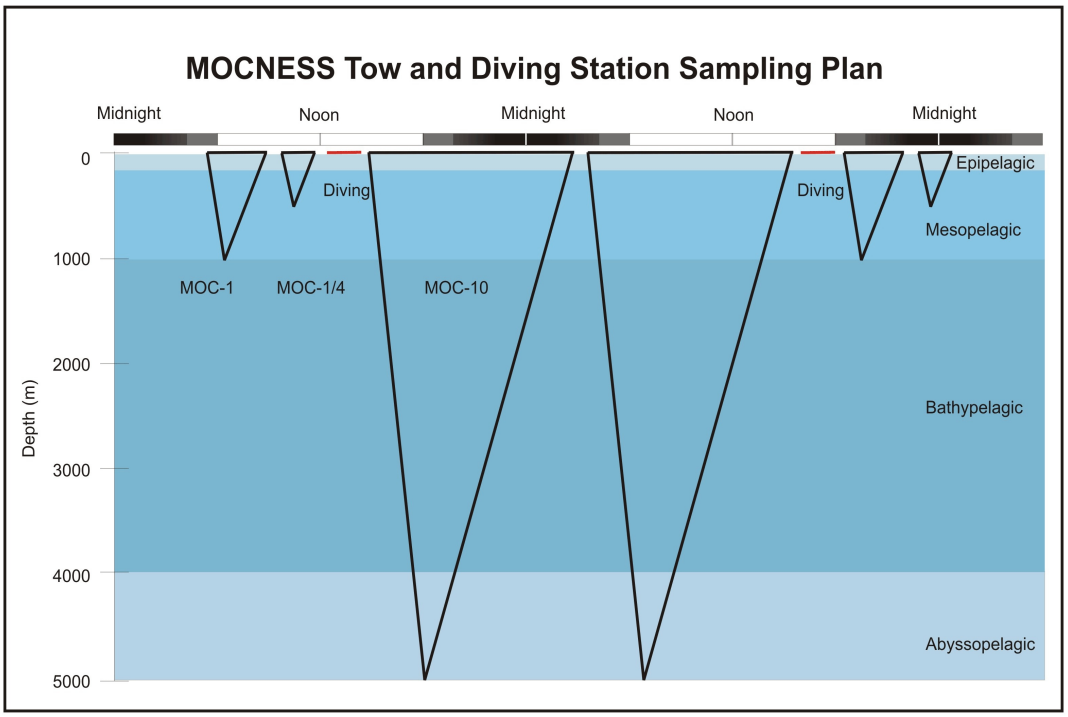


Figure 6. The idealized plan for sampling at each station to enable pairs of net tows and dives both day and night.

Sample splitting and preservation: Within a few minutes of arrival, the stratified samples (with most large gelatinous forms, fish, and macrozooplankton/nekton removed) were passed to the individuals responsible for splitting the samples (Figure 7). Generally ½ (split A) was preserved in formalin for future studies, including biomass estimates (e.g., displacement volume), species counts, and other quantitative analyses. The other half was split again with ¼ (split B) for live picking in the main lab and subsequent preservaton in alcohol for later taxonomic analysis. The other ¼ (split C) was immediately preserved in alcohol. After picking, the integrated sample (net 0) was generally split into two halves with one preserved in alcohol and the other in formalin. Picking of foraminifera from the live split took a long time, so this fraction was kept in the the

cold room and often not preserved in alcohol for several hours. Condition of these samples is questionable.

Sample analyses:
Species were identified by the taxonomic experts on board. Several individuals of each identified species were placed in a labeled vial and submitted to the DNA lab for at-sea DNA extraction, PCR amplification of target genes, and sequencing (with a few specimens retained as vouchers). Samples and specimen numbers were entered into the CMarZ Specimen Log, an ACCESS database. Representative specimens of many species were digitally photographed before preservation and some were photographed after preservation.

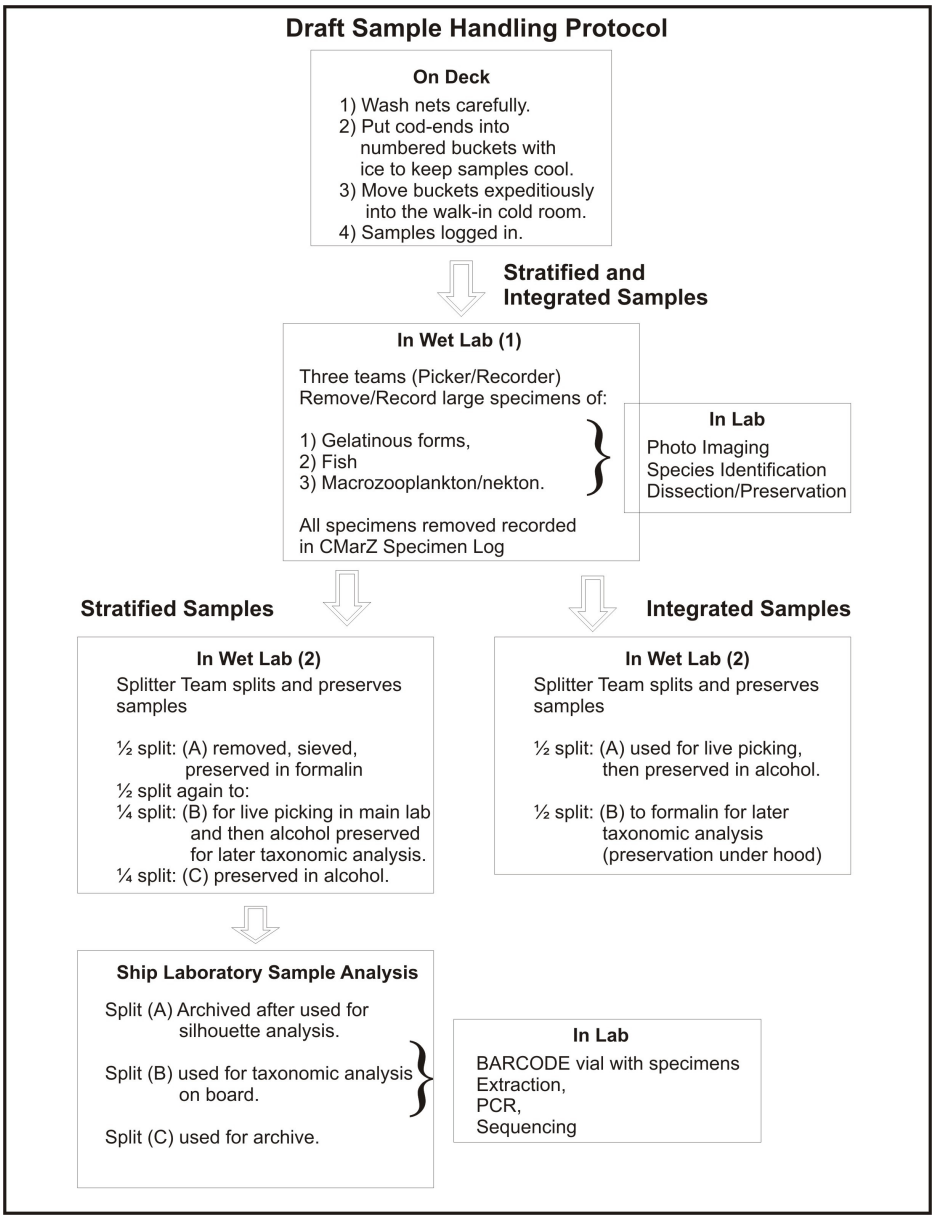


Figure 7. Schematic drawing of the protocol for processing zooplankton samples on the CMarZ cruise.

Specimens of the skeletonized protists were recovered from epi- and mesopelagic samples using simple decantation processes. The taxa of interest were manually sorted under a dissecting microscope immediately after collection. The isolated cells were cleaned in filtered sea-water using micro-brushes, and put into individual tubes containing 100 µl of GITC buffer. This buffer has been developed in the de Vargas laboratory and allows extracting the nucleic acids from the

organisms while preserving their micro-shell. The material was stored at -20°C before further analyses. Total DNA was extracted according to protocols developed by de Vargas *et al.*

WATER COLUMN STRUCTURE AT THE STATIONS

The Station locations (Figure 1), which ranged from the Northern Sargasso Sea to the tropical waters east of the Windward Islands, provided contrasting physical settings for the zooplankton collections. In the Northern Sargasso Sea, the "eighteen degree water" was present from near the surface (~40 m) to more than 400 m deep with only a shallow mixed layer of slightly warmer water at the surface (Figure 8). The main thermocline and halocline occurred between 500 and 1000 m below which temperatures gradually decreased from around 5° C to below 3° C at 5000 m. At station 2, a similar structure was present, although the surface layer was warmer (~20° C) and there was a distinct gradient in temperature and salinity in the "eighteen degree water" zone. The upper water column T/S properties at station 3 were distinctly different with lower salinity water at the surface increasing to a maximum around 100 m, and a much warmer surface temperature (~24° C). In addition, the zone of nearly isothermal and isohaline water seen at the northern stations was no longer present. Instead, below 100 m there was a steady decrease in temperature and salinity to about 900 to 1000 m and then a more gradual decrease in temperature. Salinity reached a minimum at about 900 m and then increased down to about 1200 m before gradually decreasing to 5000 m.

The pattern of low salinity at the surface, a peak at ~100 to 140 m, a minimum at 800 to 1000 m, a secondary maximum around 1400 m, and then a gradual decrease to the sea floor was observed at stations 4 and 5 in increasingly exaggerated form (Figure 8). Sea surface temperature also increased to the south with Station 5 having surface temperatures around 27° C. In addition at station 5, the staircase formations between 250 and 550 m were present as described in the narrative (Figure 3). An explanation for the origin of the water seen in the area sampled at stations 3 to 5 was provided by Ray Schmitt (WHOI) while we were at sea.

"The low salinity water at the surface originates in near equatorial latitudes, where rainfall exceeds evaporation under the Intertropical Convergence Zone (ITCZ). Basically it's the water that evaporated under the trades coming back down. The Amazon outflow is also important in this freshwater supply. ... The salinity maximum at ~150 m depth is coming from the Northeast. It is formed from the surface waters that have experienced high evaporation under the trades and been transported to the north in the surface Ekman layer. There is a region at ~25 N in the eastern Atlantic where the salinity maximum is at the surface, this water is subducted and carried southwest in the gyre circulation to [this area]. Georg Wust called it the Subtropical Under-Water (SUW). Farther down at about 800 m depth, [there is] the salinity minimum associated with the Antarctic Intermediate Water (AAIW). It's coming from the south, as part of the thermohaline circulation. Freshness originates from precipitation in the Southern Ocean.

So it's a layer cake with surface freshness from the South, SUW from the North and AAIW from the South. The salinity gradient in the main thermocline between the SUW at ~37.2 and the AAIW at ~34.8 may be the strongest large scale unstable salt gradient in the world. And thus its propensity for forming these salt finger staircases."

INDIVIDUAL PROJECT REPORTS

1.0 Blue-water Diving (Larry Madin)

Blue-water, or tethered open-water, diving is a simple technique that allows observation, photography, and collection of undamaged live zooplankton, particularly larger gelatinous forms that are commonly damaged or destroyed in nets. During the CMARZ cruise, 8 dives were made by Larry Madin and Erich Horgan, assisted by RV Brown crew members, Lt. Liz Jones, Ens. James Brinkley and 1st Asst. Engineer Keegan Plaskon. Dives were supported by the RV Brown's RHIB workboat, driven by Phil Pokorsky. We made at least one dive at each station, with 5 during daylight and 3 at night (Table 1).

On this cruise the main dive objective was to collect gelatinous animals for identification and DNA bar-code sequencing, as these forms are less likely to be represented in net collections. During the dives we collected approximately 260 individuals of 42 species (Appendix 2). This included 4 species of medusae, 13 of siphonophores, 6 of ctenophores, 7 of molluscs, 10 of thaliaceans, and a few others. In the oligotrophic waters of Stations 4 and 5, we encountered numerous colonial radiolarians and *Trichodesmium*. In general the abundance of large macrozooplankton on these dives was fairly low, consistent with the low abundances of other zooplankton sampled with the nets.

Some notable findings included two specimens of the epi- and mesopelagic ctenophore *Thalassocalyce inconstans*, a specimen of the siphonophore *Halistemma cupulifera* that had caught a leptocephalus (eel) larva, and a surprisingly high diversity of both siphonophores and Thaliaceans. Collected specimens were examined for taxonomic identification, morphological study and behavior, and then added to the group to be sequenced.

2.0 Thaliacea (Larry Madin)

Collections of Thaliacea (salps, doliolids, pyrosomes) were rather sparse on this track, although 17 species were obtained either in the net tows, or more often, from the dives.

Net collected samples included:

1. *Cyclosalpa polae* (aggregate)
2. *Thalia democratica* (solo & aggregate)

3. *Salpa cylindrica* (solo)
4. *Iasis zonaria* (solo & aggregate)
5. *Salpa aspera* (aggregate)
6. *Salpa fusiformis* (solo & aggregate)
7. *Helicosalpa virgula* (solo)
8. *Dolioletta gegenbauri*
9. *Doliopsis* sp.
10. *Doliolina* sp.
11. *Doliolum denticulatum*
12. *Pyrosoma atlanticum*
13. *Pyrosomella* sp.

Most of these were in the shallower nets, and were only found in small numbers (1 to 4 of each).

Species collected during dives included:

Brooksia rostrata (aggregate)
Iasis zonaria (aggregate)
Salpa aspera (solo & aggregate)
Salpa fusiformis (solo & aggregate)
Salpa maxima (solo & aggregate)
Salpa cylindrical (solo)
Pegea bicaudata (aggregate)
Pegea confoederata (aggregate)
Dolioletta gegenbauri
Doliolina sp.
Pyrosoma atlanticum

All salps were identified and measured, and good specimens (mainly from dives) examined and photographed for anatomical details. These descriptions will become part of the detailed morphological information which will accompany the genetic data. A parallel project to develop a morphological and molecular phylogeny of the Thaliacea will be carried out by Madin and Bucklin over the next two years.

Table 1. Distribution of species by Station

Station 1	Station 2	Station 3	Station 4	Station 5
B. rostrata	*C. polae*	*C. polae*	*B. rostrata*	*C. polae*
C. polae	*I. zonaria*	*P. bicaudata*	*D. denticulatum*	*H. virgula*
I. zonaria	*S. aspera*	*P. confoederata*		*I. zonaria*
S. aspera	*S. fusiformis*	*S. aspera*		*P. confoederata*
S. cylindrica	*D. gegenbauri*	*S. fusiformis*		*S. fusiformis*

S. fusiformis	*D. denticulatum*	*S. maxima*		*S. maxima*
T. democratica	*Doliopsis sp.*	*D. gegenbauri*		*T. democratica*
D. gegenbauri		*Doliolina sp.*		*D. denticulatum*
		D. denticulatum		
		P. atlanticum		
		Pyrosomella sp.		

All species found at the 5 stations can be considered warm-water cosmopolitan forms. Although Station 3 appears to have the greatest diversity and Station 4 the least, the sample sizes are probably much too small to draw any real conclusions.

3.0 Planktonic cnidarians (Francesc Pagès, Dhugal Lindsay, and Larry Madin)

Our main goal was to increase knowledge of the species composition and vertical distribution of planktonic cnidarians, mostly below 1000 metres depth. About 110 species have been collected, namely siphonophores (70 species), hydroidomedusae (30 species) and scyphomedusae (10 species). About 5 medusae have not been properly identified (nicknamed as Red Ball, *Pegantha* 24, *Pegantha* M, White *Nausithoe*, and Transparent *Nausithoe*) and some could be new species. One of the nicest and more interesting specimens is an epipelagic narcomedusan of the genus *Pegantha* (P. 24), whose 2 otoporpae (lines of cnidocysts) per marginal lappet bifurcate ending in 4 statocysts (sensorial organs), a splitting never before reported in any other narcomedusan.

The blue-water dives led by Larry Madin and Erich Horgan collected valuable specimens of rare and little-known species like the recently described siphonophore *Lilyopsis fluoracantha* (Haddock, Dunn and Pugh, 2005), but most of the specimens belong to species described a long time ago, such as *Athorybia rosacea* (Forskal, 1775), *Rosacea cymbiformis* (Chiaje, 1822), and *Lilyopsis rosea* (Chun, 1885).

The Ring net and the Reeve net proved to be excellent devices for collecting small-sized planktonic cnidarians. In particular, the examination of some early stages of hydromedusae that were collected will shed further light on the growth, development, and morphology of some multispecific genera like *Podocoryna* and *Bougainvillia*.

The MOCNESS-1, towed in the top 1000m, collected the greater portion of the specimens examined. Many species widely distributed in epipelagic warm waters were obtained, as well as some specimens of little-known mesopelagic siphonophores like *Frillagalma vityazi* Daniel and *Halistemma* sp.

Below 1000 m depth, the MOCNESS-10 collected several little-known species such as the siphonophores *Nectadamas richard*i (Pugh, 1992) and *Lensia quadriculata* (Pagès, Flood and Youngbluth, 2006). Likewise some specimens of the genera *Apolemia*, *Erenna*, and *Bargmannia* were also captured, but their specific identification require additional microscopic analyses.

It is too soon to estimate the amount of information obtained in comparison with the sampling effort spent. However, in our opinion, the number of species found is lower than was expected, especially below 1000 m depth where the number of specimens caught was very low, suggesting a rather sparse macro- and megaplanktonic community of gelatinous organisms. This is only partly due to the use of nets for the sampling, since results from other oceans (e.g. Southern Ocean) using similar devices have collected higher gelatinous biomasses. It is interesting to note that very few specimens of the scyphomedusan genera *Atolla* and *Periphylla* were collected. Both are common dwellers in the meso- and bathypelagic waters of the oceans.

Preliminary results from the so-called "Staircase Tow" (MOCNESS-1 Tow 13) carried out on 27 April at station 5 suggest some kind of species stratification along the hydrographic staircase. Twenty species of gelatinous zooplankton were collected, namely 13 siphonophores, 3 hydroidomedusae, 3 ctenophores and 1 salp. Only the siphonophore *Abylopsis tetragona* -a fast swimming species- occurred in the eight ranges sampled between 547 and 461 m depth. Two siphonophores (*Lensia ajax* and *L. exeter*) occurred frequently, but irregularly between net 1 (547-527 m depth) and net 8 (464-461 m depth). An increase in the number of species was observed in even-numbered nets (2, 4 and 8) where several species occurred only at single depth ranges. Net 8 collected the three dominant species plus 3 new ones, indicating the beginning of a shift towards more epipelagic species composition.

4.0 Ctenophores, Amphipods, and Cephalopods (Dhugal Lindsay)

Ctenophore forms that were identified from net samples included several cydippids belonging to the Haeckeliidae (*Aulacoctena acuminata*), the Bathyctenidae (*Bathyctena chuni*), the Pleurobrachiidae (*Hormiphora palmata*, *Pleurobrachia* sp.1), the Mertensiidae (*Charistephane fugiens*), and others. Lobates such as *Kiyohimea usagi* and *Ocyropsis maculata maculata*, the Cestoid *Cestum veneris*, and several *Beroe* species were also caught in net tows. Blue water diving allowed the collection of several individuals of the lobate *Eurhamphaena vexilligera* and the Thalassocalycid *Thalassocalyce inconstans*, in addition to some of the forms listed above.

Twelve species of amphipods were sorted from the live samples, most of them large *Physocephalata* that were easy to spot. Many more species will undoubtedly be found upon examination of the formalin and ethanol-preserved samples. More than half of the gelatinous organisms captured during the blue-water SCUBA dives were host to hyperiid amphipods at varying stages of development. In many cases it was impossible to identify the hyperiid embryos

to species or indeed genus level due to their early developmental stages. Individuals were extracted from the canals or gelatinous matrix of their hosts and placed in ethanol for sequencing. This should allow determination of any species specificity in host/parasite relationships as a factor contributing to species diversity maintenance mechanisms in the pelagic zone. The paucity of species belonging to the *Physosomata* at meso- and bathypelagic depths may have been a consequence of the dominance of these ecosystems by small siphonophores rather than the larger cnidarians that usually host these animals. Submersible dives should be conducted in this area to directly assess the types and numbers of large ctenophore and cnidarian forms to compare with the data gained on amphipods by net systems such as the MOCNESS.

Thirteen species of cephalopods were identified in the MOCNESS samples. Of these, three were octopods (*Cirrothauma murrayi*, *Bolitaena pygmaea*, *Tremoctopus violaceus*), one was a vampyromorph (*Vampyroteuthis infernalis*), and the remaining nine were various squids belonging to at least five major groups (Bathyteuthids, Chiroteuthids, Cranchids, Histioteuthids, and Enoploteuthids). Many larval individuals were also sampled and these were recorded photographically, dissected to obtain tissue for DNA analysis, and preserved in formalin for subsequent taxonomic analysis. Sampling with larger trawls will be necessary to assess the true diversity of the cephalopod fauna at these sites, but the 335 micron mesh yielded specimens in immaculate condition, greatly simplifying taxonomic analyses.

5.0 Decapod Shrimp (Hege Øverbø Hansen)

Samples were analyzed from the 10-m and 1-m MOCNESS (MOC-10 and MOC-1). A total of 18 tows were analyzed for the presence of Decapod shrimp: 11 samples from the MOC-1 and 7 samples from the MOC-10 (Table 2).

Table 2. Tows with MOC-1 and MOC-10 that sampled Decapod shrimp at the five stations.

	MOC-1	**MOC-10**
	Tow #	Tow #
Station 1	1, 2	1
Station 2	3, 4	2
Station 3	5, 7, 8	3
Station 4	9,10	4, 5
Station 5	11, 12	6, 7

A total of 366 individuals were sampled and analyzed from MOC-1 and MOC-10.

Dendrobranchiata

Within Dendrobranchiata three genera were identified but identification to species level was not done on these individuals (N=147).

Within Sergestidae, the genera *Sergestes sp.* and *Sergia sp.* were found. Within Benthesicymidae there were at least two different species of *Gennadas* but again, certain identification to species level was not made.

Caridae

All individuals within Caridea were identified to species level (n=219). A total of 19 species were identified, belonging to the families Oplophoridae (17 species), Pandalidae (1) and Pasipheidae (1) (Table 3). Most of the observed individuals belonged to the family Oplophoridae.

Table 3. Decapod species found on the CMarZ Cruise 10 - 30 April 2006. Species that were sent for DNA sequencing are marked (x).

Dendrobranchiata		Caridea				
Sergestidae	Benthesicymidae	Oplophoridae	DNA	Pandalidae	Pasipheidae	DNA
Sergestes sp	*Gennadas* sp	*Acanthephyra purpurea* (A. Milne Edwards)	x	*Parapandalus richardi* (Coutiére)	*Parapasiphae sulcatifrons* (Smith)	x
Sergia sp		*Acanthephyra stylorostratis* (Bate)	x			
		Acanthephyra brevirostris (Smith)	x			
		Acanthephyra curtirostris (Wood Mason)	x			
		Acanthephyra microphthalma (Smith)	x			
		Systellaspis braueri (Balss)				
		Systellaspis debilis (A.Milne Edwards)	x			
		Systellaspis pellucida (Filhol)				
		Systellaspis cristata (Faxon)	x			
		Hymenodora gracilis Smith				
		Hymenodora glacialis (Buchholz)	x			
		Meningodora mollis Smith	x			
		Meningodora miccyla	x			

Dendrobranchiata		Caridea				
Sergestidae	Benthesicymidae	Oplophoridae	DNA	Pandalidae	Pasipheidae	DNA
		(Chace)				
		Meningodora compsa (Chace)	x			
		Ephyrina figueirai				
		Notostomus gibbosus (A.Milne Edwards)				
		Oplophorus spinosus (Brullé)	x			

Species richness of Caridae tended to increase with lower latitudes (Table 4).

Table 4. Number of different Decapod caridean species found at the five stations with Latitude.

	Stations				
	1	2	3	4	5
Latitude	33.5	30	25	20	14
Number of species	5	10	6	10	13

Most of the individuals sampled were juveniles with a carapace length of less than 13 mm. However, some adult individuals were caught and some of these carried eggs on their pleopods (*Parapasiphae sulcatifrons, Systellaspis debilis, Oplophorus spinosus, Acanthephyra purpurea* and *A. stylorostratis*). For the first three of these species there seems to be a strategy towards eggs that are larger in size and fewer in number. The two latter species had smaller and more numerous eggs. *A. purpurea* and *A. stylorostratis* carried eggs that were developed to a stage where visible larvae could be seen within the eggs and were probably close to hatching.

Thirteen individuals were sent for DNA sequencing (Table 3).

Our main objective for participation on this cruise was to extend our knowledge of the distribution and biodiversity of pelagic shrimp in the deep zones of the Atlantic Ocean. Our goal was to identify all the sampled individuals within the Caridea while on board, and this goal was achieved. Specimens belonging to the suborder Dendrobranchiata were not identified to species onboard. However, post-cruise species identification by experts is possible through the MARBEF Taxonomy Clearing System/MAR-ECO.

Both the taxonomic and molecular results of the decapod shrimp from this cruise will be compared with previous results from the 2004 MAR-ECO cruise on the northern mid-Atlantic

ridge. This will provide new knowledge on vertical and latitudinal variations in distributions, species composition and population structure of pelagic shrimp.

6.0 Mysids (Saramma Panampunnayil)

Five stations were sampled between 33° and 14° N and 70° and 54° W. At each station samples were collected using 1/4-m MOCNESS (upper 500m), 1-m MOCNESS (9 nets, upper 1000m) and 10-m MOCNESS (5 nets, down to 5000m), both day and night. Each sample was split. 50% was preserved in 5% formalin for silhouette analysis and later taxonomic analysis; 50% was preserved in alcohol for taxonomic analysis on board and removal of identified species for barcoding.

Mysids were picked out of the samples preserved in alcohol and identified.

MOCNESS 10: Bathypelagic Mysids. 8 species were recorded.

- *Eucopia grimaldii* was the most common species and occurred throughout the sampling area and was represented by all life stages (adult and young males, females and juveniles).
- *Eucopia unguiculata*, though a widely distributed and abundant bathypelagic mysid, was encountered at Station 5 only.
- *Eucopia sculpticauda* was present throughout with high representation at Station 5.
- *Gnathophausia gigas*. Two individuals, probably immature, measuring 57 and 100mm were recorded from Station 1 and Station 5.
- *Gnathophausia* sp. Two specimens from Station 4 (to be identified later).
- *Lophogaster* sp. Two specimens from Station 3 and Station 4 (to be identified later).
- *Chalaraspidum alatum*, a single adult male from Station 5.
- *Boreomysis microps*. This widely distributed bathypelagic form was represented by a single adult male at Station 1.

MOCNESS 1: 3 species were recorded.

- *Euchaetomera tenuis* was present in three hauls. Each haul contained a single specimen.
- *Anchialina agilis*. Adult males and breeding females were collected. Usually this species lives in the lower depths, but become planktonic and more active during breeding season.
- *Siriella thompsonii.* Widely distributed cosmopolitan epipelagic species and occurred in the upper 50m.

Six species were removed for DNA sequencing: *Eucopia grimaldii*, *E. unguiculata*, *E. sculpticauda*, *Euchaetomera tenuis*, *Anchialina agilis* and *Sirella thomsonii.*

7.0 Euphausiids (Nancy Copley)

Euphausiids were identified from the live portions of several tows. *Thysanopoda obtusifrons*, a fairly large species (15-20 mm), was commonly found in the samples. Only about 47 individuals from 13 species were identified due to the small amount of time devoted to this activity. There was a shortage of microscopes and the euphausiids can be examined on land post-cruise whereas the gelatinous zooplankton needed to be identified immediately, while still alive. Nineteen identified specimens from eleven species were submitted for barcoding. The following live species were examined:

Station 1	**Station 2**	**Station 3**	**Station 4**	**Station 5**
Bentheuphausia amblyops	*Euphausia sp. (immature)*	*Euphausia brevis*	*none examined*	*Euphausia americana*
Euphausia tenera		*Nematoscelis spp.*		*Euphausia tenera*
Nematobrachion flexipes		*Stylocheiron abbreviatum*		*Nematoscelis atlantica*
Stylocheiron carinatum		*Stylocheiron carinatum*		*Nematoscelis spp.*
Thysanoessa gregaria		*Stylocheiron suhmi*		*Stylocheiron abbreviatum*
Thysanopoda obtusifrons				*Stylocheiron affine*
				Stylocheiron carinatum
				Stylocheiron elongatum
				Thysanoessa parva (?)
				Thysanopoda obtusifrons

8.0 Ostracoda (Martin Angel)

The total number of species sorted from the samples and identified during the cruise was 80. There were several which could not be identified onboard ship so the final number will probably approach 90. This includes 6-8 species that are either certainly or probably novel, which all came from the deep tows. These new species increase the number of species currently known to inhabit

the Atlantic (140) by nearly 6%. For example three individuals of the seven specimens belonging to the deep-living genus *Bathyconchoecia* are each representatives of previously undescribed species; two of the others are strikingly sculptured specimens of a species that has previously been collected at depths of 4000m off NW Africa, but still remains undescribed. The same is true for the 20 or so specimens of a *Fellia* species taken in the deep nets at stations 4 and 5.

A number of other notable species, which are rare in oceanographic collections were taken in the deep tows, including:

1. *Gigantocypris dracontovalis*, which is smaller than its better known and more abundant congener *G. muelleri* (of which only a single specimen was recorded) and has golden reflectors in its large naupliar eyes;
2. *Mollicia tyloda* that has only been recorded a couple of times since it was first described by G.W.Muller in 1906, and
3. *Macroconchoecia macroreticulata* and *M. spinireticulata* only recently described from deep water in the NE Atlantic, which were both abundant in the deeper MOC-10 samples.

The species collected at each station are listed in Table 5, which shows that much higher numbers of species were taken at Station 5. However this increased richness may be in part an artefact that reflects the greater effort devoted to sorting and analysing the MOC-10 #7 samples at station 5. Seventeen of the species were collected at all five stations, but a further four that were not recorded at station 4 are likely to be in those samples, increasing the number of ubiquitous species to 21.

Eleven species were collected for the first time at station 5, including the largest of the halocyprids, *Alacia valdiviae*, which is over 6 mm long and bright red in color, and so unlikely to have been overlooked previously. There were considerable changes in the species dominance. *Orthoconchoecia secernenda* that had been the commonest large ostracod was replaced by *O. atlantica*, *Halocypris globosa* by *Halocypria inflata*, and *Orthoconchoecia secernenda* by *O. atlantica*.

Before the cruise began, I set a target of 50 species to be sequenced. Thanks to the large number of species that made their first appearance at station 5, the target was exceeded. In all, 58 species were picked out for sequencing and these are the first halocyprids ever to be sequenced. They represent 39% of the species known to occur in the whole of the Atlantic (now 148, which includes the new species collected on the cruise) and 25% of the global inventory of planktonic ostracods (230). Hence we have already achieved substantial progress towards providing a powerful identification tool for planktonologists studying this abundant group that has largely been overlooked because of the problems associated with their identification.

Table 5. Listing of planktonic ostracods identified by Martin Angel on RB cruise 06-03

	Species list						
	Highlighted species sequenced		at all stations			at station 5 only	
		Station 0	Station 1	Station 2	Station 3	Station 4	Station 5
1	*Alacia valdiviae*						+
2	*Archiconchoecemma simula*						+
3	*Archiconchoecetta bispicula*						+
4	*Archiconchoecilla versicula*						+
5	*Archiconchoecinna cuneata*			+	+		
6	*Archiconchoecissa pljusnini*			+	+	+	
7	*Archiconchoecissa cucullata s*		+				+
8	*Boroecia borealis*					9	
9	*Conchoecetta acuminata*						+
10	*Conchoecia hyalophyllum*		+	+	+	+	+
11	*Conchoecia lophura*		+	+	+	+	+
12	*Conchoecia macrocheira*		+	+	+	+	+
13	*Conchoecia magna*			+			
14	*Conchoecia subarcuata*						+
15	*Conchoecilla daphnoides*		+	+	+	+	+
16	*Conchoecissa ametra*		+	+	+		
17	*Conchoecissa imbricata*		+	+	+		+
18	*Conchoecissa plinthina*		+	+	+	+	+
19	*Discoconchoecia elegans*	+		+			+
20	*Euconchoecia chierchiae*						
21	*Fellia bicornis*						+
22	*Fellia 'abyssopelagica'*					+	+
23	*Gaussicia incisa*					+	+
24	*Gigantocypris dracontovalis*				+	+	
25	*Gigantocypris muelleri*		+				
26	*Halocypria globosa*	+	+	+	+	+	
27	*Halocypris inflata*	+	+	+	+	+	+
28	*Halocypris pelagica*						+
29	*Loricoecia loricata*		+	+	+		+
30	*Loricoecia ctenophora*			+			
31	*Macroconchoecia macroreticulata*		+	+	+	+	+
32	*Macroconchoecia spinireticulata*		+	+	+	+	+
33	*Macrocypridina castanea*		+	+			
34	*Metaconchoecia sp*					+	+
35	*Metaconchoecia acuta*			+	+	+	+
36	*Metaconchoecia discoveryi*		+				
37	*Metaconchoecia fowleri*			+		+	
38	*Metaconchoecia glandulosa*		+	+	+	+	+
39	*Metaconchoecia inflata*			+			+
40	*M. aff lunata*						+
41	*Metaconchoecia kyrtophora*						+
42	*Metaconchoecia aff. macromma*					+	
43	*Metaconchoecia pusilla*		+	+	+	+	+

	Species list						
	Highlighted species sequenced		at all stations			at station 5 only	
		Station 0	Station 1	Station 2	Station 3	Station 4	Station 5
44	*Metaconchoecia rotundata*			+	+		+
45	*Metaconchoecinna arcuata*		+	+	+	+	+
46	*Metaconchoecinna aff.arcuata*			+		+	
47	*Mikroconchoecia curta*						
48	*Mikroconchoecia echinulata*		+	+	+	+	+
49	*Mikroconchoecia stigmatica*						+
50	*Mollicia kampta*			+			+
51	*Mollicia tyloda*			+	+		
52	*nov sp. A*					+	+
53	*Orthoconchoecia atlantica*		+	+			+
54	*Orthoconchoecia bispinosa*						+
55	*Orthoconchoecia secernenda*		+	+	+	+	+
56	*Paraconchoecia aequiseta*			+	+	+	+
57	*Paraconchoecia dasyophthalma*			+	+		+
58	*Paraconchoecia dorsotuberculata*		+	+	+	+	+
59	*Paraconchoecia inermis*			+		+	+
60	*Paraconchoecia mamillata*		+	+		+	+
61	*Paraconchoecia nanomamillata*		+	+	+		
62	*Paraconchoecia oblonga A*		+	+		+	+
63	*Paraconchoecia oblonga B*		+	+	+		+
64	*Paraconchoecia spinifera*		+	+	+		+
65	*Paramollicia dichotoma*		+	+	+		
66	*Paramollicia plactolycos*					+	+
67	*Porroecia parthenoda*		+	+	+	+	+
68	*Porroecia pseudoparthenoda*						+
69	*Porroecia porrecta*		+	+			+
70	*Porroecia spinirostris*	+	+	+	+		+
71	*Proceroecia brachyaskos*		+	+	+	+	+
72	*Proceroecia convexa*						+
73	*Proceroecia microprocera*		+	+	+	+	+
74	*Proceroecia procera*			+	+		+
75	*Pseudoconchoecia concentrica*						+
76	*Bathyconchoecia 'B'*		+				+
77	*Bathyconchoecia RB#1*		+				
78	*Bathyconchoecia RB#2*					+	
79	*Bathyconchoecia RB#3*					+	
80	*Bathyconchoecia kornickeri*						+
			37	47	35	35	58

9.0 Calanoid copepods in the genus *Euaugaptilus* and the family Scolecitrichidae (Hiroyuki Matsuura and Mikiko Kuriyama)

Calanoid copepods of the genus *Euaugaptilus* primarily inhabit the meso- and bathypelagic zones of the world oceans. The genus encompasses ca. 70 species, which is among the largest number in a single genus of all calanoid copepods. *Euaugaptilus* spp. occur at low abundances and sympatrically with many congeneric species. On the basis of the mouthpart morphology, these copepods are considered to be carnivorous. The shape of their mandible blades vary between species. Many species of *Euaugaptilus* have specialized sucker-like structures on the setae of their feeding appendages, which have been termed "buttons". The high species diversity, the low population density, and the development of the button setae in *Euaugaptilus* suggest a specialization in their food habits in the resource-limited deep sea and thus would be an interesting topic for elucidating speciation and resource partitioning in pelagic communities.

The pelagic copepod family Scolecitrichidae also comprises species distributed widely throughout the world oceans and is among the most species-rich families in the calanoid copepods, encompassing ca. 160 nominal species in 26 genera. The Scolecitrichidae, with its related families, Diaixidae, Parkiidae, Phaennidae, and Tharybidae, possess specialized sensory setae on the maxillae and maxillipeds, and these are considered to be involved in the detection of detrital food particles. Gut-content analyses have shown that scolecitrichid copepods are, in general, omnivores or detritivores with some feeding specializations within the family. The perception of chemical signals has perhaps played a key role in their high species diversity in such a resource-limited environment. These suggest the importance of scolecitrichids in our understanding of the species diversity and of niche-partitioning in the oceanic environment, in relation to their patterns of vertical distribution, feeding specialization, and taxonomic relationships.

The vertical distributions of these copepods have been studied in the Atlantic, Pacific, Indian, and Antarctic Oceans, but most of these studies have dealt with a limited number of species and specimens, hence their vertical patterns extending into the bathypelagic layer and the relationships between genera and species are still poorly known.

On this cruise, we aimed to obtain samples of these copepods, especially bathypelagic species, to compare the community structure between the Atlantic and Pacific, to see differences in the genetics of morphologically similar species, and obtain knowledge pertaining to the phylogeny of each family.

During this cruise, we sorted out 534 *Euaugaptilus* and 464 scolecitrichids, and identified 25 and 22 species, respectively (Table 6). Among those, 24 *Euaugaptilus* and 17 scolecitrichid species were picked out for sequencing. After the cruise, we are going to identify the rest of the individuals, sequence COI and the 12S of these species, and discuss the differences between the Atlantic and Pacific, and the phylogeny of these species.

Table 6. Calanoid copepod species list of the Euaugaptilidae and Scolecitrichidae

AUGAPTILIDAE		**SCOLECITRICHIDAE**	
Euaugaptilus		***Ammalothrix***	***Scaphocalanus***
E. affinis	*E. longimanus*	*A. paravalida*	*S. affinis*
E. angustus	*E. magnus*	*A. valida*	*S. bogorovi*
E. bullifer	*E. maxillaris*	***Heteramalla***	*S. elongatus*
E. clavatus	*E. nodifrons*	*H. sarsi*	*S. magnus*
E. elongatus	*E. oblongus*	***Lophothrix***	*S. major*
E. facilis	*E. pachychaeta*	*L. frontalis*	***Scolecithricella***
E. farrani	*E. palumbii*	*L. humilifrons*	*S. dentata*
E. filigerus	*E. perodiosus*	*L. latipes*	*S. vittata*
E. gracilis	*E. rectus*	***Pseudoamallothrix***	***Scolecethrix***
E. grandicornis	*E. rigidus*	*P. cenotelis*	*S. bradyi*
E. hyperboreus	*E. squamatus*	*P. emarginata*	*S. danae*
E. laticeps	*E. tenuispinus*	*P. obtusifrons*	***Scottocalanus***
E. latifrons		*P. ovata*	*S. helenae*
			S. securifrons
			S. thorii

10.0 Calanoid copepods primarily Aetideidae and Heterorhabdidae (Astrid Cornils)

The CMarZ cruise has given me the first opportunity to have an insight into the diversity and species composition of the subtropical Atlantic. I was able to identify a total of 63 species of calanoid copepods, concentrating on the families of the Aetideidae and Heterorhabdidae (Table 7). Only females and males were identified. Because of the ship movements we were unable to dissect individuals smaller than 2 mm, hence, they are probably under-represented in the species list. A lot of them will only be representatively caught in the 1/4-m MOCNESS. Some individuals of the identified species were taken to be “barcoded”.

At first impression the species composition changed considerably throughout the water column, but was not quantified. The upper 200 m (MOCNESS 1, NETS 5 – 8) were dominated by *Clausocalanus* spp, while the mesopelagic layers were apparently dominated by *Pleuromamma* spp. and *Lucicutia* spp. during the day tows. The heterorhabid *Neorhabdus capitaneus* (13 mm) was identified for the first time in the Atlantic (1000 – 2000 m), having been described by T. Park in 2000. The samples of the MOCNESS 10 were screened for mainly Aetideidae.

Working so closely with other taxonomists gave me the chance to increase my knowledge on calanoid copepod taxonomy and on other planktonic taxa, the use of image analysis, sampling strategies and DNA barcoding. Sampling with the MOCNESS has also introduced me to a new sampling gear for zooplankton.

Table 7a. Identified species of the Calanoida.

Families	Species	Families	Species
Calanidae	*Megacalanus princeps*	Phaennidae	*Phaenna spinifera*
	Mesocalanus tenuicornis	Scolecitrichidae	*Lophothrix humilifrons*
	Nannocalanus minor		*Scaphocalanus brevirostris*
	Neocalanus gracilis		*Scottocalanus helenae*
Eucalanidae	*Eucalanus elongatus*	Arietellidae	*Arietellus plumifera*
	Pareucalanus attenuatus	Augaptilidae	*Augaptilus sp.*
	Rhincalanus cornutus		*Euaugaptilus magnus*
	R. nasutus		*Euaugaptilus elongatus*
	Subeucalanus crassus		*Pontoptilus*
Paracalanidae	*Calocalanus plumulosus*		*Centraugaptilus horridus*
	Acrocalanus spp.		*Haloptilus longicornis*
Spinocalanidae	*Foxtonia barbatula*	Heterorhabdidae	*Disseta palumboi*
Clausocalanidae	*Clausocalanus spp.*		*Heterorhabdus spinifrons*
	Ctenocalanus vanus		*H. spinifer*
Aetideidae	*Aetideus acutus*		*Heterostylites longicornis*
	Chirundina streetsi		*Mesorhabdus brevicaudatus*
	Chiridiella sp. (bispinosa)		*Neorhabdus capitaneus*
	Chiridiella sp. (pacifica)	Candaciidae	*Candacia longimana*
	Chiridiella sp. (?)	Lucicutiidae	*Lucicutia spp.*
	Euchirella amoena	Metridiidae	*Gaussia princeps*
	E. curticauda		*Metridia princeps*
	E. messinensis		*Pleuromamma gracilis*
	E. pulchra		*P. piseki*

Families	Species	Families	Species
	E. rostrata		*P. xiphias*
	Gaetanus brevicornus		*P. abdominalis*
	Gaetanus miles	Pontellidae	*Pontella securifer*
	Pseudeuchaeta brevicaudata		*Pontella sp.*
	Undeuchaeta major		*Pontellina plumata*
	Undeuchaeta plumosa	Bathypontiidae	Not identified
Euchaetiidae	*Euchaeta marina*		
	E. media		
	E. spinosa		
	Valdiviella insignis		

11.0 Other Copepods Identified on RHB06-03. (Leocadio Blanco Bercial)

The following is a list of species that were identified on the cruise that were not listed in the two previous sections.

Table 7b. More identified species of the Calanoida.

Families	Species	Families	Species
Acartiidae	*Acartia negligens*	Aetideidae	*Gaetanus minor*
Calanidae	*Bathycalanus richardi*		*Gaetanus pileatus*
	Neocalanus robustior	Lucicutiidae	*Lucicutia grandis*
Candaciidae	*Candacia elongata*	Metridiidae	*Metridia macrura*
	Candacia ethiopica		*Metridia venusta*
	Candacia pachydactila	Phaennidae	*Onchocalanus cristatus*
	Candacia paenelongimana	Arietellidae	*Phyllopus helgae*
	Paracandacia bispinosa		*Paraugaptilus buchani*
Centropagidae	*Centropages violaceus*	Scolecitrichidae	*Scottocalanus persecans*
Clausocalanidae	*Clausocalanus arcuicornis*	Eucalanidae	*Subeucalanus monachus*
	Clausocalanus furcatus	Megapontiidae	*Hyalopontius enormis*
	Clausocalanus jobei		
	Clausocalanus lividus		
	Clausocalanus mastigophorus		
	Clausocalanus pergens		

12.0 Larvaceans and Planktonic Molluscs (Russ Hopcroft)

I had two principle purposes during the cruise: general photography of zooplankton, and identification of larvacean species for the barcoding (sequencing) effort.

Photography was an almost full-time task. Approximately 1500 useful images have been taken of ~100 different living species of zooplankton at 4 MPix resolution. Depending on the species, from one to 20 pictures have been taken per specimen. These are currently being reviewed and cleaned-up for posting on the CMarZ and CoML websites. Ultimately these images will be accessed via the CMarZ species pages. Hundreds of additional images were made on the 2 MPix system by other investigators, principally for foraminfera/radiolarians and jellies. All these images will constitute one of the more visible "public" legacies of the cruise.

In regard to the larvaceans, progress during the cruise was disappointing. Only 12 or 13 of the ~70 species described in this group were encountered during this cruise (Table 8). With the possible exception of the smallest MOCNESS, these collecting systems extruded most of the larvaceans, and rendered those remaining unidentifiable in the collections. The Reeve net was generally successful, but densities of animals were unusually low. Even for the Reeve net, there appeared to be a relatively limited time-window over which material in the collection remained in a useful condition, and this may have contributed to an underestimation of species present. Only the most common tropical species were encountered, with the notable exception of the giant "mesopelagic" species, *Bathochordaeus stygius.* There appear to have been several distinct faunal shifts between stations. In the future, some method of slowing the degradation rate of the samples must be found for this specific group; perhaps partial "preservation" with ethanol while sorting the samples will work better.

Table 8. Identified larvaceans. (P = present in low numbers; C = common)

Species	Stn 0	Stn 1	Stn 2	Stn 3	Stn 4	Stn 5
Apendicularia sicula					P	
Bathochordaeus stygius			P	P		
Fritillaria borealis	C	C	P	P	P	
Fritillaria formica				C	C	C
Fritillaria pellucida	C	C	P	P	P	
Fritillaria tenella					P	
Oikopleura cophocerca			C	C	C	P
Oikopleura dioica					P	
Oikopleura fusiformis	C	C				
Oikopleura longicauda	C	C			P	C

Oikopleura rufescens					P	P
Stegosoma magnum					P	P/C
Megalocerus huxleyi						?

Not to be idle and because pelagic molluscs were present in many of the collections, taxonomic attention was expanded to this neglected group. Of the pteropods with calcareous shells (generally Euthecosomes), 20 of the ~33 known species were encountered, along with a suspected 5 species (out of 51) of the naked pteropods (Gymnosomes). Several Pseudothecosomes were observed in the samples, but only one was found in suitable condition for definitive identification (out of 7 species). For the heteropods, 17 of 29 known species were found during this cruise. The nudibranch *Phylliroe* was also collected.

Given that such a large percentage of this group has now been collected, I suggest this material be subjected to 28S sequencing in addition to COI. In several cases, I suspect some of the described species are simply younger forms of other species, and it will be interesting to see what insights arise from the molecular analysis. Tropical Pacific cruises later this year will hopefully fill in some of the missing species.

13.0 Skeletonized Microplankton (Colomban de Vargas, Silvia Watanabe, Yurika Ujiie, and Hui Liu)

The CMarZ team "*Skeletonized Microplankton*" was comprised of Silvia Watanabe (Museum of Natural History, Buenos Aires, Argentina), Yurika Ujiie (University of Geneva, Switzerland), Hui Liu (Rutgers University, USA), and Colomban de Vargas (Roscoff Marine Station, France). (Figure 9)

During the cruise, our aim was to collect skeletonized microzooplanktonic taxa, isolate and identify the morphospecies, take pictures of specimens, and preserve material for further morphological and genetic analyses. We focused our effort on the planktonic foraminifera, but collected significant data on the radiolarians and phytoplanktonic coccolithophores as well.

These unicellular pelagic organisms are particularly resilient to genetic analyses, in particular *barcoding*, due to their small size and divergent origins, very far from the better-known metazoans. In addition, the relative absence of morphological characters challenges classical taxonomy, and cryptic species appear to be widespread in these groups. The intense biomineralization of their skeletons plays a key role in sea-water chemistry and in the building of km-thick deep-sea sediments. If the large majority of oceanic plankton is remineralized in the water column, the skeletonized microplankton have left in the geological record by far the most complete and well preserved fossil archive, so that a better assessment of species diversity and ecology will allow further understanding of how plankton and paleo-oceans have co-evolved.

Figure 9. From left to right: Silvia Watanabe, Colomban de Vargas, Hui Liu, and Yurika Ujiie, respectively from Argentina, France, USA, and Switzerland.

Skeletonized microzooplankton were immediately isolated from the fresh, living samples into Petri-dishes. Cells were individually picked under the dissecting microscope using brushes, and sub-sampled, species by species, into smaller plastic dishes filled with filtered sea-water. The samples were then carefully examined, and representative specimens were photographed before being isolated into a special DNA-extraction buffer that preserves both nucleic acids and carbonate skeletons (GITC, de Vargas *et al.,* unpublished).

In total, 1541 single-cell DNA extractions were realized along the 5 main stations (see Appendix 3 for complete listing). Nineteen morphological species of planktonic foraminifera were observed (*Candeina nitida, Globigerina humilis, Globigerinella aequilateralis, Globigerinita glutinata, Globigerinoides conglobatus, Globigerinoides rubber, Globigerinoides sacculifer, Globorotalia crassaformis, Globorotalia hirsute, Globorotalia inflata, Globorotalia menardii, Globorotalia truncatulinoides, Globorotalia tumida, Hastigerina digitata, Hastigerina pelagica, Neogloboquadrina dutertrei, Orbulina universa, Pulleniatina obliquiloculata, Pulleniatina finalis)*, which represent about half the known, morphologically defined living “species”. In

addition, 892 pictures of living specimens were taken before DNA extraction in order to document the morphological aspects – color, texture, etc.– of living cells (Figure 10) , which is a first in foraminifera research.

Species diversity and abundance varied significantly between the 5 stations (Figure 11). The populations were rich, abundant, and contained large adult specimens at Station 1, while much smaller and rare cells were observed at the following stations. This is probably linked to the moon cycle. Most species of foraminifera – mainly those living in shallow water – reproduce at or close to the full moon, which occurred in the evening of April 13th at our Station 1.

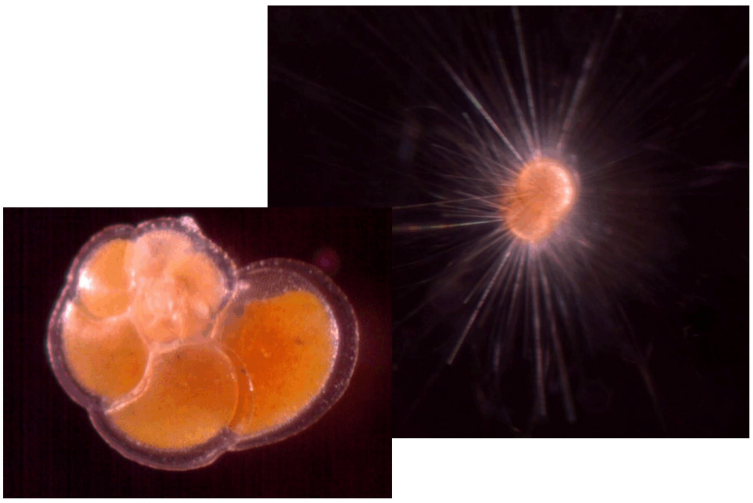


Figure 10. The spinose species *Globigerinoides sacculifer* and the non-spinose taxon *Globorotalia menardii*. Characters such as color and spines are not preserved after the death of the cell, but maybe significant for taxonomy. (Photos by C. de Vargas)

Details of morphospecies distribution are not shown in this short final report. However, at each station, a clear depth zonation was revealed thanks to the stratified sampling. An example is given in Figure 12, which shows the number of DNA extractions performed for each MOCNESS-Net (1 to 8, from the deepest to the shallowest). Physical parameters of the water column, measured in real-time by the MOCNESS, are shown on the left part of the Figure 12. We note the presence of unique morphospecies in deep layers below the Deep Chlorophyll Maximum (DCM, ~50m), such as *G. truncatulinoides* or *G. hirsuta*. Species diversity increases toward surface waters, with a peak right within the DCM. The details of morphospecies distribution with depth will be studied by Sylvia Watanabe, using the archive samples preserved in ethanol or formalin.

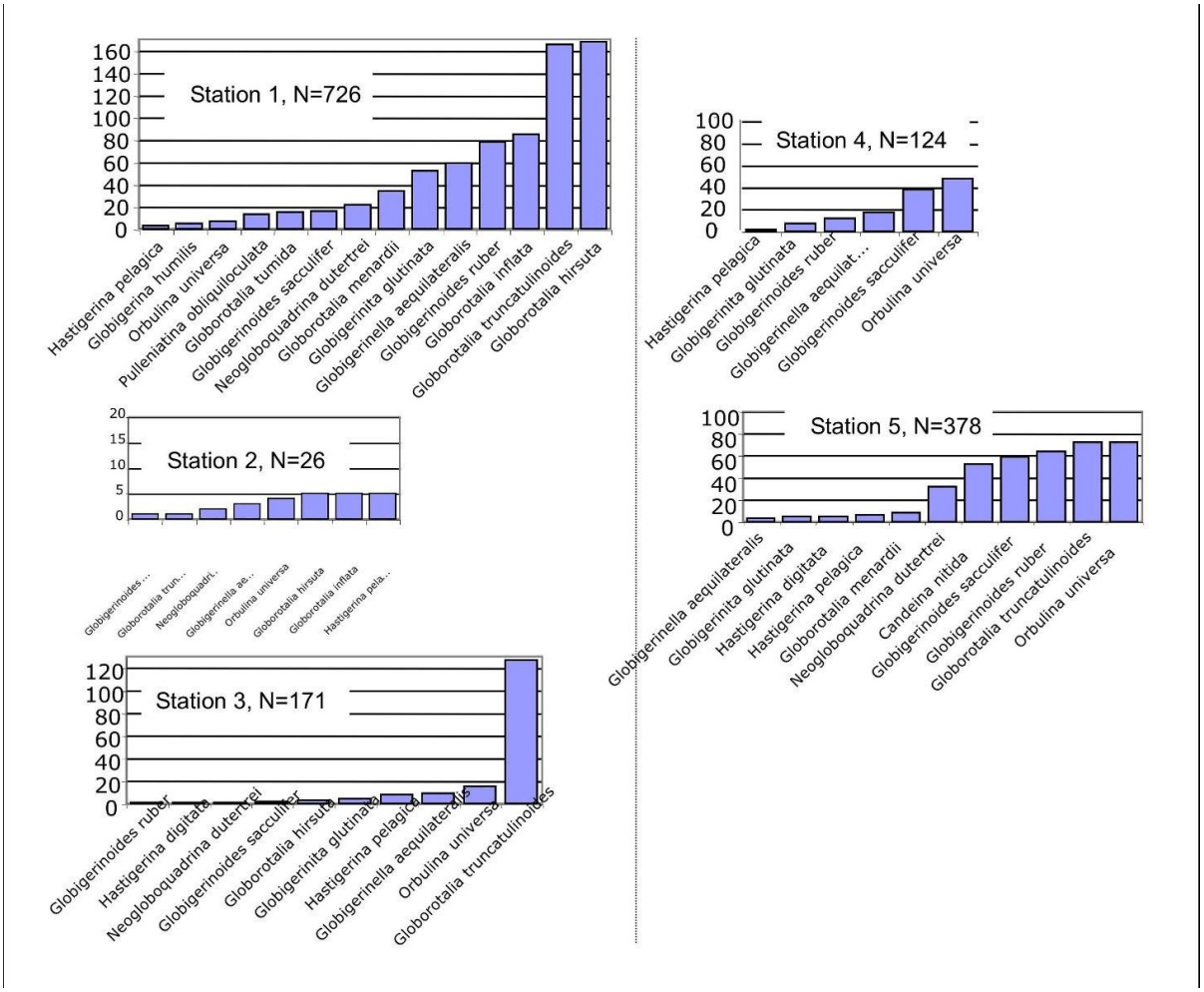


Figure 11. Number of DNA extractions realized per species and at each station. Note that all graphs are on the same scale, except for Station 2 where abundance was very low.

Future genetic analyses will allow us to solve the biological meaning of interesting morphological and ecological patterns we observe at the morphospecies level. For instance, we detected a clear change in the coiling direction of the shells of *Globorotalia truncatulinoides* between Stations 1 and 3 (Left from Right coiling shells, Figure 13A.)

The change in coiling direction in *Globorotalia truncatulinoides* is a classic in Micropaleontology and has been related to glacial-interglacial cycles. In our cruise, we observed this change not only between stations but also within depths at the same station (Figure 13B, data by S. Watanabe). Our data confirm that the Left-coiling *truncatulinoides* prefers cooler water, both in horizontal

and vertical dimensions of the oceans, and genetic data will tell us if this morphologic change is

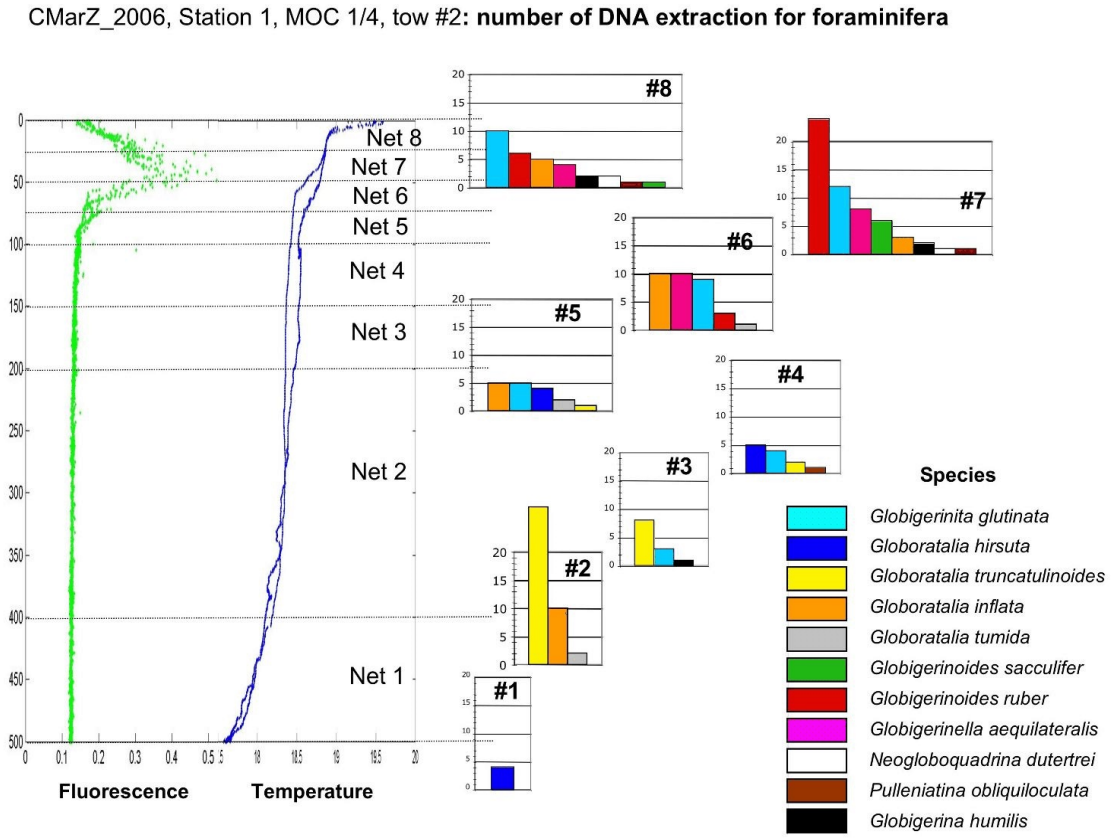


Figure 12. Number of single-cell specimens used for DNA extraction collected by depth at Station 1.

associated with speciation.

Besides foraminifera, our team worked on two other groups of giant protists building elaborate skeletons: the radiolarians and coccolithophores. During most dives, Larry Madin and Erich Horgan collected wonderfully preserved colonial radiolarians. Detailed photographs of the colonies, individual cells and their symbionts were taken, and pieces of single colonies were preserved for DNA (frozen) and morphological (formalin and ethanol) analyses (Appendix 4).

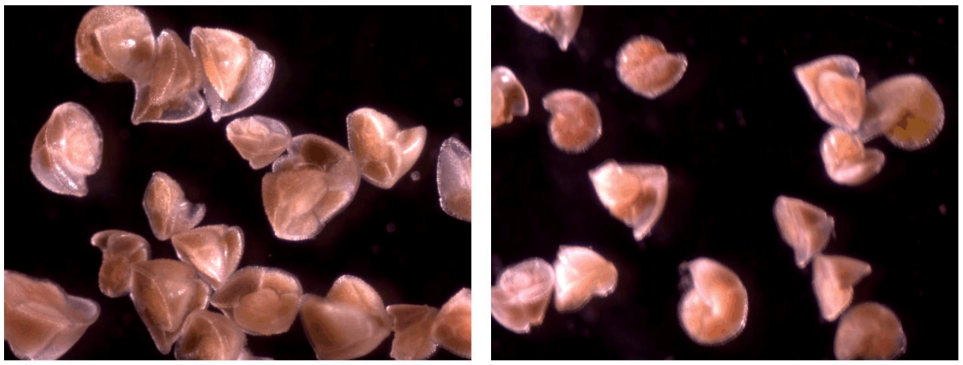


Figure 13A. Populations of Left-coiling and Right-coiling *G. ti* CMarZ_2006, Station 1, MOC 1/4, tow #2: number of DNA extraction for foraminifera **3. (Photo by C. de V**

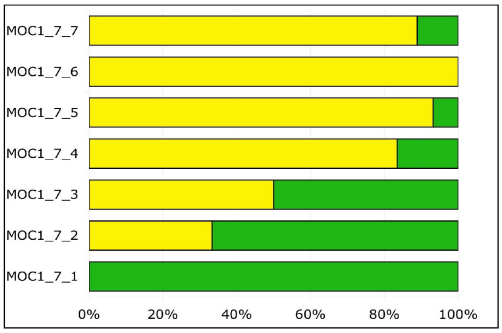


Figure 13B. Ratio of Left (green)/Right (yellow) coiling shells in the population of *G. truncatulinoides* sampled at Station 3. Data were obtained by Silvia Watanabe using the formalin preserved fraction.

Finally, an intense effort to collect coccolithophores was done by Hui Liu, graduate student at Rutgers University, as described next.

Hui Liu addition:
"It is really a great experience and rare opportunity for me to be here. The twenty days of intense working, learning, and enjoying the deep blue not only advanced my knowledge and skills in exploring the mystery of marine life, but also transformed my vision of research and life.

Other than helping with the MOCNESS sample processing, and sorting foraminifera once in a while, my major job during the CMarZ cruise was to collect coccolithophore samples for biodiversity and biogeography studies of key coccolithophore taxa, using a combination of genetic, molecular, and morphological analyses. Sea water was collected at each station from different depths using a bucket (surface), Niskin bottles (within the DCM and in intermediate waters within the mixed layer) and phytoplankton nets with 5 or 10 µm mesh size (~15 m depth). The water sample was transferred immediately to the main lab and filtered through 5 different types of membranes: Poly-Ether Sulphone for total DNA extraction, Polycarbonate for Scanning Electron Microscopy (SEM) , Cellulose nitrate for optic Microscopy, and ANODISC and AAWP for Fluorescent In Situ Hybridization (FISH). Altogether 750 liters of water were filtered and 121 filters were obtained. Ten out of twenty-nine DNA samples were selected to perform DNA extraction on board using the DNeasy plant mini kit. Large Subunit (LSU) ribosomal DNA was then amplified using the Polymerase Chain Reaction (PCR) method with primers specific to the Haptophyta (coccolithophores): Hapto4 and Leuk34r. The amplified DNA will be further used for a clone

library and DNA sequencing analyses after the cruise. Optic microscopy, SEM and FISH samples will be analyzed as well to identify the boundaries between species and life cycle stages at different depths. In addition, basic cruise track data (salinity, temperature, fluorometry, pCO2, etc.) will be needed to characterize the water-masses and hydrography of the samples' locations.

The cruise is ending soon. I'm very happy to get nice samples for my future work and I've learned a great deal. I'd like to thank everyone who worked together as a team and made everything possible, who patiently taught me how to collect and process the MOCNESS samples, who introduced different groups of zooplankton and techniques which I'm not familiar with, who helped me with collecting hundreds of liters of water, who kindly built the filtration holder for me, who generously loaned me whatever I asked for, and who made jokes and good coffee when I got tired. Finally, I want to say to Martin, 'You are the inspiration of all of us'."

14.0 Microzooplankton – Tintinnids (Barbara Costas)

14.1 Cruise Objectives

The objective was to sample the epipelagic and if possible mesopelagic regions of the tropical/subtropical waters west of the mid-Atlantic ridge to collect and identify tintinnids. This includes both traditional identification through preservation with Lugol's Iodine Solution (Acetic), "Lugal's", as well as amplification of the internal transcribed spacer region (ITS) of the rDNA gene and potentially the COI region as well.

14.2 Sampling

Two basic approaches to sampling were used for the collection and identification of tintinnids. The first sampling approach involved collection of bulk water from two depths via a 30L Niskin bottle. The second sampling approach involved examining samples collected in the smaller nets (1/4-m MOCNESS, Reeve net, and various hand-deployed Ring nets) and picking out individual tintinnids for identification and DNA sequencing. Table 9 contains the details of the various sampling activities at the stations.

14.2.1 Bulk Water Sampling: A total of 60L of water was used per depth, so water was combined from two casts. From this water a sample (500ml) was taken for later chlorophyll *a* and pigment analysis (via High Profile Liquid Chromatography, or HPCL) by filtering onto a borosilicate glass fiber filter and preserving at -80˚C. A 500 ml sample of water was preserved with Lugol's to a final concentration of 5%. This water will be examined via microscopy back at the University of Connecticut's Department of Marine Sciences (UCONN DMS) for identification and enumeration of the tintinnids to at least genus level. Any naked ciliates will also be enumerated and identified where possible. The water was then concentrated gently via reverse filtration using a 20 μm

sieve. The concentrated water was then separated into 5 aliquots (1/2, 1/6th [two replicates], and 1/18th [two replicates] of the concentrate volume) and filtered onto 3.0 µm cellulose nitrate filters. These filters were placed into 1.5 ml tubes and stabilized with a DNA prep buffer. Upon returning to UCONN DMS, the DNA will be extracted from the filters and primers specific to the Phylum Ciliophora and Class Spirotrichea will be used to amplify the ITS region. Libraries of the ciliates present at the various depths and locations will then be created allowing for comparison between depths and stations.

Table 9. Sampling activities associated with Tintinnid identification during the cruise. The table contains the cruise event number, station and cast information, and sampling activities and depth.

Event Number	Station	Cast	Sampling Activity	Depth
RB10306.004	1	2	10µm Hand Ring Net	10m
RB10406.004	1	1	Niskin bottles	10m & 75m
RB10406.008	1	2	¼-m MOCNESS	500-350m, 350-200m, 200-150m, 150-100m, 100-75m, 75-50m, 50-25m, and 25-0m
RB10406.010	1	2	Reeve Net	500m
RB10606.003	2	2	Niskin bottles	15m & 75m
RB10606.005	2	3	Reeve Net	500m
RB10906.002	3	5	Reeve Net	200m
RB10906.009	3	3	Niskin bottles	15m & 75m
RB10906.016	3	2	10µm Hand Ring Net	10m
RB11306.002	4	7	Reeve Net	200m
RB11306.007	4	2	5µm Hand Ring Net	15m
RB11306.011	4	5	64µm Hand Ring Net	Surface
RB11306.016	4	4	Niskin bottles	45m & 100m
RB11306.014	4	8	Reeve Net	200m
RB11506.003	5	9	Reeve Net	200m
RB11506.014	5	5	Niskin bottles	40m & 100m
RB11506.012	5	10	Reeve Net	200m
RB11706.006	5	6	¼-m MOCNESS	350-230m, 230-170m, 170-150m, 150-120m, 120-110m, 110-90m, 90-70m, 70-0m
RB11706.008	12	5	Reeve Net	200m

14.2.2 *Net Collection:*

14.2.2.1 Quarter-meter MOCNESS nets: Where possible, a sub-sample of the ¼-m MOCNESS live fraction was examined for the presence of any swimming (live) tintinnids and/or loricas. A sampling of empty loricas was preserved in Lugol's for further identification back at UCONN DMS. If any "live" animals (swimmers) were seen, they were pulled from the sub-sample, photographed, and set aside for DNA analysis through single cell PCR amplification and sequencing of the ITS region, and if possible COI. This work will be completed at UCONN DMS, although preliminarily analysis of preserved loricas was conducted during the cruise. Table 10 contains preliminary identification data based on the lorica analysis.

Table 10. List of ciliates found in the various net casts examined. The event number matches the cruise event log and Table 9. Tintinnid designation was the preliminary number given to tintinnids (or nakeds) based on lorica shape and size as well as swimming behavior (live). Please refer to Appendix 5 for images and preliminary identification of the tintinnids listed. The comment column describes how the tintinnid (or naked) was processed.

Event Number	Tintinnid Designation	Comments
RB10306.004	Tin 1	Individual single cells picked from ½ of sample. Also digital images and Lugol's preserved sample.
	Tin 2	Individual single cells picked from ½ of sample. Also digital images and Lugol's preserved sample
	Tin 3	Individual single cells picked from ½ of sample. Lugol's preserved sample.
RB10406.008		
1. Net 1	Tin 2 and Tin 8	Lugol's preserved sample (no lives)
2. Net 2	Tin 2, 3, 5, and 6	Lugol's preserved sample (no lives)
3. Net 3	Tin 2, 3, 5, 6, and 8	Lugol's preserved sample (no lives)
4. Net 4	Tin 2, 3, 5, 6, and 8	Lugol's preserved sample (no lives)
5. Net 5	Tin 2, 2a, 3, 6	Lugol's preserved sample (no lives)
6. Net 6	Tin 2, 2a	Lugol's preserved sample (no lives)
7. Net 7	No loricas observed	Lugol's preserved sample (no lives)
8. Net 8	Tin 3 and 6	Lugol's preserved sample (no lives)

Event Number	Tintinnid Designation	Comments
RB10406.010	Tin 2	Individual single cells picked from sample. Lugol's preserved sample.
	Tin 5	Individual single cells picked from. Also digital images and Lugol's preserved sample.
	Tin 6	Individual single cells picked from. Also digital images and Lugol's preserved sample.
	Tin 7	Individual single cells picked from sample. Lugol's preserved sample. No picture
	Tin 8	Individual single cells picked from sample. Lugol's preserved sample. No picture
RB10606.005	Tin 8	Individual single cells picked. Individuals placed into DNA buffer (bulk). Picture and Lugol's preserved.
	Tin 2	Individual single cells picked. Individuals placed into DNA buffer (bulk). Picture and Lugol's preserved.
	Tin 2a	Individual single cells picked. Individuals placed into DNA buffer (bulk). Picture and Lugol's preserved.
	Tin 9	Individual single cells picked. Individuals placed into DNA buffer (bulk). Picture and Lugol's preserved.
	Tin 6	Individual single cells picked. Individuals placed into DNA buffer (bulk). Picture and Lugol's preserved.
	Tin 5	Individual single cells picked. Individuals placed into DNA buffer (bulk). Picture and Lugol's preserved.
	Tin 10	Individual single cells picked. Individuals placed into DNA buffer (bulk). Picture of live.
RB10906.002	Tin 11	Individual single cells picked. Individuals placed into DNA buffer (bulk). Picture and Lugol's preserved.
	Tin 2	Individuals placed into DNA buffer
	Tin 12	Individual single cells picked. Picture of live.

Event Number	Tintinnid Designation	Comments
	Tin 13	Individual single cells picked. Individuals placed into DNA buffer (bulk). Picture and Lugol's preserved.
	Tin 14	Individual single cells picked. Individuals placed into DNA buffer (bulk). Picture and Lugol's preserved.
	Tin 6	Individuals placed into DNA buffer
	Tin 5	Individual single cells picked
RB10906.016	Tin 11	Few, but picked individuals and placed into DNA buffer
RB11306.002	Tin 2	Individual single cells picked. Individuals placed into DNA buffer (bulk). Picture and Lugol's preserved.
	Tin 11	Individual single cells picked. Individuals placed into DNA buffer (bulk). Picture and Lugol's preserved
	Tin 15	Individual single cells picked. Individuals placed into DNA buffer (bulk). Picture and Lugol's preserved
	Tin 16	Individual single cells picked. Individuals placed into DNA buffer (bulk). Picture and Lugol's preserved
	Tin 17	Individual single cells picked. Individuals placed into DNA buffer (bulk). Picture and Lugol's preserved
	Tin 18	Individual single cells picked. Individuals placed into DNA buffer (bulk). Picture and Lugol's preserved
	Tin 9	Individual single cells picked. Picture and Lugol's preserved.
	Tin 19	Individual single cells picked. Picture and Lugol's preserved.
	Tin 2a	Individual single cells picked
	Tin 5	Individual single cells picked. Individuals placed into DNA buffer (bulk).
	Tin 14	Individuals placed into DNA buffer.

Event Number	Tintinnid Designation	Comments
	Tin 20	Individual single cells picked. Picture and Lugol's preserved
	Tin 8	Saw empty loricas
RB11306.007	Naked A	Individual single cells picked. Picture and Lugol's preserved
	Naked B	Picture and Lugol's preserved
	Naked C	Picture and Lugol's preserved
	Tin 19	Individual single cells picked
RB11306.011	Tin 19	Individual single cells picked
RB11306.014	Tin 15	Individuals placed into DNA buffer
	Tin 17	Individuals placed into DNA buffer
	Tin 19	Individuals placed into DNA buffer
	Tin 14	Individuals placed into DNA buffer
	Tin 5	Individuals placed into DNA buffer
	Tin 16	Individuals placed into DNA buffer
	Tin 2	Individual single cells picked
RB11506.003	Tin 11	Individual single cells picked. Picture and Lugol's preserved.
	Tin 16	Individual single cells picked. Picture and Lugol's preserved.
	Tin 19	Individual single cells picked. Picture and Lugol's preserved.
	Naked 21	Individual single cells picked. Picture and Lugol's preserved.
	Tin 15	Individual single cells picked. Picture of live.
	Tin 22	Individual single cells picked. Picture of live.
	Tin 17	Individual single cells picked. Picture of live.
	Tin 5	Individuals picked into DNA buffer
	Tin 8	Saw empty loricas
	Tin 20	Saw empty loricas
RB11506.012	Tin 16	Individuals picked into DNA buffer
	Tin 11	Individuals picked into DNA buffer
	Tin 19	Individuals picked into DNA buffer

Event Number	Tintinnid Designation	Comments
	Tin 5	Individuals picked into DNA buffer
RB11706.006		
1. Net 1		No tintinnids seen (empty loricas or live)
2. Net 2		No tintinnids seen (empty loricas or live)
3. Net 3	Tin 20	Individual picked for single cell. Picture of live. Also preserved empty loricas.
	Tin 17	Preserved empty loricas (Lugol's)
	Tin 22	Preserved empty loricas (Lugol's)
4. Net 4	Tin 20	Preserved empty loricas (Lugol's)
	Tin 22	Preserved empty loricas (Lugol's)
5. Net 5	Tin 6	Individual picked for single cell. Picture of live.
		Preserved empty loricas (Lugol's)
	Tin 20	
6. Net 6	Tin 22	Preserved empty loricas (Lugol's)
7. Net 7	Tin 8	Preserved empty loricas (Lugol's)
	Tin 22	Preserved empty loricas (Lugol's)
8. Net 8		No tintinnids seen (empty loricas or live)
RB11706.008		
	Tin 19	Individual single cells picked. Picture of live
	Tin 11	Individual single cells picked. Picture of live.
	Tin 16	Individual single cells picked. Picture of live.
	Tin 15	Individual single cells picked. Picture of live.
	Tin 23	Individual single cells picked. Picture of live.
	Tin 20	Saw empty loricas.

14.2.2.2. Sixty-four µm Reeve Net Tows: Water from Reeve Net tows was passed through a 150 µm mesh and then concentrated via gentle filtration with a 20 µm mesh. This concentrate was then examined for live tintinnids. Assumed similar species (based on general characteristics and swimming pattern) were then picked. Digital photos were taken, some were preserved with Lugol's for further identification once back at UCONN DMS, and others set aside for DNA analysis through single cell PCR amplification and sequencing of the ITS region, and for many the

COI as well. In addition, "same species" that seemed abundant were put into DNA prep buffer, which will allow extraction of the entire genome. Most single cell PCRs (Stations 1-4) were completed on-board the R/V Ron Brown. Station 5 and the actual sequencing analysis will be completed at UCONN DMS. Table 10 contains preliminary identification data based on lorica analysis.

14.2.2.3. Surface Ring Net Tows (5, 10, and 64 μm): Samples from several tows were examined for the presence of tintininds. Live tintinnids were picked, photographed, and, where possible, preserved in Lugol's for further identification. Others of similar species were set aside for DNA (single cell) analysis. The PCR amplification for these samples was completed on the R/V Ron Brown, but sequence analysis of the ITS region and potentially the COI region will be completed at UCONN DMS. Table 10 contains any preliminary identification data based on lorica analysis. Note that the surface tows throughout the cruise had no or very few tintinnids, and therefore limited samples exist from these tows.

14.3 Discussion/Preliminary Observations

Little sampling of this region has previously been done in regards to the tintinnid community. Preliminary work has identified 22 potential tintinnid species and one potential naked ciliate species ("nakeds"). Appendix 5 contains images and preliminary identification where possible. Further examination of the preserved samples as well as finalizing the DNA analysis will clarify the number of species picked and identified. In addition, it is expected that examination of the preserved samples will provide for additional species, *i.e.* those smaller tintinnids that could not be properly captured in the relatively large-mesh nets (64 μm).

The cruise produced ten community DNA samples (two depths at each station) and ten corresponding preserved water samples from the bulk water sampling. In addition, there are Lugol's preserved water samples from the various Reeve Net tows examined as well as individual loricas preserved from the these and other net samples (see Table 9). Over 500 tintinnids were picked for single cell DNA analysis (this includes multiples from assumed similar species), as well as an additional 400 animals placed into DNA prep buffer for bulk extraction of potentially 12 preliminarily identified species.

Prior to the cruise, we would have expected to find the tintinnids in the upper water column, *i.e.* near the phytoplankton (their expected food source). Examination of the samples from the various surface (to 15 m) ring net tows indicates that, at least at the five stations sampled, the tintinnid community is generally below 15 m. The two ¼-m MOCNESS tow samples that were examined for tintinnids (the only net system capable of capture), indicates that the tintinnid biomass is quite deep in the water column, and in the case of the MOC-¼ cast 2, down to 500m.

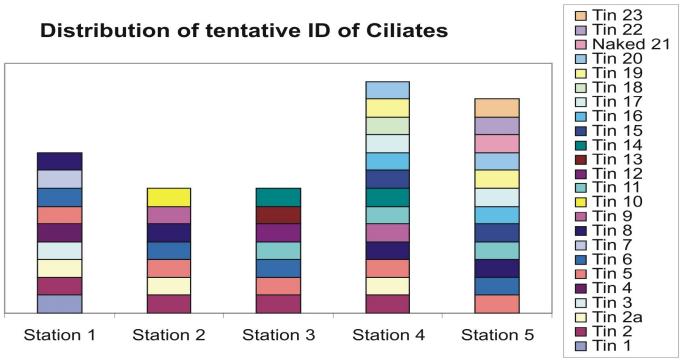


Figure 14. Distribution of tentative species found by station. Blocks are only representative of presence/absence, not abundance. Station 4 had the most diversity followed by Station 3. Several tentative species were found at multiple stations.

In fact, in both MOC-¼ casts 2 and 6 no tintinnid loricas (or swimmers) were found to be in the samples from the top net (surface waters).

The overall diversity of the tintinnids based on the preliminary work and identification indicates the most species at Stations 4 and 5. There is also the potential that several of the same species were present throughout much of the sampling region, including one at Stations 1 through 4 and two at Stations 2 through 5. (See Table 10 and Figure 14). Preliminary work does not indicate that any one species was present at all 5 stations; however, the analysis of the bulk water DNA may show otherwise.

15.0 Pelagic fishes (Tracey Sutton)

The large-gear bathypelagic sampling conducted during the 2006 CMarZ cruise aboard the NOAA research vessel Ron Brown provided a unique opportunity to sample and census deep-pelagic fishes that are often missed by standard trawling procedures (i.e., smaller, but more numerous forms that pass through the mesh of fisheries-style trawling gear). The combination of discrete depth sampling via the MOCNESS, fine-mesh nets designed and constructed specifically for this endeavor, and an experienced operating crew has generated a valuable and quantitative collection of specimens from the poorly known bathypelagic realm. A brief summary of quantitative methods and preliminary results are provided below.

15.1 Methods

The primary collecting gear for deep-pelagic fishes were the 1-m and 10-m MOCNESS midwater trawls, outfitted with 333-μm mesh nets (excepting the initial oblique deployment net of 3-mm mesh). Immediately following gear retrieval and sample wash-down, all fish specimens were sorted from the catch and processed completely in a systematic fashion. All specimens were identified, measured to the nearest 0.1 mm (standard length) and enumerated. Biomass (g wet weight) was estimated for all specimens using taxon-specific length/weight regressions. Abundance and biomass data were then pooled for each net sample, tow, and station to gain a quantitative view of fish assemblage structure, both in terms of biodiversity and relative composition. Tissue samples were taken of selected species for DNA-barcoding analyses.

15.2 Results

15.2.1 Assemblage Structure. A total of 3,965 fish specimens were collected, representing minimally 127 species (84 genera), from 42 families. The high ratio of genera and families to total species number is often a truer measure of diversity than species counts *per se*, as high counts of the latter are often the result of taxonomic 'splitting' of certain focus groups. A complete species list, with raw abundances (not normalized for volume filtered) by station is presented in Appendix 7. Two things were readily apparent from initial scan of these data: 1) we did not approach an asymptote for species versus effort, as reflected by the high numbers of new species in later trawls; 2) excepting the numerical dominance of the genus *Cyclothone* (68% of all

specimens), diversity as a function of species number per total specimen abundance was quite high – roughly two out of three bathypelagic species were represented by less than five specimens.

As expected for low-latitude bathypelagic ecosystems far removed from topographic features (i.e. ridges, canyons), fish biomass was quite low. The entire fish catch from the cruise amounted to just under 500 g wet weight biomass. As with abundance, the genus *Cyclothone* dominated the biomass of the assemblage, but to a lesser degree than with numbers, since the biomass contribution by large dragonfishes (e.g. *Rhadinesthes, Eustomias, Photonectes*) was quite significant.

Integration of current knowledge on species' vertical distributions with catch data from this cruise suggests some degree of contamination from shallower depth strata, particularly from mesopelagic myctophid species (*Diaphus, Lepidophanes*), but this amount was not major compared to the taxa that we caught that are considered truly bathypelagic. These taxa include the ceratioid anglerfishes (8 species from 5 families), the bathypelagic eels (*Eurypharynx, Saccopharynx*, and *Serrivomer*), the great swallowers (*Chiasmodon* and *Pseudoscopelus*), and the whalefishes (*Cetostoma* and *Rondeletia*). Perhaps the best indicator of the discreteness of the bathypelagic sampling in these waters was what we *didn't* get – the upper mesopelagic zone here is generally dominated by myctophids (*Diaphus, Notolychnus, Myctophum*) and lightfishes (*Vinciguerria* and *Pollichthys*) and shallow hatchetfishes (*Maurolicus, Valencienellus*). These represented a minor component of abundance and biomass, but did add to the species richness total. A brief foray into the mesopelagic zone during the last MOC10 deployment (MOC-10-07-Net 4) showed fairly conclusively that the low catches we had observed in the deep tows were a true measure of the low biomass at depth rather than a flaw in the fishing ability of the new MOCNESS configuration. Indeed, nearly 1,000 specimens were taken in this net, including some very large myctophid and dragonfish specimens. This sample would be considered a large haul with standard midwater trawls (i.e. Tucker trawl with 3-mm mesh).

15.2.2 Rare species: One of the most exciting features of bathypelagic trawling is that every tow potentially contains undescribed or very rare species. Some of the notable catches from this cruise were:

- 5 species of the genus *Eustomias* (most cruises usually generate only one or two specimens); this genus is an ideal target for addressing the oceanic species concept. There are presently 115 described species in this genus, all separated by a single character (barbel form). Tissue was taken from all for barcoding, which may help unlock this mystery.
- Male anglerfishes from 5 families were taken. The taxonomy of male ceratioids is so poorly known due to their rarity and undersampling, keys do not exist for most species. As with *Eustomias*, fish tissue was taken from all to match them with keys for females, thus enabling the construction of a key for the most speciose bathypelagic fish group.

- Leptostomias sp. nov. (1 specimen): this is one of the most well-defined genera of dragonfishes, all of which I am quite familiar with. All described species have a barbel at least 50% of their body length (this specimen is 10%) that terminates in a simple bulb with either one or two filaments. This specimen has a barbel with well-developed tentacles (> 12 in number), each of which is innervated and vascularized.
- Pseudoscopelus "sp. A" cf. *obtusifrons* (1 specimen): this specimen varies from its nearest neighbor (P. obtusifrons) in the pattern of photophores and the form of the premaxillary teeth, both of which are diagnostic characters for the genus.
- Astronesthes cf. *indicus* (1 specimen): I am quite familiar with this tropical species, and the specimen that we took was shorter (lower photophore counts) and had a longer barbel than the classic form of the species.

16.0 Larval Fish (C.B. Lalithambike Devi)

The zooplankton collected using MOC1 and MOC10 were analyzed in the ship's lab immediately after each tow. The fish larvae were picked live from the whole sample and were kept in the cold room for further analysis. The subsampled zooplankton preserved in ethanol and formaldehyde were also examined and the larvae picked out.

The fish larvae were identified into different taxa.

- 43 species belonging to 18 families were present in the live samples analyzed.
- The rest of the samples were preserved in formaldehyde for further studies after the cruise.
- Maximum abundance and diversity(4 families and 7 species) were observed at lat 29° 57'N and lon 71° 01'W (MOC1 Tow 3 Net 5).
- Abundance and diversity decreased from there. Only 2 families with 7 species were found at 25° 00'N and 59° 56'W (taken from 0-1000m).
- At lat 33° 38'N and lon 69° 47'W, 5 species were encountered in 4 families (MOC10 Tow 1 Net 4).
- In all the three locations, the mesopelagic groups Myctophidae and Gonostomatidae were dominant.
- Two of the *Cyclothone* species (*C. braueri* and *C. pallida*) contributed the most to the numerical abundance.
- Maximum species diversity was observed in the family Myctophidae (15 species).
- *Notoscopelus resplendens* and *Benthosema glaciale* were the dominant species found in the area.
- *Thunnus sp.* was found only in one sample (MOC10 Tow5 Net 4) at 19° 49'N and 54° 44'W.
- The members of the Percoids were rare.
- 15 species were given for barcoding.

The lanternfish family Myctophidae is the most widespread family of midwater fish in the world ocean. Their larvae are highly prominent in the open ocean plankton samples.

17.0 Team DNA Sequencing (Rob Jennings, Paola Batta Lona, Brian Ortman, Ebru Unal, Leo Blanco Bercial)

Samples for DNA analysis were preserved in nondenatured 95% ethanol for long-term storage after DNA extraction. Most samples were extracted within a few days of sorting and placement in 95% ethanol. For species smaller than ~25mm^3, at least one intact individual was retained from at least one collection as a physical voucher. Up to three individuals from the remaining collections were removed and the entire organism extracted. For species larger than ~25mm^3, an intact individual from one collection was retained where possible, as long as three other individuals were present from which to remove a small portion for extraction (i.e., at least 4 total individuals). If fewer than four individuals were collected, the smallest portion allowable for DNA extraction was removed from each from a non-taxonomically important region of the specimen.

DNA extraction was performed with the Qiagen DNeasy Kit, using standard protocols. Tissues were dissected under sterile conditions, and digested with proteinase K until no solid pieces of tissue were visible. Purified genomic DNA was eluted in Buffer AE, supplied in the DNeasy Kit. Elution volumes varied to reflect original individual size, but in general were 100-200 L.

An approximately 650 base pair region of the cytochrome oxidase C subunit I (COI) gene was amplified using standard primers and thermal cycler profiles, performed in a Perkin-Elmer 480 thermal cycler. PCR products were electrophoresed through 1% agarose/TBE gels, stained with ethidium bromide, and visualized under UV light. Target bands were purifed from the PCR reactions using the Qiagen PCR Cleanup Kit, following manufacturer's protocols. Purified COI PCR products were eluted in Buffer EB (10mM Tris) in preparation for sequencing.

Sequencing reactions consisted of purified COI products, one of the PCR primers as sequencing primer, and the BigDye 3.1 Terminator sequencing chemistry (ABI). The reactions were one-quarter standard volume (1/4X) and were performed in an ABI 9600 thermal cycler according to manufacturer's protocols. The sequences were then purified by ethanol/EDTA/sodium chloride precipitation, followed by centrifugation to pellet the sequenced DNA. Sequences were washed with 80% ethanol and re-centrifuged, then dissolved in 10 L high-quality deionized formamide (HiDi, ABI) in preparation for sequence determination. This was conducted on a 4-capillary 3130 DNA Sequencer (ABI) using a 50cm capillary array and standard operating conditions. A one-hour electrophoresis time on the 3130 produced approximately 500-700 base pair reads in one direction, providing complete or almost complete bi-directional coverage of the COI gene fragment.

Both DNA strands were aligned for each single individual sequenced, and checked against each other for discrepancies. All discrepancies were corrected by eye (or, if discrepancies were not easily resolvable, the sequences were deemed unreadable and the PCR repeated) before producing edited, finalized COI barcodes.

The molecular group had an extremely successful cruise. We assembled our fully functional lab before the ship left port, and were already running test PCRs and sequencing reactions while underway to the first station. After an initial burst of sequencing of some of the samples from Stations Zero and One, the team had to develop a modified sequencing reaction cleanup protocol. We discovered that the high humidity and salty air were causing precipitation in our ethanol and EDTA solutions. Upon fixing this problem, the sequencer ran trouble-free, and a lot of hard work reduced the backlog of samples to a large extent.

Combining Stations 0-5 (and including Station 3b), team DNA catalogued over 1200 individual organisms, comprising 523 species from 12 phyla (Table 11). Of these, we extracted DNA from about 770 individuals, and were successful in PCR amplifying roughly 80% of these individuals. Complete, edited barcodes (requiring good sequence reads in both directions) were obtained for about 100 species, and processing is still ongoing for another 100 species. Given our goal of sequencing three individuals per species, the ~200 COI barcodes obtained *in barco* reflect a sequencing effort of many hundred reactions. This level of output reflects the hard work and perseverance of the entire DNA team and represents perhaps an order of magnitude higher throughput than most land-based labs of our type and size typically yield.

Table 11. Species collected and submitted for sequencing and individuals with DNA extracted.

Taxonomic group		# Species Collected	# Individuals Extracted
Arthropods			
	Amphipoda	31	47
	Copepoda	138	190
	Mysidacea	6	
	Other Crustacea	18	23
	Euphausiidae	14	20
	Ostracoda	58	100
Cnidaria			
	Anthozoa	1	0
	Hydrozoa	103	166
	Scyphozoa	7	12
Mollusca			

Taxonomic group		# Species Collected	# Individuals Extracted
	Gastropoda	50	107
	Other Mollusca	27	17
Others			
	Cephalochordata	1	2
	Chaetognatha	1	1
	Ctenophora	22	31
	Echinodermata	1	1
	Larvacea	12	26
	Nemertea	1	3
	Polychaeta	3	4
	Thaliacea	14	18
	Pisces (larval)	15	
	Total	**523**	**768**

Team DNA did not get to as much on-board analysis and comparison of the DNA barcodes we generated as we might have liked. Nevertheless, many engaging conversations with the taxonomists have left us with intriguing molecular puzzles to pursue. Some of these questions reflect ongoing or proposed projects, while others came up *de novo* as we worked. These lines of research can be partly answered once we finish analyzing the barcodes already collected; full answers may require more samples and sequencing. Some of these questions involve using bulk extraction and cloning of amplified DNA to identify prey items in the guts of several species (we have gut samples from fish suspected of eating siphonophores, as well as from siphonophores suspected of eating fish). Others involve sequencing two alternate forms of what has to date been described as a single species (e.g., a “large” and “small” form, or a form with colored spots and a form without spots) to see if they truly belong to the same species. In many instances, connecting the taxonomic question to the molecular methodologies required to answer it might never have happened (or at least taken much longer to arise) if not for the presence of both kinds of experts on this cruise.

Apart from initiating research questions, the sequences collected on this cruise are a tremendously valuable addition to the catalogue of DNA barcodes for marine zooplankton, particularly in the under-sampled deep waters trawled on this cruise. As stated by others, although overall biomass was low in these deep layers, species diversity was quite high, allowing us to obtain DNA barcodes for a vast array of species. Our collections include many of the same species from different stations, which will enable us to investigate the spatial scale of genetic cohesiveness in the future. Although many zooplankton species are usually thought to have huge abundances and effective population sizes, the various regimes we moved through over the course of our cruise

track (subtropical, Sargasso, tropical, etc.) could possibly create barriers to gene flow that might reveal themselves as we analyze our samples more fully.

18.0 Silhouette photography, CMarz web site (Nancy Copley and Dicky Allison)

18.1 Silhouette Photography (N. Copley)

Silhouette photographs were taken of two MOC-1 night tows (8 nets each) , from stations 1 and 2 (MOC-01-002 and MOC-01-003) for later digital length and abundance analysis. In order to accomplish the photography, the ship's salinity room was converted into a darkroom. This room proved adaptable, after a few modifications, due to its small size and double entry which excluded almost all light. The overhead lights had to be removed because there was no separate light circuit independent of the rest of the Hydo lab in the salinity room. Heavy black cloth was placed over both the inner and outer doors to keep out the light and duct tape was used to cover the internal lights of the Guildline Autosal which could not be turned off or moved. Following a seminar on using the WHOI Digitizer program which is used to measure and count zooplankton, the darkroom method of taking silhouette photographs was demonstrated to all those who were interested in seeing this technique.

In the wet lab, samples were split with a Motoda box splitter to a degree that allowed a sample to lie in a single layer (one specimen thick) in an 8" x 10" plexiglass box, typically between zero split and 1/16th split. In the darkroom, a sheet of photographic paper (Ilford multigrade IV RC Deluxe, 8" x 10") was labeled with tow, net and split information using a waterproof pen and placed in the box. A collar was inserted to hold the paper down and prevent plankton from slipping underneath, and then the sample was gently poured into the box. Timing the moment of exposure to the rocking of the ship was attempted so that the sample was not congregated on one side of the film but this was not always successful. A camera flash held about 3' above the sample was used to expose the film which was then developed using Kodak Polymax T developer (1-2 minutes), Stop Bath (10 seconds), and Rapid Fixer (3 minutes). The films were washed in a tray of circulating water for at least 10 minutes before rinsing with a dilute solution of Photo Flo to prevent spotting and hung to dry. Scanning the photographs and analyzing them will be done post-cruise.

18.2 CMarZ Web site (N. Copley and D. Allison)

A web site for the cruise was set up just prior to sailing and was maintained using ssh and ftp during the cruise. The url is www.cmarz.org/CMarZ_Cruise_April. "24/7" internet access had only recently become available at sea and we used it to the maximum extent possible on the Ron Brown. Both the Chief Scientist reports and the Teacher-at-Sea daily logs were posted. A photo gallery of the science party, of animals found in the samples, and of life on board the ship were

also made available on these pages. Several short film clips were placed on the site: the dive boat being launched down the side of the Ron Brown, several types of gelatinous zooplankton swimming, the launching the three MOCNESS systems, an overview of how the samples were retrieved from the net and initially examined, and a view of the gene sequencer and associated computer output. Periodic updates to the cruise track were posted. A subdirectory was created for media outlets to download high resolution photographs and movie clips, www.cmarz.org/CMarZ_Cruise_April/images_press. These were accessed widely by print and internet sites worldwide.

Figure 15. Page from the cruise website gallery of zooplankton showing a variety of the zooplankton captured at sea.

19.0 Training on Zooplankton Sampling and Molecular Analysis (Chaolun Li)

As a researcher from the Institute of Oceanology, Chinese Academy of Sciences, and a member of CMarZ, I was pleased to participate in this CMarZ cruise funded by NOAA and to achieve my expected objectives.

Zooplankton sampling in the deep sea: A practicable and effective sampling method is essential to biodiversity study in the deep sea. With the advent of multiple opening-closing net systems in the mid-1900s, high-resolution sampling of the bathypelagic and abyssopelagic zones became possible. One of my objectives on this cruise was to become familiar with the MOCNESS, which was used to sample zooplankton throughout the water column. I received substantial training with the structure, working principles, and operation of the MOCNESS. I participated in the operation of the gear from the installation and loading of the nets to the setup and testing of the MOCNESS electronics. I also learned how to control the towing of the nets in realtime through the use of the deck unit and software controls and display.

Training of the molecular analysis of zooplankton: Shipboard molecular analysis of zooplankton was one of the most successful aspects of work on this cruise. Another of my objectives was to learn as much as possible about the molecular analysis of zooplankton. With the kindness and patience of the people in the DNA sequencing group, I experienced the whole process of COI analysis of zooplankton. Ebru Unal taught me about the process from DNA extraction and purification to PCR amplification. Rob Jennings showed me how to make a gel, do electrophoresis, and image analysis. This training will advance my skills in molecular analysis on zooplankton and help to unify the molecular approaches for zooplankton research ongoing at our institute in China. This will help to produce coordinated data from the China Sea and ensure its integration into the wider global database.

20.0 ARMADA Teacher at Sea Project (Joseph Catron,)

20.1 Objectives

As an ARMADA Teacher at Sea, I had the basic responsibility of participating in the CMarZ scientific endeavor in a capacity that would benefit the research process. In addition it was expected that I keep a journal of my experiences on the Ron H. Brown, and make these journals accessible via the Internet. Funding for my travel, and participation were provided by the ARMADA Project, through the University of Rhode Island. This program, in part, is designed to immerse science teachers in a real-world scientific investigation aboard NOAA ships. It is ARMADA's expectation that these experiences will enrich the teacher, and in turn be shared with their colleagues and students. Beyond my basic requirements, I wanted to obtain a few practical

ideas from the CMarZ project that I could develop into lesson plans, learn of career opportunities that my students may benefit from, remain in contact with my classroom, and gain a better appreciation for the ocean, which I teach about without having ever spent time at sea.

20.2 Outcomes

The basic expectations of my participation in the scientific process were met. Much of the scientific work in the CMarZ project required expertise in taxonomic identification of zooplankton. This skill is not easily transferable in a short amount of time. Therefore, I did not aid in this process, although I would have enjoyed learning to become proficient in identifying at least one major group of organisms. I did learn many specifics about the zooplankton that live in the pelagic oceans. The DNA barcoding lab was engaged in problem-solving and also under a tight schedule, so direct participation in their work was not possible. I did however get to spend time in the lab learning the process of DNA extraction, amplification, and sequencing. My direct support of the CMarZ project came from the help I provided in record keeping, launching and retrieving the MOCNESS systems, preserving specimens, and in general helping anywhere I was needed or could be used. I feel I was an asset to the CMarZ project in this respect.

While interacting with the participants on the CMarZ study, I was able to develop two lesson plan ideas, and I am working out the details of a third lesson. One lesson will involve students using silhouette photography, used by Nancy Copley at WHOI. I will have students use silhouettes to compare abundance, diversity, and biomass between the pelagic zones. Another lesson idea I developed was related to COI genes and microarrays. I penciled out a lesson that would teach students, in general, how a microarray chip can be used to test for species presence from a mixed DNA sample collected in a plankton tow. The third lesson is currently still in the planning stage. I would like to come up with a way to integrate the physics of light and pigments with the biology of bioluminescence of deep-sea organisms. Although these lessons are not in a final and ready-to-use format, I am pleased to have 3 relevant and creative lessons plan ideas.

The daily journal I was required to write, and post on the Internet worked well, thanks to Dicky Allison from WHOI. She was able to help edit my journal writing, and post my writings on the CMarZ Cruise Website. I was able to use this protocol to communicate with my students. My classes were covering animal taxonomy at the time, which was also occurring daily aboard the ship. I used many of the journal entries to introduce the students to different marine taxonomic groups. Each day, a question was posed to the students. They were asked to respond to me using email. This process was slow. I was slightly disappointed not to receive more answers in a timely fashion. This is primarily a reflection on not being able to communicate directly with my classroom. In general however, I feel the journaling and classroom connection was successful.

To address all of the things I have learned during this cruise would require a lengthy response.

Having never been to sea, much of what I experienced was novel and each day was filled with a plethora of learning. One of the most important things I think my students will benefit from is what I learned about how important it is to be a scientifically literate person. During the cruise, press conferences occurred and reporters later printed what we were accomplishing on this project. In some instances, their reporting was grossly distorted. This provided me with a two-fold lesson. First, there is a need for the average person to be scientifically literate, and the other is that what appears in the general media about science may not always be accurate. All students should strive to become literate in science, as well as intelligently skeptical of what they read. I learned to better appreciate the great expanse of the ocean, as well as more details on its nature than I will include in this report. I am sure the next time we study the ocean in class, it will be with greater insight and detail. Finally, I have several career ideas to share with students when I return. These careers range from working as an engineer aboard a NOAA ship, to conducting scientific research at the Woods Hole Oceanographic Institution.

20.3 Acknowledgments

This cruise has been rewarding and enjoyable. All of my basic needs were well met, and my professional expectations were accomplished. I would like to thank Jill Johnen and Andrea Kecseks from the ARMADA Project for making this cruise possible. I am thankful to Ann Bucklin from AVERY Point, for helping me get set up to participate in the CMarZ project. I was disappointed that I did not get to meet her in person. I would like to give special thanks to Peter Wiebe, Nancy Copley, and Dicky Allison, from WHOI, for helping me find my niche, aiding me in meeting my goals, and for making this cruise a success.

CRUISE PARTICIPANTS
Science Party (Name, Institution)

Peter Wiebe (Chief Scientist)	Woods Hole Oceanographic Institution,USA
Dicky Allison	Woods Hole Oceanographic Institution, USA
Martin Angel	National Oceanography Centre, UK
Leo Blanco Bercial	University of Oviedo, Spain
Joe Catron	Billings High School, Billings, Montana, USA
Nancy Copley	Woods Hole Oceanographic Institution, USA
Astrid Cornils	Alfred Wegener Institute, Germany
Barbara Costas	University of Connecticut, USA
Colomban de Vargas	Station Biologique, France
Lalithambika Devi	National Institute of Oceanography, India
Hege Øverbø Hansen	Institute of Marine Research, Norway
Russ Hopcroft	University of Alaska, USA

Erich Horgan	Woods Hole Oceanographic Institution, USA
Rob Jennings	University of Connecticut, USA
Mikiko Kuriyama	University of Tokyo, Japan
Chaolun Li	Institute of Oceanology, China
Dhugal Lindsay	JAMSTEC, Japan (& Australia)
Hui Liu	Rutgers University, USA
Paola Batta Lona	University of Connecticut, USA
Larry Madin	Woods Hole Oceanographic Institution, USA
Hiroyuki Matsuura	University of Tokyo, Japan
Brian Ortman	University of Connecticut, USA
Francesc Pagès	Institut de Ciències del Mar, Spain
Saramma Panampunnayil	National Institute of Oceanography, India
Tracey Sutton	Harbor Branch Oceanographic Institution, USA
Yurika Ujiie	University of Geneva, Switzerland
Ebru Unal	University of Connecticut, USA
Silvia Watanabe	Universidad de Buenos Aires, Argentina

Ship's Officers and Crew

Gary Petrae	Captain
Stacy Birk	Commander
Elizabeth Jones	Lieutenant
Jackie Almeida	Ensign
James Brinkley	Ensign
Priscilla Rodriguez	Lieutenant Commander U.S. Public Health Service
Frank Dunlop	Chief Engineer
Keegan Plaskon	1st Assistant Engineer
Gordon Gardipe	2nd Assistant Engineer
Wayne Smith	3rd Assistant Engineer
Nick DiNicola	Wiper
Ben Zielke	Wiper
Bruce Cowden	Chief Bosun
David Owen	Bosun Group Leader
Reginald Williams	Deck Utilityman
Victoria Carpenter	Able Bodied Seaman
Phil Pokorski	Ordinary Seaman
Mary O'Connell	Ordinary Seaman
Jesse Byrd	Ordinary Seaman
Leo Wade	Ordinary Seaman
Richard Whitehead	Chief Steward

Karen Bailey	Chief Cook
Herb Watson	2nd Cook
Michael Moats	General Vessel Assistant
Jonathan Shannahoff	Chief Survey Technician
Jeff Hill	Lead Electronics Technician

APPENDIX 1. Event Log.

				Local Time			Event	Univ. Coor. Time (UCT)			Latitude (°N)	Longitude (°W)	Water Depth	Cast Depth	Scientific	
eventno	Instr	cast#	Station#	Mth	Day	hhmm	s/e	Mth		hhmm	Deg. Min.	Deg. Min.	(m)	(m)	Invest.	Comments
rb10006.001	Depart			4	10	1410	s	4	10	1810	3251.21	7956.65			Wiebe	Leave dock
rb10106.001	RingNet5	1	0	4	11	1432	s	4	11	1832	3302.723	7502.006	4034	100m	Hopcroft	64 mm mesh; Over stbd side
rb10106.002	RingNet5	1	0	4	11	1446	e	4	11	1846	3302.725	7502.003	4035	100m	Hopcroft	Tow complete
rb10306.001	MOC1	1	1	4	13	0618	s	4	13	1018	3331.467	6957.678	5337	1000	Madin	
rb10306.002	MOC1	1	1	4	13	0922	e	4	13	1322	3335.900	6953.460	5337	1000	Madin	successful
rb10306.003	Dive	1	1	4	13	1040	s	4	13	1440	3337.281	6951.884	5334	100ft	Madin	
rb10306.004	RingNet5	1	1	4	13	1044	s	4	13	1444	3337.281	6951.884	5334	10	Costas	
rb10306.005	RingNet5	1	1	4	13	1135	e	4	13	1535	3337.268	6951.872	5334	10	Costas	Tow complete
rb10306.006	Dive	1	1	4	13	1140	s	4	13	1540	3337.268	6951.872	5334	100ft	Madin	good dive
rb10306.007	MOC.25	1	1	4	13	1357	s	4	13	1757	3337.306	6951.803	5334	500	Wiebe	Electronic delays
rb10306.008	MOC.25	1	1	4	13	1516	e	4	13	1916	3338.386	6948.949	5334	500	Wiebe	abort-only net 0 opened-power?
rb10306.009	MOC10	1	1	4	13	1606	s	4	13	2006	3338.548	6947.691	5332	5000	Wiebe	deployment successful
rb10406.001	PoleNet	1	1	4	14	0032	s	4	14	0432	3341.720	6930.531	5336	0	Dhugal	trying for Jellyfish
rb10406.002	PoleNet	1	1	4	14	0035	e	4	14	0435	3341.720	6930.531	5336	0	Dhugal	
rb10406.003	MOC10	1	1	4	14	0745	e	4	14	1145	3340.245	6913.418	5332	5000	Wiebe	no net2- no codend; net3 not open
rb10406.004	Niskins	1	1	4	14	0930	s	4	14	1330	3339.286	6911.782	5303	75	Costas	30L water collection for ciliates; 75mx2;
rb10406.005	Niskins	1	1	4	14	1006	e	4	14	1406	3339.286	6911.787	5306	10	Costas	75mx2; 10mx2;
rb10406.006	ReeveNet	1	1	4	14	1047	s	4	14	1449	3339.269	6911.777	5310	100	Hopcroft	
rb10406.007	ReeveNet	1	1	4	14	1055	e	4	14	1455	3339.269	6911.794	5306	100	Hopcroft	successful; to wet lab
rb10406.008	MOC.25	2	1	4	14	1329	s	4	14	1729	3335.803	6924.606	5333	500	Wiebe	good
rb10406.009	MOC.25	2	1	4	14	1550	e	4	14	1950	3333.748	6929.379	5337	500	Wiebe	good
rb10406.010	ReeveNet	2	1	4	14	1608	s	4	14	2008	3333.73	6929.568	5340	500	Hopcroft	in
rb10406.011	ReeveNet	2	1	4	14	1651	e	4	14	2151	3333.73	6929.566	5340	500	Hopcroft	out
rb10406.012	MOC1	2	1	4	14	1805	s	4	14	2205	3337.589	6931.554	5342	1000	Wiebe	flow meter not working; brought in and untied and launched again.
rb10406.013	MOC1	2	1	4	14	2051	e	4	15	0050	3333.904	6938.33	5339	1000	Wiebe	successful recovery
rb10406.014	Dive	2	1	4	14	2144	s	4	15	0144	3333.335	6940.168	5339	1	Madin	
rb10406.015	Dive	2	1	4	14	2302	e	4	15	0302	3334.670	6938.356	5341	1	Madin	lots of jellies
rb10406.016	MOC.25	3	1	4	14	2342	s	4	15	0342	3334.251	6938.859	5337	500	Wiebe	tow aborted-loss of signal
rb10506.001	MOC.25	3	1	4	15	0025	e	4	15	0425	3333.144	6938.968	5340	500	Wiebe	
rb10506.001b	Transit		1-2	4	15	0030	s	4	15	0430					Wiebe	Heading for station 2
rb10506.001c	Arrival		2	4	15	1730	e	4	15	2130					Wiebe	Arrival station 2
rb10506.002	MOC.25	4	2	4	15	1756	s	4	15	2156	2959.999	6959.92	53578	500	Wiebe	deployed successfully
rb10506.003	MOC.25	4	2	4	15	1808	e	4	15	2208	2959.270	6959.12	5376	500	Wiebe	communication failure, early return
rb10606.001	MOC1	3	2	4	16	0042	s	4	16	0442	2959.711	7001.648	5355	1000	Madin	
rb10606.002	MOC1	3	2	4	16	0339	e	4	16	0739	2953.241	7004.464	5355	1000	Madin	good tow
rb10606.003	Niskins	2	2	4	16	0425	s	4	16	0825	2952.679	7004.798	5377	75	Costas	30L 75mx3 for ciliates and coccoliths
rb10606.004	Niskins	2	2	4	16	0514	e	4	16	0914	2952.679	7004.798	5377	15	Costas	50mx1 for coccoliths; 15mx2 for ciliates
rb10606.005	ReeveNet	3	2	4	16	0545	s	4	16	0945	2952.513	7004.441	5377	500	Hopcroft	
rb10606.006	ReeveNet	3	2	4	16	0630	e	4	16	1030	2952.493	7004.441	5377	500	Hopcroft	
rb10606.007	MOC1	4	2	4	16	0658	s	4	16	1058	2952.09	7004.530	5380	1000	Madin	
rb10606.008	MOC1	4	2	4	16	0930	e	4	16	1330	2951.405	7008.427	5384	1000	Madin	

				Local Time			Event	Univ. Coor. Time (UCT)			Latitude (°N)	Longitude (°W)	Water Depth	Cast Depth	Scientific	
eventno	Instr	cast#	Station#	Mth	Day	hhmm	s/e	Mth		hhmm	Deg. Min.	Deg. Min.	(m)	(m)	Invest.	Comments
rb10606.009	MOC10	2	2	4	16	1529	s	4	16	1929	2949.77	7014.292	584	5000	Wiebe	lots of misstarts and malfunctions during tow
rb10706.001	MOC10	2	2	4	17	0416	e	4	17	0816	2929.273	7029.875	5386	5000	Madin	success with a few wrinkles
rb10706.002	ReeveNet	4	2	4	17	0450	s	4	17	0850	2928.902	7030.385	5380	200	Hopcroft	
rb10706.003	Reevenet	4	2	4	17	0510	e	4	17	0910	2928.799	7030.348	5380	200	Hopcroft	
rb10706.004	RingNet5	3	2	4	17	0525	s	4	17	0925	2928.806	7030.349	5384	0	Hopcroft	
rb10706.005	RingNet5	3	2	4	17	0547	e	4	17	0947	2828.720	7030.381	5384	0	Hopcroft	
rb10706.006	Underway		2-3	4	17	0700	s	4	17	1100	2928.82	7030.47	5383		Wiebe	Heading for Station 3
rb10906.001	Arrive		3	4	19	0617	e	4	19	1017	2500.009	6000.084	5987		Wiebe	Arrive Station 3
rb10906.002	ReeveNet	5	3	4	19	0633	s	4	19	1033	2459.903	5959.915	6000	200	Hopcroft	64 micron mesh
rb10906.003	ReeveNet	5	3	4	19	0700	e	4	19	1100	2459.785	5959.505	5995	200	Hopcroft	200m only
rb10906.004	RingNet5	4	3	4	19	0702	s	4	19	1102	2459.733	5959.489	5997	0	Hopcroft	surface. 64micron
rb10906.005	RingNet5	4	3	4	19	0721	e	4	19	1121	2459.154	5959.311	5996	0	Hopcroft	
rb10906.006	PullTest		3	4	19	0801		4	19	1201	2459.230	5958.407	5995		Wiebe	Pull test on newly reterminated cable
rb10906.007	MOC1	5	3	4	19	0904	s	4	19	1304	2500.027	5956.727	5989	1000	Madin	Smooth launch, trouble with wraps
rb10906.008	MOC1	5	3	4	19	1748	e	4	19	2148	2452.428	6008.611	5631	4000	Wiebe	Two opened only; broken cable
rb10906.009	Niskins	3	3	4	19	1814	s	4	19	2214	2452.381	6008.650	5628	75	Costas	3x75m; 1x50m; 2x20m
rb10906.010	Niskins	3	3	4	19	1920	e	4	19	2320	2451.938	6008.342	5628	15	Costas	End of 6 casts
rb10906.011	ReeveNet	6	3	4	19	1925	s	4	19	2325	2451.938	6008.342	5677	200	Hopcroft	
rb10906.012	ReeveNet	6	3	4	19	1948	e	4	19	2348	2451.385	6008.230	5674	200	Hopcroft	
rb10906.013	RingNet75	1	3	4	19	1955	s	4	19	2355	2451.420	6008.320	5675	200	DeVargas	20m and 50m down
rb10906.014	RingNet75	1	3	4	19	2048	e	4	20	0048	2451.324	6008.240	5677	200	DeVargas	
rb10906.015	Dive	3	3	4	19	2104	s	4	20	0104	2450.336	6008.179	5670	102 ft	Madin	
rb10906.016	RingNet75	2	3	4	19	2125	s	4	20	0125	~2450.0	~6008.0	5700	10	DeVargas	
rb10906.017	RingNet75	2	3	4	19	2216	e	4	20	0216	~2450.0	~6008.0	5760		DeVargas	OK
rb10906.018	Dive	3	3	4	19	2228	e	4	20	0228	2450.426	6005.489	5765	102ft	Madin	
rb10906.019	MOC10	3	3	4	19	2334	s	4	20	0334	2450.385	6004.8107	5745	5000	Wiebe	Some questions about sparse catch
rb11006.001	MOC10	3	3	4	20	0925	e	4	20	1325	2447.485	6021.868	5838	5000	Madin	Broken tab again!
rb11006.002	MOC1	6	3	4	20	1114	s	4	20	1514	2449.340	6026.812	5848	1000	Madin	Well checked out system.
rb11006.003	MOC1	6	3	4	20	1130	e	4	20	1530	2449.445	6026.800	5632	1000	Wiebe	Lost signal when net at 70m. Abort. Only Net 1.
rb11006.004	MOC1	7	3	4	20	1244	s	4	20	1644	2452.133	6029.228	5698	1000	Wiebe	Replaced U/W communication module
rb11006.005	MOC1	7	3	4	20	1604	e	4	20	2004	2457.692	6032.159	5754	1000	Wiebe	Looked good.
rb11006.006	Dive	4	3	4	20	1636	s	4	20	2036	2458.678	6032.504	5721	121ft	Madin	
rb11006.007	RingNet75	3	3	4	20	1700	s	4	20	2100	2458.732	6031.854	5703	50	DeVargas	
rb11006.008	RingNet75	3	3	4	20	1732	e	4	20	2132	2458.749	6031.552	5702	50	DeVargas	
rb11006.009	Dive	4	3	4	20	1732	e	4	20	2132	2458.749	6031.552	5700	121ft	Madin	
rb11006.010	MOC1	8	3	4	20	1909	s	4	20	2309	2459.966	6030.776	5714	1000	Wiebe	Successful deployment
rb11006.011	MOC1	8	3	4	20	2246	e	4	21	0246	2503.2939	6035.552	5764	1000	Wiebe	only 7 depths. No #8.
rb11006.012	RingNet75	4	3	4	20	2315	s	4	21	0315	2503.223	6036.3374	5811	30	Hopcroft	50 mwo. ~30m deep. At depth 20 min.
rb11006.013	RingNet75	4	3	4	20	2347	e	4	21	0347	2503.355	6037.007	5811	30	Hopcroft	
rb11106.001	MOC10	4	3	4	21	0028	s	4	21	0428	2503.367	6037.536	5789	5000	Madin	
rb11106.002	BioObs	1	3	4	21	0819	s	4	21	1219	2503.477	6051.272	5668	0	Madin	Pilot whales(16) to stbd. Basking.
rb11106.003	MOC10	4	3	4	21	1126	e	4	21	1526	2503.049	6058.849	5789	5000	Madin	Great tow. Finally!
rb11106.004	Transit		3-4	4	21	1211	s	4	21	1611			5792		Wiebe	heading for stn 4.

				Local Time			Event	Univ. Coor. Time (UCT)			Latitude (°N)	Longitude (°W)	Water Depth	Cast Depth	Scientific	
eventno	Instr	cast#	Station#	Mth	Day	hhmm	s/e	Mth		hhmm	Deg. Min.	Deg. Min.	(m)	(m)	Invest.	Comments
rb11106.005	Dive	5	3-4	4	21	1358	s	4	21	1758	2457.522	6040.701	5641	117ft	Madin	
rb11106.006	HandNet5	1	3-4	4	21	1410	s	4	21	1810	2457.522	6040.701	5641	50	DeVargas	5um modified Hensen
rb11106.007	HandNet5	1	3-4	4	21	1450	e	4	21	1850	2457.256	6039.874	5694	50	DeVargas	25cm dia. -> 65cm dia.
rb11106.008	Dive	5	3-4	4	21	1450	e	4	21	1850	2457.256	6039.874	5694	117ft	Madin	
rb11106.009	Transit		3-4	4	21	1500	s	4	21	1900	2457.222	6039.773	5719		Wiebe	Heading for stn. 4
rb11306.001	Arrive		4	4	23	0040	e	4	23	0441	2000.077	5500.081	5213		Wiebe	On Station 4
rb11306.002	ReeveNet	7	4	4	23	0052	s	4	23	0454	2000.156	5500.111	5218	200	Hopcroft	Collecting microzoos
rb11306.003	ReeveNet	7	4	4	23	0113	e	4	23	0513	2000.321	5500.089	5196	200	Hopcroft	
rb11306.004	MOC10	5	4	4	23	0142	s	4	23	0542	2000.030	5459.805	5181	5000	Madin	good deployment
rb11306.005	MOC10	5	4	4	23	1256	e	4	23	1656	1949.387	5444.379	4949	5000	Madin	Amazing catch esp. net 4
rb11306.006	Dive	6	4	4	23	1336	s	4	23	1736	1949.103	5443.337	4945	107ft	Madin	
rb11306.007	HandNet5	2	4	4	23	1349	s	4	23	1749	1942.211	5443.487	4945	50	DeVargas	5 um mesh
rb11306.008	HandNet5	2	4	4	23	1430	e	4	23	1830	1949.496	5444.146	5041	50	DeVargas	5 um mesh
rb11306.009	Dive	6	4	4	23	1431	e	4	23	1830	1949.496	5444.146	5045	107ft	Madin	
rb11306.010	MOC1	9	4	4	23	1521	s	4	23	1921	1949.227	5443.585	5042	1000	Wiebe	smooth entry
rb11306.011	RingNet5	5	4	4	23	1640	s	4	23	2040	1947.821	5441.345	4987	0	Hopcroft	
rb11306.012	RingNet5	5	4	4	23	1715	e	4	23	2115			4987	0	Hopcroft	
rb11306.013	MOC1	9	4	4	23	1839	e	4	23	2239	1945.720	5437.532	4996	1000	Wiebe	Lost collar/bucket Net #3
rb11306.014	ReeveNet	8	4	4	23	1900	s	4	23	2300	1945.720	5437.300	5007	200	Hopcroft	
rb11306.015	ReeveNet	8	4	4	23	1930	e	4	23	2330	1945.720	5437.300	5007	200	Hopcroft	
rb11306.016	Niskin	4	4	4	23	1935	s	4	23	2335	1945.625	5436.905	5016	variable	Costas	3x100m
rb11306.017	Niskin	4	4	4	23	2040	e	4	24	0040	1945.822	5436.740	5043		Costas	3x45m
rb11306.018	RingNet75	5	4	4	23	2055	s	4	24	0051	1945.832	5436.737	5030	300	Hopcroft	less than 200m
rb11306.019	RingNet75	5	4	4	23	2126	e	4	24	0127	1946.827	5436.121	5043	300	Hopcroft	
rb11306.020	MOC1	10	4	4	23	2152	s	4	24	0152	1947.120	5435.625	5037	1000	Wiebe	
rb11406.001	MOC1	10	4	4	24	0119	e	4	24	0519	1949.426	5428.627	5037	1000	Madin	
rb11406.002	Dive	7	4	4	24	nd	s	4	24	nd	1949.400	5428.630	nd	22.8	Madin	74ft
rb11406.003	Dive	7	4	4	24	0330	e	4	24	0730	1949.198	5428.826	4771	22.8	Madin	74ft
rb11406.004	HandNet75	1	4	4	24	0357	s	4	24	0757	1949.181	5428.828	4769	nd	Yurika	
rb11406.005	HandNet75	1	4	4	24	0415	e	4	24	0815	1949.342	5428.694	4766	nd	Yurika	
rb11406.006	Underway		4-5	4	24	0430	s	4	24	0830	1949.363	5428.710	4773		Wiebe	Heading for Stn.5
rb11506.001	On Station		5	4	25	0830	e	4	25	1230	1359.956	5500.016	5295		Wiebe	Arrive on Stn. 5
rb11506.002	ReeveNet	9	5	4	25	0837	s	4	25	1237	1359.962	5500.029	5289	200	Hopcroft	200 mwo; 20m/min
rb11506.003	ReeveNet	9	5	4	25	0859	e	4	25	1259	1400.023	5500.090	5291	200	Hopcroft	
rb11506.004	MOC1	11	5	4	25	0916	s	4	25	1315	1400.174	5459.976	5296	1000	Madin	good deployment
rb11506.005	MOC1	11	5	4	25	1238	e	4	25	1638	1401.042	5455.089	5323	1000	Wiebe	good haul - long net 7
rb11506.006	Dive	8	5	4	25	1309	s	4	25	1709	1401.103	5454.636	5322	29.8	Madin	97ft
rb11506.007	RingNet5	6	5	4	25	1325	s	4	25	1725	1401.119	5454,610	5320	0	Hopcroft	handnet really (no wire used)
rb11506.008	RingNet5	6	5	4	25	1335	e	4	25	1735	1401.137	5454.617	5320	0	Hopcroft	2 handnets at this time
rb11506.009	HandNet5	3	5	4	25	1338	s	4	25	1738	1401.114	5454.624	5322	15	DeVargas	5um mesh
rb11506.010	HandNet5	3	5	4	25	1406	e	4	25	1806	1401.144	5454.631	5325	15	DeVargas	5um
rb11506.011	Dive	8	5	4	25	1406	e	4	25	1806	1401.149	5454.631	5325	29.8	Madin	97ft
rb11506.012	ReeveNet	10	5	4	25	1440	s	4	25	1840	1401.132	5454.617	5321	200	Hopcroft	
rb11506.013	ReeveNet	10	5	4	25	1506	e	4	25	1906	1401.132	5454.634	5322	200	Hopcroft	

				Local Time			Event	Univ. Coor. Time (UCT)			Latitude (°N)	Longitude (°W)	Water Depth	Cast Depth	Scientific	
eventno	Instr	cast#	Station#	Mth	Day	hhmm	s/e	Mth		hhmm	Deg. Min.	Deg. Min.	(m)	(m)	Invest.	Comments
rb11506.014	Niskins	5	5	4	25	1515	s	4	25	1915	1401.137	5454.634	5327	100	Costas	3x100m
rb11506.015	Niskins	5	5	4	25	1622	e	4	25	2022	1401.131	5454.629	5326	100	Costas	3x47
rb11506.016	RingNet75	6	5	4	25	1635	s	4	25	2035	1401.570	5454.495	5330	50	DeVargas	
rb11506.017	RingNet75	6	5	4	25	1655	e	4	25	2055	1401.570	5454.495	5330	50	DeVargas	
rb11506.018	MOC1	12	5	4	25	1725	s	4	25	2126	1402.499	5453.482	5383	1000	Wiebe	
rb11506.019	MOC1	12	5	4	25	2041	e	4	26	0041	1405.102	5448.879	5371	1000	Wiebe	
rb11506.020	MOC10	6	5	4	25	2156	s	4	26	0156	1405.830	5446.800	5366	5000	Wiebe	
rb11606.001	MOC10	6	5	4	26	1001	e	4	26	1401	1412.948	5427.378	5312	5000	Madin	good tow
rb11606.002	MOC25	5	5	4	26	1027	s	4	26	1427	1413.542	5426.688	5310	500	Wiebe	
rb11606.003	MOC25	5	5	4	26	1229	e	4	26	1629	1415.430	5424.227	5304	500	Wiebe	
rb11606.004	MOC10	7	5	4	26	1410	s	4	26	1810	1416.930	5421.960	5299	5000	Wiebe	
rb11706.001	MOC10	7	5	4	27	0338	e	4	27	0738	1420.497	5357.916	5299	5000	Madin	good tow
rb11706.002	ReeveNet	11	5	4	27	0415	s	4	27	0815	1420.848	5357.240	5279	200	Hopcroft	
rb11706.003	ReeveNet	11	5	4	27	0441	e	4	27	0841	1421.145	5357.376	5283	200	Hopcroft	
rb11706.004	RingNet75	7	5	4	27	0453	s	4	27	0853	1421.449	5357.315	5287	20	DeVargas	40 mwo
rb11706.005	RingNet75	7	5	4	27	0520	e	4	27	0920	1422.291	5357.009	5287	20	DeVargas	
rb11706.006	MOC25	6	5	4	27	0612	s	4	27	1012	1423.793	5356.630	5279	350	Madin	DeVargas' foram tow
rb11706.007	MOC25	6	5	4	27	0900	e	4	27	1300	1428.635	5355.039	5268	350	Madin	
rb11706.008	ReeveNet	12	5	4	27	0915	s	4	27	1315	1428.846	5354.949	5297	200	Costas	down-up; 10m/min
rb11706.009	ReeveNet	12	5	4	27	0935	e	4	27	1335	1428.901	5354.949	5274	200	Costas	
rb11706.010	MOC1	13	5	4	27	1051	s	4	27	1451	1424.772	5356.494	5261	650	Wiebe	Staircase Tow
rb11706.011	MOC1	13	5	4	27	1507	e	4	27	1907	1425.119	5352.530	5157	551	Wiebe	tiny false start and began again
rb11706.012	Transit			4	27	1600	s	4	27	2000	1425.697	5358.938	5307		Wiebe	Station complete. San Juan bound.
rb11906.001	HullDive			4	29	0900	s	4	29	1300	1602.511	6242.118	1582		Madin	
rb11906.002	HullDive			4	29	0945	e	4	29	1345	1602.473	6242.557	917		Madin	
rb11906.003	RingNet75	8	6	4	29	1900	s	4	29	2300	1705.205	6422.036	nd	60	Hopcroft	60m line over the rail
rb11906.004	RingNet75	8	6	4	29	1930	e	4	29	2330	1705.654	6422..438	nd	60	Hopcroft	
rb12006.001	Arrive			4	30	0900	e	4	30	1300	1827.535	6606.970	nd		Wiebe	at the dock - cruise complete

APPENDIX 2. Summary of Blue Water Dive Collections.

SCUBA Collections on CMARZ cruise, April 2006									
Values are numbers collected on each dive									
	Dive No								
TAXON [No. species]	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	sums
Radiolaria							3		3
colonials	4	2	6	10	13				35
phaeodarians			1						1
Forams [1]									
Hastigerina pelagica						1			1
Medusae [4]									
Aegina (rosea) citrea								2	2
Geryonia proboscidalis		1		1					2
Liriope tetraphylla				1					1
Pelagia noctiluca				1					1
Siphonophores [13]									
Agalma elegans			1	1					2
Agalma sp			1						1
Athorybia rosacea					2			1	3
Forskalia edwardsii							1		1
Forskalia tholoides								1	1
Halistemma cupulifera			1						1
Hippopodius hippopus	6	1							7
Lilyopsis fluoracantha								1	1
Lilyopsis rosea		1							1
Nanomia bijuga		1							1
Rhizophysa filiformis			1						1
Rosacea cymbiformis	1			1					2
Sulculeolaria quadrivalvis	1							1	2
Ctenophores [6]									
Beroe mitrata							1		1
Cestum veneris				1	1	1		1	4
Eurhamphaea vexilligera		3				1			4
Ocyropsis maculata-immaculata		1							1
Ocyropsis maculata-maculata		1						14	15
Thalassocalyce inconstans							1	1	2
Molluscs [7]									
Cardiapoda richardi	1								1
Cavolinia sp.	1								1
Clio cuspidata (w /hydroids)		1							1
Clio sp			1						1

SCUBA Collections on CMARZ cruise, April 2006									
Values are numbers collected on each dive									
	Dive No								
TAXON [No. species]	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	sums
Corolla ovata								1	1
Oxygyrus keraudreni							1		1
Pterotrachea hippocampus	1	1							2
Thaliaceans [10]									
Brooksia rostrata (agg chain)		1					1		2
Dolioletta gegenbauri (colony)	2			1					3
Iasis zonaria (agg chain)		3							3
Pegea bicaudata				3					3
Pegea confoederata (aggs)				4				75	79
Pyrosoma atlanticum			1						1
Salpa aspera (agg chain)		40	2 chains						40
Salpa cylindrica (sol)					1				1
Salpa fusiformis (agg chain)		15							15
Salpa fusiformis (sol)				1					1
Salpa maxima (agg chain)				5					5
Salpa maxima (sol)								1	1
Crustacea [1]									
juvenile euphausiid			1						1
Other									
Alciopid polychaete		1							1
Rhizosolenia mats						2			2
Total species 42									260

APPENDIX 3. List of DNA extractions from foraminifera.

CMarZ Plankton Discovery Cruise, April 2006					
Skeletonized Microplankton -SM- Team					
Total	**1541 DNA extractions**				
Sta. #	**DNA ID**	**species**	**Net type**	**Depth (m)**	**Remarks**
1	Z-1	*Globorotalia menardii*	Ring net	200-0	
1	Z-2	*Globorotalia menardii*	Ring net	200-0	
1	Z-3	*Globorotalia menardii*	Ring net	200-0	
1	Z-4	*Globorotalia menardii*	Ring net	200-0	
1	Z-5	*Globorotalia menardii*	Ring net	200-0	
1	Z-6	*Globorotalia menardii*	Ring net	200-0	
1	Z-7	*Globorotalia menardii*	Ring net	200-0	
1	Z-8	*Globorotalia menardii*	Ring net	200-0	
1	Z-9	*Globorotalia menardii*	Ring net	200-0	
1	Z-10	*Globorotalia menardii*	Ring net	200-0	
1	Z-11	*Globorotalia menardii*	Ring net	200-0	
1	Z-12	*Globorotalia menardii*	Ring net	200-0	
1	Z-13	*Globorotalia menardii*	Ring net	200-0	
1	Z-14	*Globorotalia menardii*	Ring net	200-0	
1	Z-15	*Globorotalia menardii*	Ring net	200-0	
1	Z-16	*Globorotalia menardii*	Ring net	200-0	
1	Z-17	*Globorotalia menardii*	Ring net	200-0	
1	Z-18	*Globorotalia menardii*	Ring net	200-0	
1	Z-19	*Globorotalia menardii*	Ring net	200-0	
1	Z-20	*Globorotalia menardii*	Ring net	200-0	
1	Z-21	*Globorotalia menardii*	Ring net	200-0	
1	Z-22	*Globorotalia menardii*	Ring net	200-0	
1	Z-23	*Globorotalia menardii*	Ring net	200-0	
1	Z-24	*Globorotalia menardii*	Ring net	200-0	
1	Z-25	*Globorotalia menardii*	Ring net	200-0	
1	Z-26	*Globorotalia menardii*	Ring net	200-0	
1	Z-27	*Globorotalia menardii*	Ring net	200-0	
1	Z-28	*Globorotalia menardii*	Ring net	200-0	
1	Z-29	*Globorotalia menardii*	Ring net	200-0	
1	Z-30	*Pulleniatina obliquiloculata*	Ring net	200-0	
1	Z-31	*Globigerinoides sacculifer*	Ring net	200-0	
1	Z-32	*Globigerinoides sacculifer*	Ring net	200-0	

Sta. #	DNA ID	species	Net type	Depth (m)	Remarks
1	Z-33	*Globigerinoides sacculifer*	Ring net	200-0	
1	Z-34	*Globigerinoides sacculifer*	Ring net	200-0	
1	Z-35	*Globigerinoides sacculifer*	Ring net	200-0	
1	Z-36	*Globigerinoides sacculifer*	Ring net	200-0	
1	Z-37	*Globigerinoides ruber*	Ring net	200-0	
1	Z-38	*Globigerinoides ruber*	Ring net	200-0	
1	Z-39	*Globigerinoides ruber*	Ring net	200-0	
1	Z-40	*Globigerinoides ruber*	Ring net	200-0	
1	Z-41	*Globigerinoides ruber*	Ring net	200-0	
1	Z-42	*Globigerinoides ruber*	Ring net	200-0	
1	Z-43	*Globigerinoides ruber*	Ring net	200-0	
1	Z-44	*Globigerinoides ruber*	Ring net	200-0	
1	Z-45	*Globigerinoides ruber*	Ring net	200-0	
1	Z-46	*Globigerinoides ruber*	Ring net	200-0	
1	Z-47	*Neogloboquadrina dutertrei*	Ring net	200-0	Right coiling, reddish cytoplasm
1	Z-48	*Neogloboquadrina dutertrei*	Ring net	200-0	Right coiling, reddish cytoplasm
1	Z-49	*Neogloboquadrina dutertrei*	Ring net	200-0	Right coiling, reddish cytoplasm
1	Z-50	*Neogloboquadrina dutertrei*	Ring net	200-0	Right coiling, reddish cytoplasm
1	Z-51	*Neogloboquadrina dutertrei*	Ring net	200-0	Left coiling, yellowish cytoplasm
1	Z-52	*Pulleniatina obliquiloculata*	Ring net	200-0	
1	Z-53	*Globorotalia hirsuta*	MOC-1_T1_N4	200-400	
1	Z-54	*Globorotalia hirsuta*	MOC-1_T1_N4	200-400	
1	Z-55	*Globorotalia hirsuta*	MOC-1_T1_N4	200-400	
1	Z-56	*Globorotalia hirsuta*	MOC-1_T1_N4	200-400	
1	Z-57	*Globorotalia hirsuta*	MOC-1_T1_N4	200-400	
1	Z-58	*Globorotalia hirsuta*	MOC-1_T1_N4	200-400	
1	Z-59	*Globorotalia hirsuta*	MOC-1_T1_N4	200-400	
1	Z-60	*Globorotalia hirsuta*	MOC-1_T1_N4	200-400	
1	Z-61	*Globorotalia hirsuta*	MOC-1_T1_N4	200-400	
1	Z-62	*Globorotalia hirsuta*	MOC-1_T1_N4	200-400	
1	Z-63	*Globorotalia hirsuta*	MOC-1_T1_N4	200-400	
1	Z-64	*Globorotalia hirsuta*	MOC-1_T1_N4	200-400	

Sta. #	DNA ID	species	Net type	Depth (m)	Remarks
1	Z-65	*Globorotalia hirsuta*	MOC-1_T1_N4	200-400	
1	Z-66	*Globorotalia hirsuta*	MOC-1_T1_N4	200-400	
1	Z-67	*Globorotalia hirsuta*	MOC-1_T1_N4	200-400	
1	Z-68	*Globorotalia hirsuta*	MOC-1_T1_N4	200-400	
1	Z-69	*Globorotalia hirsuta*	MOC-1_T1_N4	200-400	
1	Z-70	*Globorotalia hirsuta*	MOC-1_T1_N4	200-400	
1	Z-71	*Globorotalia hirsuta*	MOC-1_T1_N4	200-400	
1	Z-72	*Globorotalia hirsuta*	MOC-1_T1_N4	200-400	
1	Z-73	*Globorotalia hirsuta*	MOC-1_T1_N4	200-400	
1	Z-74	*Globorotalia hirsuta*	MOC-1_T1_N4	200-400	
1	Z-75	*Globorotalia hirsuta*	MOC-1_T1_N4	200-400	
1	Z-76	*Globorotalia hirsuta*	MOC-1_T1_N4	200-400	
1	Z-77	*Globorotalia hirsuta*	MOC-1_T1_N4	200-400	
1	Z-78	*Globorotalia hirsuta*	MOC-1_T1_N4	200-400	
1	Z-79	*Globorotalia hirsuta*	MOC-1_T1_N4	200-400	
1	Z-80	*Globorotalia hirsuta*	MOC-1_T1_N4	200-400	
1	Z-81	*Globorotalia hirsuta*	MOC-1_T1_N4	200-400	
1	Z-82	*Globorotalia hirsuta*	MOC-1_T1_N4	200-400	
1	Z-83	*Globorotalia hirsuta*	MOC-1_T1_N4	200-400	
1	Z-84	*Globorotalia hirsuta*	MOC-1_T1_N4	200-400	
1	Z-85	*Globorotalia hirsuta*	MOC-1_T1_N4	200-400	
1	Z-86	*Globorotalia hirsuta*	MOC-1_T1_N4	200-400	
1	Z-87	*Globorotalia hirsuta*	MOC-1_T1_N4	200-400	
1	Z-88	*Globorotalia hirsuta*	MOC-1_T1_N4	200-400	
1	Z-89	*Globorotalia truncatulinoides*	MOC-1_T1_N4	200-400	Left coiling
1	Z-90	*Globorotalia truncatulinoides*	MOC-1_T1_N4	200-400	Left coiling
1	Z-91	*Globorotalia truncatulinoides*	MOC-1_T1_N4	200-400	Left coiling
1	Z-92	*Globorotalia truncatulinoides*	MOC-1_T1_N4	200-400	Left coiling
1	Z-93	*Globorotalia truncatulinoides*	MOC-1_T1_N4	200-400	Left coiling
1	Z-94	*Globorotalia truncatulinoides*	MOC-1_T1_N4	200-400	Left coiling
1	Z-95	*Globorotalia truncatulinoides*	MOC-1_T1_N4	200-400	Left coiling
1	Z-96	*Globorotalia truncatulinoides*	MOC-1_T1_N4	200-400	Left coiling
1	Z-97	*Globorotalia truncatulinoides*	MOC-1_T1_N4	200-400	Left coiling

Sta. #	DNA ID	species	Net type	Depth (m)	Remarks
1	Z-98	*Globorotalia truncatulinoides*	MOC-1_T1_N4	200-400	Left coiling
1	Z-99	*Globorotalia truncatulinoides*	MOC-1_T1_N4	200-400	Left coiling
1	Z-100	*Globorotalia truncatulinoides*	MOC-1_T1_N4	200-400	Left coiling
1	Z-101	*Globorotalia truncatulinoides*	MOC-1_T1_N4	200-400	Left coiling
1	Z-102	*Globorotalia truncatulinoides*	MOC-1_T1_N4	200-400	Left coiling
1	Z-103	*Globorotalia truncatulinoides*	MOC-1_T1_N4	200-400	Left coiling
1	Z-104	*Globorotalia truncatulinoides*	MOC-1_T1_N4	200-400	Left coiling
1	Z-105	*Globorotalia truncatulinoides*	MOC-1_T1_N4	200-400	Left coiling
1	Z-106	*Globorotalia truncatulinoides*	MOC-1_T1_N4	200-400	Left coiling
1	Z-107	*Globorotalia truncatulinoides*	MOC-1_T1_N4	200-400	Left coiling
1	Z-108	*Globorotalia truncatulinoides*	MOC-1_T1_N4	200-400	Left coiling
1	Z-109	*Globorotalia truncatulinoides*	MOC-1_T1_N4	200-400	Left coiling
1	Z-110	*Globorotalia truncatulinoides*	MOC-1_T1_N4	200-400	Left coiling
1	Z-111	*Globorotalia truncatulinoides*	MOC-1_T1_N4	200-400	Left coiling
1	Z-112	*Globorotalia truncatulinoides*	MOC-1_T1_N4	200-400	Left coiling
1	Z-113	*Globorotalia truncatulinoides*	MOC-1_T1_N4	200-400	Left coiling
1	Z-114	*Globorotalia inflata*	MOC-1_T1_N4	200-400	
1	Z-115	*Globorotalia inflata*	MOC-1_T1_N4	200-400	
1	Z-116	*Globorotalia inflata*	MOC-1_T1_N5	100-200	
1	Z-117	*Globorotalia inflata*	MOC-1_T1_N5	100-200	
1	Z-118	*Globorotalia inflata*	MOC-1_T1_N5	100-200	
1	Z-119	*Globorotalia inflata*	MOC-1_T1_N5	100-200	
1	Z-120	*Globorotalia inflata*	MOC-1_T1_N5	100-200	
1	Z-121	*Globorotalia inflata*	MOC-1_T1_N5	100-200	
1	Z-122	*Globorotalia inflata*	MOC-1_T1_N5	100-200	
1	Z-123	*Globorotalia inflata*	MOC-1_T1_N5	100-200	

Sta. #	DNA ID	species	Net type	Depth (m)	Remarks
1	Z-124	*Orbulina universa*	MOC-1_T1_N5	100-200	
1	Z-125	*Orbulina universa*	MOC-1_T1_N5	100-200	
1	Z-126	*Globigerinella aequilateralis*	MOC-1_T1_N5	100-200	
1	Z-127	*Hastigerina pelagica*	MOC-1_T1_N5	100-200	
1	Z-128	*Globigerinita glutinata*	MOC-1_T1_N5	100-200	
1	Z-129	*Neogloboquadrina dutertrei*	MOC-1_T1_N5	100-200	
1	Z-130	*Globorotalia truncatulinoides*	MOC-1_T1_N5	100-200	Left coiling
1	Z-131	*Globorotalia truncatulinoides*	MOC-1_T1_N5	100-200	Left coiling
1	Z-132	*Globorotalia truncatulinoides*	MOC-1_T1_N5	100-200	Left coiling
1	Z-133	*Globorotalia truncatulinoides*	MOC-1_T1_N5	100-200	Left coiling
1	Z-134	*Globorotalia truncatulinoides*	MOC-1_T1_N5	100-200	Left coiling
1	Z-135	*Globorotalia truncatulinoides*	MOC-1_T1_N5	100-200	Left coiling
1	Z-136	*Globorotalia truncatulinoides*	MOC-1_T1_N5	100-200	Left coiling
1	Z-137	*Globorotalia truncatulinoides*	MOC-1_T1_N5	100-200	Left coiling
1	Z-138	*Globorotalia truncatulinoides*	MOC-1_T1_N5	100-200	Left coiling
1	Z-139	*Globorotalia truncatulinoides*	MOC-1_T1_N5	100-200	Left coiling
1	Z-140	*Globorotalia truncatulinoides*	MOC-1_T1_N5	100-200	Left coiling
1	Z-141	*Globorotalia truncatulinoides*	MOC-1_T1_N5	100-200	Left coiling
1	Z-142	*Globorotalia truncatulinoides*	MOC-1_T1_N5	100-200	Left coiling
1	Z-143	*Globorotalia truncatulinoides*	MOC-1_T1_N5	100-200	Left coiling
1	Z-144	*Globorotalia truncatulinoides*	MOC-1_T1_N5	100-200	Left coiling
1	Z-145	*Globorotalia truncatulinoides*	MOC-1_T1_N5	100-200	Left coiling
1	Z-146	*Globorotalia truncatulinoides*	MOC-1_T1_N5	100-200	Left coiling

Sta. #	DNA ID	species	Net type	Depth (m)	Remarks
1	Z-147	*Globorotalia truncatulinoides*	MOC-1_T1_N5	100-200	Left coiling
1	Z-148	*Globorotalia truncatulinoides*	MOC-1_T1_N5	100-200	Left coiling
1	Z-149	*Globorotalia truncatulinoides*	MOC-1_T1_N5	100-200	Left coiling
1	Z-150	*Globorotalia truncatulinoides*	MOC-1_T1_N5	100-200	Left coiling
1	Z-151	*Globorotalia truncatulinoides*	MOC-1_T1_N5	100-200	Left coiling
1	Z-152	*Globorotalia truncatulinoides*	MOC-1_T1_N5	100-200	Left coiling
1	Z-153	*Globorotalia truncatulinoides*	MOC-1_T1_N5	100-200	Left coiling
1	Z-154	*Globorotalia truncatulinoides*	MOC-1_T1_N5	100-200	Left coiling
1	Z-155	*Globorotalia truncatulinoides*	MOC-1_T1_N5	100-200	Left coiling
1	Z-156	*Globorotalia truncatulinoides*	MOC-1_T1_N5	100-200	Left coiling
1	Z-157	*Globorotalia truncatulinoides*	MOC-1_T1_N5	100-200	Left coiling
1	Z-158	*Globorotalia truncatulinoides*	MOC-1_T1_N5	100-200	Left coiling
1	Z-159	*Globorotalia truncatulinoides*	MOC-1_T1_N5	100-200	Left coiling
1	Z-160	*Globorotalia truncatulinoides*	MOC-1_T1_N5	100-200	Left coiling
1	Z-161	*Globorotalia truncatulinoides*	MOC-1_T1_N5	100-200	Left coiling
1	Z-162	*Globorotalia hirsuta*	MOC-1_T1_N5	100-200	beautiful!
1	Z-163	*Globorotalia hirsuta*	MOC-1_T1_N5	100-200	beautiful!
1	Z-164	*Globorotalia hirsuta*	MOC-1_T1_N5	100-200	beautiful!
1	Z-165	*Globorotalia hirsuta*	MOC-1_T1_N5	100-200	beautiful!
1	Z-166	*Globorotalia hirsuta*	MOC-1_T1_N5	100-200	beautiful!
1	Z-167	*Globorotalia hirsuta*	MOC-1_T1_N5	100-200	beautiful!
1	Z-168	*Globorotalia hirsuta*	MOC-1_T1_N5	100-200	beautiful!
1	Z-169	*Globorotalia hirsuta*	MOC-1_T1_N5	100-200	beautiful!
1	Z-170	*Globorotalia hirsuta*	MOC-1_T1_N5	100-200	beautiful!
1	Z-171	*Globorotalia hirsuta*	MOC-1_T1_N5	100-200	beautiful!
1	Z-172	*Globorotalia hirsuta*	MOC-1_T1_N5	100-200	beautiful!
1	Z-173	*Globorotalia hirsuta*	MOC-1_T1_N5	100-200	beautiful!

Sta. #	DNA ID	species	Net type	Depth (m)	Remarks
1	Z-174	*Globorotalia hirsuta*	MOC-1_T1_N5	100-200	beautiful!
1	Z-175	*Globorotalia hirsuta*	MOC-1_T1_N5	100-200	beautiful!
1	Z-176	*Globorotalia hirsuta*	MOC-1_T1_N5	100-200	beautiful!
1	Z-177	*Globorotalia hirsuta*	MOC-1_T1_N5	100-200	beautiful!
1	Z-178	*Globorotalia hirsuta*	MOC-1_T1_N5	100-200	beautiful!
1	Z-179	*Globorotalia hirsuta*	MOC-1_T1_N5	100-200	beautiful!
1	Z-180	*Globorotalia hirsuta*	MOC-1_T1_N5	100-200	beautiful!
1	Z-181	*Globorotalia hirsuta*	MOC-1_T1_N5	100-200	beautiful!
1	Z-182	*Globorotalia hirsuta*	MOC-1_T1_N5	100-200	beautiful!
1	Z-183	*Globorotalia hirsuta*	MOC-1_T1_N5	100-200	beautiful!
1	Z-184	*Globorotalia hirsuta*	MOC-1_T1_N5	100-200	beautiful!
1	Z-185	*Globorotalia hirsuta*	MOC-1_T1_N5	100-200	beautiful!
1	Z-186	*Globorotalia hirsuta*	MOC-1_T1_N5	100-200	beautiful!
1	Z-187	*Globorotalia hirsuta*	MOC-1_T1_N5	100-200	beautiful!
1	Z-188	*Globorotalia hirsuta*	MOC-1_T1_N5	100-200	beautiful!
1	Z-189	*Globorotalia hirsuta*	MOC-1_T1_N5	100-200	beautiful!
1	Z-190	*Globorotalia hirsuta*	MOC-1_T1_N5	100-200	beautiful!
1	Z-191	*Globorotalia hirsuta*	MOC-1_T1_N5	100-200	beautiful!
1	Z-192	*Hastigerina pelagica*	MOC-1_T1_N6	50-100	
1	Z-193	*Hastigerina pelagica*	MOC-1_T1_N6	50-100	
1	Z-194	*Globigerinoides ruber*	MOC-1_T1_N6	50-100	
1	Z-195	*Globorotalia inflata*	MOC-1_T1_N6	50-100	
1	Z-196	*Globorotalia inflata*	MOC-1_T1_N6	50-100	
1	Z-197	*Globorotalia inflata*	MOC-1_T1_N6	50-100	
1	Z-198	*Globorotalia inflata*	MOC-1_T1_N6	50-100	
1	Z-199	*Globorotalia inflata*	MOC-1_T1_N6	50-100	
1	Z-200	*Globorotalia inflata*	MOC-1_T1_N6	50-100	
1	Z-201	*Globorotalia inflata*	MOC-1_T1_N6	50-100	
1	Z-202	*Globorotalia inflata*	MOC-1_T1_N6	50-100	
1	Z-203	*Globorotalia inflata*	MOC-1_T1_N6	50-100	
1	Z-204	*Globorotalia inflata*	MOC-1_T1_N6	50-100	
1	Z-205	*Globorotalia inflata*	MOC-1_T1_N6	50-100	
1	Z-206	*Globigerinella aequilateralis*	MOC-1_T1_N6	50-100	
1	Z-207	*Globigerinella aequilateralis*	MOC-1_T1_N6	50-100	
1	Z-208	*Globigerinella aequilateralis*	MOC-1_T1_N6	50-100	
1	Z-209	*Globigerinella aequilateralis*	MOC-1_T1_N6	50-100	
1	Z-210	*Globigerinella aequilateralis*	MOC-1_T1_N6	50-100	

Sta. #	DNA ID	species	Net type	Depth (m)	Remarks
1	Z-211	*Globigerinella aequilateralis*	MOC-1_T1_N6	50-100	
1	Z-212	*Globigerinella aequilateralis*	MOC-1_T1_N6	50-100	
1	Z-213	*Globigerinella aequilateralis*	MOC-1_T1_N6	50-100	
1	Z-214	*Globigerinella aequilateralis*	MOC-1_T1_N6	50-100	
1	Z-215	*Globigerinella aequilateralis*	MOC-1_T1_N6	50-100	
1	Z-216	*Globigerinella aequilateralis*	MOC-1_T1_N6	50-100	
1	Z-217	*Globigerinella aequilateralis*	MOC-1_T1_N6	50-100	
1	Z-218	*Globigerinoides ruber*	MOC-1_T1_N6	50-100	
1	Z-219	*Globigerinoides ruber*	MOC-1_T1_N6	50-100	
1	Z-220	*Globigerinoides ruber*	MOC-1_T1_N6	50-100	
1	Z-221	*Globigerinoides ruber*	MOC-1_T1_N6	50-100	
1	Z-222	*Globigerinoides ruber*	MOC-1_T1_N6	50-100	
1	Z-223	*Globigerinoides ruber*	MOC-1_T1_N6	50-100	
1	Z-224	*Globigerinoides ruber*	MOC-1_T1_N6	50-100	
1	Z-225	*Globigerinoides ruber*	MOC-1_T1_N6	50-100	
1	Z-226	*Globigerinoides sacculifer*	MOC-1_T1_N6	50-100	
1	Z-227	*Neogloboquadrina dutertrei*	MOC-1_T1_N6	50-100	
1	Z-228	*Neogloboquadrina dutertrei*	MOC-1_T1_N6	50-100	
1	Z-229	*Neogloboquadrina dutertrei*	MOC-1_T1_N6	50-100	
1	Z-230	*Neogloboquadrina dutertrei*	MOC-1_T1_N6	50-100	
1	Z-231	*Pulleniatina obliquiloculata*	MOC-1_T1_N6	50-100	
1	Z-232	*Pulleniatina obliquiloculata*	MOC-1_T1_N6	50-100	
1	Z-233	*Globorotalia menardii*	MOC-1_T1_N6	50-100	
1	Z-234	*Globorotalia hirsuta*	MOC-1_T1_N6	50-100	
1	Z-235	*Orbulina universa*	MOC-1_T1_N6	50-100	
1	Z-236	*Orbulina universa*	MOC-1_T1_N6	50-100	
1	Z-237	*Globigerinoides ruber*	MOC-1_T1_N6	50-100	
1	Z-238	*Globigerinoides ruber*	MOC-1_T1_N6	50-100	

Sta. #	DNA ID	species	Net type	Depth (m)	Remarks
1	Z-239	*Globigerinoides ruber*	MOC-1_T1_N6	50-100	
1	Z-240	*Globigerinoides ruber*	MOC-1_T1_N6	50-100	
1	Z-241	*Globigerinoides ruber*	MOC-1_T1_N6	50-100	
1	Z-242	*Globigerinoides ruber*	MOC-1_T1_N6	50-100	
1	Z-243	*Globigerinoides ruber*	MOC-1_T1_N6	50-100	
1	Z-244	*Globigerinoides ruber*	MOC-1_T1_N6	50-100	
1	Z-245	*Globigerinoides ruber*	MOC-1_T1_N6	50-100	
1	Z-246	*Globigerinoides ruber*	MOC-1_T1_N6	50-100	
1	Z-247	*Globigerinoides ruber*	MOC-1_T1_N6	50-100	
1	Z-248	*Globigerinoides ruber*	MOC-1_T1_N6	50-100	
1	Z-249	*Globigerinoides ruber*	MOC-1_T1_N6	50-100	
1	Z-250	*Globigerinoides ruber*	MOC-1_T1_N6	50-100	
1	Z-251	*Globigerinoides ruber*	MOC-1_T1_N6	50-100	
1	Z-252	*Globigerinoides ruber*	MOC-1_T1_N6	50-100	
1	Z-253	*Globigerinoides ruber*	MOC-1_T1_N6	50-100	
1	Z-254	*Globigerinoides ruber*	MOC-1_T1_N6	50-100	
1	Z-255	*Globigerinoides ruber*	MOC-1_T1_N6	50-100	
1	Z-256	*Globigerinoides ruber*	MOC-1_T1_N6	50-100	
1	Z-257	*Globorotalia truncatulinoides*	MOC-1_T1_N3	400-600	
1	Z-258	*Globorotalia truncatulinoides*	MOC-1_T1_N3	400-600	
1	Z-259	*Globorotalia truncatulinoides*	MOC-1_T1_N3	400-600	
1	Z-260	*Globorotalia truncatulinoides*	MOC-1_T1_N3	400-600	
1	Z-261	*Globorotalia truncatulinoides*	MOC-1_T1_N3	400-600	
1	Z-262	*Globorotalia truncatulinoides*	MOC-1_T1_N3	400-600	
1	Z-263	*Globorotalia truncatulinoides*	MOC-1_T1_N3	400-600	
1	Z-264	*Globorotalia truncatulinoides*	MOC-1_T1_N3	400-600	
1	Z-265	*Globorotalia truncatulinoides*	MOC-1_T1_N3	400-600	
1	Z-266	*Globorotalia truncatulinoides*	MOC-1_T1_N3	400-600	
1	Z-267	*Globorotalia truncatulinoides*	MOC-1_T1_N3	400-600	
1	Z-268	*Globorotalia truncatulinoides*	MOC-1_T1_N3	400-600	

Sta. #	DNA ID	species	Net type	Depth (m)	Remarks
1	Z-269	*Globorotalia truncatulinoides*	MOC-1_T1_N3	400-600	
1	Z-270	*Globorotalia truncatulinoides*	MOC-1_T1_N3	400-600	
1	Z-271	*Globorotalia truncatulinoides*	MOC-1_T1_N3	400-600	
1	Z-272	*Globorotalia truncatulinoides*	MOC-1_T1_N3	400-600	
1	Z-273	*Globorotalia truncatulinoides*	MOC-1_T1_N3	400-600	
1	Z-274	*Globorotalia truncatulinoides*	MOC-1_T1_N3	400-600	
1	Z-275	*Globorotalia hirsuta*	MOC-1_T1_N3	400-600	
1	Z-276	*Globorotalia hirsuta*	MOC-1_T1_N3	400-600	
1	Z-277	*Globorotalia hirsuta*	MOC-1_T1_N3	400-600	
1	Z-278	*Globorotalia hirsuta*	MOC-1_T1_N3	400-600	
1	Z-279	*Globorotalia hirsuta*	MOC-1_T1_N3	400-600	
1	Z-280	*Globorotalia hirsuta*	MOC-1_T1_N3	400-600	
1	Z-281	*Globorotalia hirsuta*	MOC-1_T1_N3	400-600	
1	Z-282	*Globorotalia hirsuta*	MOC-1_T1_N3	400-600	
1	Z-283	*Globorotalia hirsuta*	MOC-1_T1_N3	400-600	
1	Z-284	*Globorotalia hirsuta*	MOC-1_T1_N3	400-600	
1	Z-285	*Globorotalia hirsuta*	MOC-1_T1_N3	400-600	
1	Z-286	*Globorotalia hirsuta*	MOC-1_T1_N3	400-600	
1	Z-287	*Globorotalia hirsuta*	MOC-1_T1_N3	400-600	
1	Z-288	*Globorotalia hirsuta*	MOC-1_T1_N3	400-600	
1	Z-289	*Globorotalia hirsuta*	MOC-1_T1_N3	400-600	
1	Z-290	*Globorotalia hirsuta*	MOC-1_T1_N3	400-600	
1	Z-291	*Globorotalia hirsuta*	MOC-1_T1_N3	400-600	
1	Z-292	*Globorotalia hirsuta*	MOC-1_T1_N3	400-600	
1	Z-293	*Globorotalia hirsuta*	MOC-1_T1_N3	400-600	
1	Z-294	*Globorotalia hirsuta*	MOC-1_T1_N3	400-600	
1	Z-295	*Globorotalia hirsuta*	MOC-1_T1_N3	400-600	
1	Z-296	*Globorotalia hirsuta*	MOC-1_T1_N3	400-600	
1	Z-297	*Globorotalia hirsuta*	MOC-1_T1_N3	400-600	
1	Z-298	*Globorotalia hirsuta*	MOC-1_T1_N3	400-600	
1	Z-299	*Globorotalia hirsuta*	MOC-1_T1_N3	400-600	
1	Z-300	*Globorotalia hirsuta*	MOC-1_T1_N3	400-600	
1	Z-301	*Globorotalia hirsuta*	MOC-1_T1_N3	400-600	
1	Z-302	*Globorotalia hirsuta*	MOC-1_T1_N3	400-600	
1	Z-303	*Globorotalia hirsuta*	MOC-1_T1_N3	400-600	
1	Z-304	*Globorotalia hirsuta*	MOC-1_T1_N3	400-600	

Sta. #	DNA ID	species	Net type	Depth (m)	Remarks
1	Z-305	*Globigerinella aequilateralis*	MOC-1_T1_N7	25-50	
1	Z-306	*Globigerinella aequilateralis*	MOC-1_T1_N7	25-50	
1	Z-307	*Globigerinella aequilateralis*	MOC-1_T1_N7	25-50	
1	Z-308	*Globigerinella aequilateralis*	MOC-1_T1_N7	25-50	
1	Z-309	*Globigerinella aequilateralis*	MOC-1_T1_N7	25-50	
1	Z-310	*Globigerinella aequilateralis*	MOC-1_T1_N7	25-50	
1	Z-311	*Globigerinella aequilateralis*	MOC-1_T1_N7	25-50	
1	Z-312	*Globigerinella aequilateralis*	MOC-1_T1_N7	25-50	
1	Z-313	*Globigerinella aequilateralis*	MOC-1_T1_N7	25-50	
1	Z-314	*Globigerinella aequilateralis*	MOC-1_T1_N7	25-50	
1	Z-315	*Globigerinella aequilateralis*	MOC-1_T1_N7	25-50	
1	Z-316	*Globigerinella aequilateralis*	MOC-1_T1_N7	25-50	
1	Z-317	*Globigerinella aequilateralis*	MOC-1_T1_N7	25-50	
1	Z-318	*Globigerinella aequilateralis*	MOC-1_T1_N7	25-50	
1	Z-319	*Globigerinella aequilateralis*	MOC-1_T1_N7	25-50	
1	Z-320	*Globigerinella aequilateralis*	MOC-1_T1_N7	25-50	
1	Z-321	*Globorotalia inflata*	MOC-1_T1_N7	25-50	
1	Z-322	*Globorotalia inflata*	MOC-1_T1_N7	25-50	
1	Z-323	*Globorotalia inflata*	MOC-1_T1_N7	25-50	
1	Z-324	*Globorotalia inflata*	MOC-1_T1_N7	25-50	
1	Z-325	*Globorotalia inflata*	MOC-1_T1_N7	25-50	
1	Z-326	*Globorotalia inflata*	MOC-1_T1_N7	25-50	
1	Z-327	*Globorotalia inflata*	MOC-1_T1_N7	25-50	
1	Z-328	*Pulleniatina obliquiloculata*	MOC-1_T1_N7	25-50	reddish cytoplasm
1	Z-329	*Pulleniatina*	MOC-1_T1_N7	25-50	reddish cytoplasm

Sta. #	DNA ID	species	Net type	Depth (m)	Remarks
		obliquiloculata			
1	Z-330	*Pulleniatina obliquiloculata*	MOC-1_T1_N7	25-50	reddish cytoplasm
1	Z-331	*Neogloboquadrina dutertrei*	MOC-1_T1_N7	25-50	
1	Z-332	*Neogloboquadrina dutertrei*	MOC-1_T1_N7	25-50	
1	Z-333	*Neogloboquadrina dutertrei*	MOC-1_T1_N7	25-50	
1	Z-334	*Globorotalia truncatulinoides*	MOC-1_T1_N7	25-50	
1	Z-335	*Globorotalia truncatulinoides*	MOC-1_T1_N7	25-50	
1	Z-336	*Globorotalia truncatulinoides*	MOC-1_T1_N7	25-50	
1	Z-337	*Globorotalia menardii*	MOC-1_T1_N7	25-50	
1	Z-338	*Globorotalia menardii*	MOC-1_T1_N7	25-50	
1	Z-339	*Globorotalia hirsuta*	MOC-1_T1_N7	25-50	
1	Z-340	*Globigerinita glutinata*	MOC-1_T1_N7	25-50	
1	Z-341	*Globigerinita glutinata*	MOC-1_T1_N7	25-50	
1	Z-342	*Globigerinoides sacculifer*	MOC-1_T1_N7	25-50	
1	Z-343	*Globorotalia inflata*	MOC-1_T1_N8	0-25	
1	Z-344	*Globorotalia inflata*	MOC-1_T1_N8	0-25	
1	Z-345	*Globorotalia inflata*	MOC-1_T1_N8	0-25	
1	Z-346	*Globorotalia inflata*	MOC-1_T1_N8	0-25	
1	Z-347	*Globorotalia inflata*	MOC-1_T1_N8	0-25	
1	Z-348	*Globorotalia inflata*	MOC-1_T1_N8	0-25	
1	Z-349	*Globorotalia inflata*	MOC-1_T1_N8	0-25	
1	Z-350	*Globorotalia inflata*	MOC-1_T1_N8	0-25	
1	Z-351	*Globorotalia inflata*	MOC-1_T1_N8	0-25	
1	Z-352	*Globorotalia inflata*	MOC-1_T1_N8	0-25	
1	Z-353	*Globorotalia inflata*	MOC-1_T1_N8	0-25	
1	Z-354	*Globorotalia inflata*	MOC-1_T1_N8	0-25	
1	Z-355	*Globorotalia inflata*	MOC-1_T1_N8	0-25	
1	Z-356	*Globorotalia inflata*	MOC-1_T1_N8	0-25	
1	Z-357	*Globorotalia inflata*	MOC-1_T1_N8	0-25	
1	Z-358	*Globorotalia inflata*	MOC-1_T1_N8	0-25	
1	Z-359	*Globorotalia inflata*	MOC-1_T1_N8	0-25	
1	Z-360	*Globorotalia inflata*	MOC-1_T1_N8	0-25	
1	Z-361	*Globorotalia inflata*	MOC-1_T1_N8	0-25	
1	Z-362	*Pulleniatina*	MOC-1_T1_N8	0-25	

Sta. #	DNA ID	species	Net type	Depth (m)	Remarks
		obliquiloculata			
1	Z-363	*Neogloboquadrina dutertrei*	MOC-1_T1_N8	0-25	
1	Z-364	*Neogloboquadrina dutertrei*	MOC-1_T1_N8	0-25	
1	Z-365	*Neogloboquadrina dutertrei*	MOC-1_T1_N8	0-25	
1	Z-366	*Neogloboquadrina dutertrei*	MOC-1_T1_N8	0-25	
1	Z-367	*Neogloboquadrina dutertrei*	MOC-1_T1_N8	0-25	
1	Z-368	*Neogloboquadrina dutertrei*	MOC-1_T1_N8	0-25	
1	Z-369	*Globigerinita glutinata*	MOC-1_T1_N8	0-25	
1	Z-370	*Globigerinita glutinata*	MOC-1_T1_N8	0-25	
1	Z-371	*Globigerinita glutinata*	MOC-1_T1_N8	0-25	
1	Z-372	*Globigerinita glutinata*	MOC-1_T1_N8	0-25	
1	Z-373	*Globigerinita glutinata*	MOC-1_T1_N8	0-25	
1	Z-374	*Globigerinita glutinata*	MOC-1_T1_N8	0-25	
1	Z-375	*Globorotalia menardii*	MOC-1_T1_N8	0-25	
1	Z-376	*Globorotalia menardii*	MOC-1_T1_N8	0-25	
1	Z-377	*Globorotalia truncatulinoides*	MOC-1_T1_N8	0-25	
1	Z-378	*Globorotalia truncatulinoides*	MOC-1_T1_N8	0-25	
1	Z-379	*Globorotalia truncatulinoides*	MOC-1_T1_N8	0-25	
1	Z-380	*Globorotalia hirsuta*	MOC-1_T1_N8	0-25	reddish cytoplasm
1	Z-381	*Globorotalia hirsuta*	MOC-1_T1_N8	0-25	reddish cytoplasm
1	Z-382	*Globorotalia hirsuta*	MOC-1_T1_N8	0-25	
1	Z-383	*Globorotalia hirsuta*	MOC-1_T1_N8	0-25	
1	Z-384	*Globorotalia hirsuta*	MOC-1_T1_N8	0-25	
1	Z-385	*Globorotalia hirsuta*	MOC-1_T1_N8	0-25	
1	Z-386	*Globorotalia hirsuta*	MOC-1_T1_N8	0-25	
1	Z-387	*Globorotalia hirsuta*	MOC-1_T1_N8	0-25	
1	Z-388	*Globorotalia tumida*	MOC-1/4_T2_N5	75-100	
1	Z-389	*Globorotalia tumida*	MOC-1/4_T2_N5	75-100	
1	Z-390	*Globorotalia tumida*	MOC-1/4_T2_N6	50-75	
1	Z-391	*Globigerinoides ruber*	MOC-1_T1_N8	0-25	
1	Z-392	*Globigerinoides ruber*	MOC-1_T1_N8	0-25	
1	Z-393	*Globigerinoides ruber*	MOC-1_T1_N8	0-25	
1	Z-394	*Globigerinoides ruber*	MOC-1_T1_N8	0-25	

Sta. #	DNA ID	species	Net type	Depth (m)	Remarks
1	Z-395	*Globigerinoides ruber*	MOC-1_T1_N8	0-25	
1	Z-396	*Globigerinoides ruber*	MOC-1_T1_N8	0-25	
1	Z-397	*Globigerinoides ruber*	MOC-1_T1_N8	0-25	
1	Z-398	*Globorotalia hirsuta*	MOC-1_T2_N2	600-800	kept the extra in EtOH, tube 3ml
1	Z-399	*Globorotalia hirsuta*	MOC-1_T2_N2	600-800	kept the extra in EtOH, tube 3ml
1	Z-400	*Globorotalia hirsuta*	MOC-1_T2_N2	600-800	kept the extra in EtOH, tube 3ml
1	Z-401	*Globorotalia hirsuta*	MOC-1_T2_N2	600-800	kept the extra in EtOH, tube 3ml
1	Z-402	*Globorotalia hirsuta*	MOC-1_T2_N2	600-800	kept the extra in EtOH, tube 3ml
1	Z-403	*Globorotalia hirsuta*	MOC-1_T2_N2	600-800	kept the extra in EtOH, tube 3ml
1	Z-404	*Globorotalia hirsuta*	MOC-1_T2_N2	600-800	kept the extra in EtOH, tube 3ml
1	Z-405	*Globorotalia hirsuta*	MOC-1_T2_N2	600-800	kept the extra in EtOH, tube 3ml
1	Z-406	*Globorotalia hirsuta*	MOC-1_T2_N2	600-800	kept the extra in EtOH, tube 3ml
1	Z-407	*Globorotalia hirsuta*	MOC-1_T2_N2	600-800	kept the extra in EtOH, tube 3ml
1	Z-408	*Globorotalia hirsuta*	MOC-1_T2_N2	600-800	kept the extra in EtOH, tube 3ml
1	Z-409	*Globigerinella aequilateralis*	MOC-1_T2_N3	400-600	
1	Z-410	*Orbulina universa*	MOC-1_T2_N8	0-25	
1	Z-411	*Orbulina universa*	MOC-1_T2_N8	0-25	
1	Z-412	*Orbulina universa*	MOC-1_T2_N8	0-25	
1	Z-413	*Globigerinoides ruber*	MOC-1_T2_N8	0-25	white and small shell, slide C1
1	Z-414	*Globigerinoides ruber*	MOC-1_T2_N8	0-25	white and small shell, slide C1
1	Z-415	*Globigerinoides ruber*	MOC-1_T2_N8	0-25	white and small shell, slide C1
1	Z-416	*Globigerinoides ruber*	MOC-1_T2_N8	0-25	white and small shell, slide C1
1	Z-417	*Globigerinoides ruber*	MOC-1_T2_N8	0-25	white and small shell, slide C1
1	Z-418	*Globigerinoides ruber*	MOC-1_T2_N8	0-25	white and small shell, slide C1

Sta. #	DNA ID	species	Net type	Depth (m)	Remarks
1	Z-419	*Globigerinoides ruber*	MOC-1_T2_N8	0-25	white and small shell, slide C1
1	Z-420	*Globigerinoides ruber*	MOC-1_T2_N8	0-25	white and small shell, slide C1
1	Z-421	*Globigerinoides ruber*	MOC-1_T2_N8	0-25	white and small shell, slide C1
1	Z-422	*Globigerinella aequilateralis*	MOC-1_T2_N8	0-25	whitish and big shell
1	Z-423	*Globigerinella aequilateralis*	MOC-1_T2_N8	0-25	whitish and big shell
1	Z-424	*Globigerinella aequilateralis*	MOC-1_T2_N8	0-25	whitish and big shell
1	Z-425	*Globigerinella aequilateralis*	MOC-1_T2_N8	0-25	small shell, reddish cytoplasm
1	Z-426	*Globigerinella aequilateralis*	MOC-1_T2_N8	0-25	small shell, reddish cytoplasm
1	Z-427	*Globigerinella aequilateralis*	MOC-1_T2_N8	0-25	small shell, reddish cytoplasm
1	Z-428	*Globigerinella aequilateralis*	MOC-1_T2_N8	0-25	small shell, reddish cytoplasm
1	Z-429	*Globigerinoides ruber*	MOC-1/4_T2_N7	25-50	white shell
1	Z-430	*Globigerinoides ruber*	MOC-1/4_T2_N7	25-50	white shell
1	Z-431	*Globigerinoides ruber*	MOC-1/4_T2_N7	25-50	white shell
1	Z-432	*Globigerinoides ruber*	MOC-1/4_T2_N7	25-50	white shell
1	Z-433	*Globigerinoides ruber*	MOC-1/4_T2_N7	25-50	white shell
1	Z-434	*Globigerinoides ruber*	MOC-1/4_T2_N7	25-50	white shell
1	Z-435	*Globigerinoides ruber*	MOC-1/4_T2_N7	25-50	white shell
1	Z-436	*Globigerinoides ruber*	MOC-1/4_T2_N7	25-50	white shell
1	Z-437	*Globigerinoides ruber*	MOC-1/4_T2_N7	25-50	white shell
1	Z-438	*Globigerinoides ruber*	MOC-1/4_T2_N7	25-50	white shell
1	Z-439	*Globigerinoides ruber*	MOC-1/4_T2_N7	25-50	white shell
1	Z-440	*Globigerinoides ruber*	MOC-1/4_T2_N7	25-50	white shell
1	Z-441	*Globigerinoides ruber*	MOC-1/4_T2_N7	25-50	white shell
1	Z-442	*Globigerinoides ruber*	MOC-1/4_T2_N7	25-50	pink shell
1	Z-443	*Globigerinoides ruber*	MOC-1/4_T2_N7	25-50	pink shell
1	Z-444	*Globigerinoides ruber*	MOC-1/4_T2_N7	25-50	pink shell
1	Z-445	*Globigerinoides ruber*	MOC-1/4_T2_N7	25-50	pink shell
1	Z-446	*Globigerinoides ruber*	MOC-1/4_T2_N7	25-50	pink shell
1	Z-447	*Globigerinoides ruber*	MOC-1/4_T2_N7	25-50	pink shell
1	Z-448	*Globigerinoides ruber*	MOC-1/4_T2_N7	25-50	pink shell
1	Z-449	*Globigerinoides ruber*	MOC-1/4_T2_N7	25-50	pink shell
1	Z-450	*Globigerinoides ruber*	MOC-1/4_T2_N7	25-50	pink shell

Sta. #	DNA ID	species	Net type	Depth (m)	Remarks
1	Z-451	*Globigerinoides ruber*	MOC-1/4_T2_N7	25-50	pink shell
1	Z-452	*Globigerinoides ruber*	MOC-1/4_T2_N7	25-50	pink shell
1	Z-453	*Globorotalia crassaformis*	MOC-1/4_T2_N2	200-400	Silvia
1	Z-454	*Globorotalia inflata*	MOC-1/4_T2_N8	0-25	small shell, orange color cytoplasm
1	Z-455	*Globorotalia inflata*	MOC-1/4_T2_N8	0-25	reddish cytoplasm
1	Z-456	*Globorotalia inflata*	MOC-1/4_T2_N8	0-25	reddish cytoplasm
1	Z-457	*Globorotalia inflata*	MOC-1/4_T2_N8	0-25	reddish cytoplasm
1	Z-458	*Globorotalia inflata*	MOC-1/4_T2_N8	0-25	reddish cytoplasm
1	Z-459	*Globorotalia inflata*	MOC-1/4_T2_N6	50-75	
1	Z-460	*Globorotalia inflata*	MOC-1/4_T2_N6	50-75	
1	Z-461	*Globorotalia inflata*	MOC-1/4_T2_N6	50-75	
1	Z-462	*Globorotalia inflata*	MOC-1/4_T2_N6	50-75	
1	Z-463	*Globorotalia inflata*	MOC-1/4_T2_N6	50-75	
1	Z-464	*Globorotalia inflata*	MOC-1/4_T2_N6	50-75	
1	Z-465	*Globorotalia inflata*	MOC-1/4_T2_N6	50-75	
1	Z-466	*Globorotalia inflata*	MOC-1/4_T2_N6	50-75	
1	Z-467	*Globorotalia inflata*	MOC-1/4_T2_N6	50-75	
1	Z-468	*Globorotalia inflata*	MOC-1/4_T2_N6	50-75	
1	Z-469	*Globorotalia inflata*	MOC-1/4_T2_N2	200-400	
1	Z-470	*Globorotalia inflata*	MOC-1/4_T2_N2	200-400	
1	Z-471	*Globorotalia inflata*	MOC-1/4_T2_N2	200-400	
1	Z-472	*Globorotalia inflata*	MOC-1/4_T2_N2	200-400	
1	Z-473	*Globorotalia inflata*	MOC-1/4_T2_N2	200-400	
1	Z-474	*Globorotalia inflata*	MOC-1/4_T2_N2	100-150	
1	Z-475	*Globorotalia inflata*	MOC-1/4_T2_N2	100-150	
1	Z-476	*Globorotalia inflata*	MOC-1/4_T2_N2	100-150	
1	Z-477	*Globorotalia inflata*	MOC-1/4_T2_N2	100-150	
1	Z-478	*Globorotalia inflata*	MOC-1/4_T2_N2	100-150	
1	Z-479	*Globorotalia truncatulinoides*	MOC-1/4_T2_N2	100-150	
1	Z-480	*Globorotalia tumida*	MOC-1/4_T2_N2	100-150	
1	Z-481	*Globorotalia inflata*	MOC-1/4_T2_N5	75-100	
1	Z-482	*Globorotalia inflata*	MOC-1/4_T2_N5	75-100	
1	Z-483	*Globorotalia inflata*	MOC-1/4_T2_N5	75-100	
1	Z-484	*Globorotalia inflata*	MOC-1/4_T2_N5	75-100	
1	Z-485	*Globorotalia inflata*	MOC-1/4_T2_N5	75-100	
1	Z-486	*Globorotalia truncatulinoides*	MOC-1/4_T2_N5	75-100	
1	Z-487	*Globigerina humilis*	MOC-1/4_T2_N8	0-25	
1	Z-488	*Globigerina humilis*	MOC-1/4_T2_N8	0-25	

Sta. #	DNA ID	species	Net type	Depth (m)	Remarks
1	Z-489	*Globigerina humilis*	MOC-1/4_T2_N3	150-200	
1	Z-490	*Globorotalia scitula*	MOC-1/4_T2_N2	200-400	
1	Z-491	*Globorotalia tumida*	MOC-1/4_T2_N2	200-400	
1	Z-492	*Globorotalia hirsuta*	MOC-1/4_T2_N2	200-400	
1	Z-493	*Globorotalia hirsuta*	MOC-1/4_T2_N2	200-400	
1	Z-494	*Globorotalia hirsuta*	MOC-1/4_T2_N2	200-400	
1	Z-495	*Globorotalia hirsuta*	MOC-1/4_T2_N2	200-400	
1	Z-496	*Globorotalia hirsuta*	MOC-1/4_T2_N2	200-400	
1	Z-497	*Globorotalia hirsuta*	MOC-1/4_T2_N2	200-400	
1	Z-498	*Globorotalia hirsuta*	MOC-1/4_T2_N2	200-400	
1	Z-499	*Globorotalia hirsuta*	MOC-1/4_T2_N2	200-400	
1	Z-500	*Globorotalia hirsuta*	MOC-1/4_T2_N2	200-400	
1	Z-501	*Globorotalia hirsuta*	MOC-1/4_T2_N2	200-400	
1	Z-502	*Globorotalia hirsuta*	MOC-1/4_T2_N2	200-400	
1	Z-503	*Globorotalia hirsuta*	MOC-1/4_T2_N2	200-400	
1	Z-504	*Globorotalia hirsuta*	MOC-1/4_T2_N2	200-400	
1	Z-505	*Globorotalia hirsuta*	MOC-1/4_T2_N2	200-400	
1	Z-506	*Globorotalia hirsuta*	MOC-1/4_T2_N2	200-400	
1	Z-507	*Globorotalia hirsuta*	MOC-1/4_T2_N5	75-100	
1	Z-508	*Globorotalia hirsuta*	MOC-1/4_T2_N5	75-100	
1	Z-509	*Globorotalia hirsuta*	MOC-1/4_T2_N5	75-100	
1	Z-510	*Globorotalia hirsuta*	MOC-1/4_T2_N5	75-100	
1	Z-511	*Pulleniatina obliquiloculata*	MOC-1/4_T2_N4	100-150	
1	Z-512	*Globigerinita glutinata*	MOC-1/4_T2_N4	100-150	
1	Z-513	*Globigerinita glutinata*	MOC-1/4_T2_N4	100-150	
1	Z-514	*Globigerinita glutinata*	MOC-1/4_T2_N4	100-150	
1	Z-515	*Globigerinita glutinata*	MOC-1/4_T2_N4	100-150	
1	Z-516	*Globorotalia truncatulinoides*	MOC-1/4_T2_N4	100-150	
1	Z-517	*Globorotalia truncatulinoides*	MOC-1/4_T2_N4	100-150	
1	Z-518	*Globorotalia hirsuta*	MOC-1/4_T2_N4	100-150	
1	Z-519	*Globorotalia hirsuta*	MOC-1/4_T2_N4	100-150	
1	Z-520	*Globorotalia hirsuta*	MOC-1/4_T2_N4	100-150	
1	Z-521	*Globorotalia hirsuta*	MOC-1/4_T2_N4	100-150	
1	Z-522	*Globorotalia hirsuta*	MOC-1/4_T2_N4	100-150	
1	Z-523	*Globorotalia truncatulinoides*	MOC-1/4_T2_N3	150-200	Right coiling
1	Z-524	*Globorotalia truncatulinoides*	MOC-1/4_T2_N3	150-200	left coiling
1	Z-525	*Globorotalia*	MOC-1/4_T2_N3	150-200	left coiling

Sta. #	DNA ID	species	Net type	Depth (m)	Remarks
		truncatulinoides			
1	Z-526	*Globorotalia truncatulinoides*	MOC-1/4_T2_N3	150-200	left coiling
1	Z-527	*Globorotalia truncatulinoides*	MOC-1/4_T2_N3	150-200	left coiling
1	Z-528	*Globorotalia truncatulinoides*	MOC-1/4_T2_N3	150-200	left coiling
1	Z-529	*Globorotalia truncatulinoides*	MOC-1/4_T2_N3	150-200	left coiling
1	Z-530	*Globorotalia truncatulinoides*	MOC-1/4_T2_N3	150-200	left coiling
1	Z-531	*Globorotalia truncatulinoides*	MOC-1/4_T2_N2	200-400	Right coiling
1	Z-532	*Globorotalia truncatulinoides*	MOC-1/4_T2_N2	200-400	Right coiling
1	Z-533	*Globorotalia truncatulinoides*	MOC-1/4_T2_N2	200-400	Right coiling
1	Z-534	*Globorotalia truncatulinoides*	MOC-1/4_T2_N2	200-400	left coiling
1	Z-535	*Globorotalia truncatulinoides*	MOC-1/4_T2_N2	200-400	left coiling
1	Z-436	*Globorotalia truncatulinoides*	MOC-1/4_T2_N2	200-400	left coiling
1	Z-537	*Globorotalia truncatulinoides*	MOC-1/4_T2_N2	200-400	left coiling
1	Z-538	*Globorotalia truncatulinoides*	MOC-1/4_T2_N2	200-400	left coiling
1	Z-539	*Globorotalia truncatulinoides*	MOC-1/4_T2_N2	200-400	left coiling
1	Z-540	*Globorotalia truncatulinoides*	MOC-1/4_T2_N2	200-400	left coiling
1	Z-541	*Globorotalia truncatulinoides*	MOC-1/4_T2_N2	200-400	left coiling
1	Z-542	*Globorotalia truncatulinoides*	MOC-1/4_T2_N2	200-400	left coiling
1	Z-543	*Globorotalia truncatulinoides*	MOC-1/4_T2_N2	200-400	left coiling
1	Z-544	*Globorotalia truncatulinoides*	MOC-1/4_T2_N2	200-400	left coiling
1	Z-545	*Globorotalia truncatulinoides*	MOC-1/4_T2_N2	200-400	left coiling
1	Z-546	*Globorotalia*	MOC-1/4_T2_N2	200-400	left coiling

Sta. #	DNA ID	species	Net type	Depth (m)	Remarks
		truncatulinoides			
1	Z-547	*Globorotalia truncatulinoides*	MOC-1/4_T2_N2	200-400	left coiling
1	Z-548	*Globorotalia truncatulinoides*	MOC-1/4_T2_N2	200-400	left coiling
1	Z-549	*Globorotalia truncatulinoides*	MOC-1/4_T2_N2	200-400	left coiling
1	Z-550	*Globorotalia truncatulinoides*	MOC-1/4_T2_N2	200-400	left coiling
1	Z-551	*Globorotalia truncatulinoides*	MOC-1/4_T2_N2	200-400	left coiling
1	Z-552	*Globorotalia truncatulinoides*	MOC-1/4_T2_N2	200-400	left coiling
1	Z-553	*Globorotalia truncatulinoides*	MOC-1/4_T2_N2	200-400	left coiling
1	Z-554	*Globorotalia truncatulinoides*	MOC-1/4_T2_N2	200-400	left coiling
1	Z-555	*Globorotalia truncatulinoides*	MOC-1/4_T2_N2	200-400	left coiling
1	Z-556	*Globorotalia truncatulinoides*	MOC-1/4_T2_N2	200-400	left coiling
1	Z-557	*Globorotalia truncatulinoides*	MOC-1/4_T2_N2	200-400	left coiling
1	Z-558	*Globorotalia inflata*	MOC-1_T2_N4	200-400	
1	Z-559	*Globorotalia inflata*	MOC-1_T2_N4	200-400	
1	Z-560	*Globorotalia inflata*	MOC-1_T2_N4	200-400	
1	Z-561	*Globorotalia inflata*	MOC-1_T2_N4	200-400	
1	Z-562	*Globorotalia inflata*	MOC-1_T2_N4	200-400	
1	Z-563	*Globorotalia tumida*	MOC-1_T2_N5	100-200	
1	Z-564	*Globorotalia tumida*	MOC-1_T2_N5	100-200	
1	Z-565	*Globorotalia tumida*	MOC-1_T2_N5	100-200	
1	Z-566	*Globorotalia tumida*	MOC-1_T2_N5	100-200	
1	Z-567	*Globorotalia tumida*	MOC-1_T2_N5	100-200	
1	Z-568	*Globorotalia tumida*	MOC-1_T2_N5	100-200	
1	Z-569	*Pulleniatina finalis*	MOC-1_T2_N5	100-200	
1	Z-570	*Pulleniatina finalis*	MOC-1_T2_N5	100-200	
1	Z-571	*Globorotalia truncatulinoides*	MOC-1_T2_N5	100-200	right coiling
1	Z-572	*Globorotalia truncatulinoides*	MOC-1_T2_N5	100-200	right coiling
1	Z-573	*Globorotalia truncatulinoides*	MOC-1_T2_N5	100-200	right coiling

Sta. #	DNA ID	species	Net type	Depth (m)	Remarks
1	Z-574	*Globorotalia truncatulinoides*	MOC-1_T2_N5	100-200	right coiling
1	Z-575	*Globorotalia truncatulinoides*	MOC-1_T2_N5	100-200	left coiling
1	Z-576	*Globorotalia truncatulinoides*	MOC-1_T2_N5	100-200	left coiling
1	Z-577	*Globorotalia truncatulinoides*	MOC-1_T2_N5	100-200	left coiling
1	Z-578	*Globorotalia truncatulinoides*	MOC-1_T2_N5	100-200	left coiling
1	Z-579	*Globorotalia truncatulinoides*	MOC-1_T2_N5	100-200	left coiling
1	Z-580	*Globigerinita glutinata*	MOC-1/4_T2_N6	50-75	
1	Z-581	*Globigerinita glutinata*	MOC-1/4_T2_N6	50-75	
1	Z-582	*Globigerinita glutinata*	MOC-1/4_T2_N6	50-75	
1	Z-583	*Globigerinita glutinata*	MOC-1/4_T2_N6	50-75	
1	Z-584	*Globigerinita glutinata*	MOC-1/4_T2_N6	50-75	
1	Z-585	*Globigerinita glutinata*	MOC-1/4_T2_N6	50-75	
1	Z-586	*Globigerinita glutinata*	MOC-1/4_T2_N6	50-75	
1	Z-587	*Globigerinita glutinata*	MOC-1/4_T2_N6	50-75	
1	Z-588	*Globigerinita glutinata*	MOC-1/4_T2_N6	50-75	
1	Z-589	*Globigerinita glutinata*	MOC-1/4_T2_N8	0-25	
1	Z-590	*Globigerinita glutinata*	MOC-1/4_T2_N8	0-25	
1	Z-591	*Globigerinita glutinata*	MOC-1/4_T2_N8	0-25	
1	Z-592	*Globigerinita glutinata*	MOC-1/4_T2_N8	0-25	
1	Z-593	*Globigerinita glutinata*	MOC-1/4_T2_N8	0-25	
1	Z-594	*Globigerinita glutinata*	MOC-1/4_T2_N8	0-25	
1	Z-595	*Globigerinita glutinata*	MOC-1/4_T2_N8	0-25	
1	Z-596	*Globigerinita glutinata*	MOC-1/4_T2_N8	0-25	
1	Z-597	*Globigerinita glutinata*	MOC-1/4_T2_N8	0-25	
1	Z-598	*Globigerinita glutinata*	MOC-1/4_T2_N8	0-25	
1	Z-599	*Globigerinita glutinata*	MOC-1/4_T2_N5	75-100	
1	Z-600	*Globigerinita glutinata*	MOC-1/4_T2_N5	75-100	
1	Z-601	*Globigerinita glutinata*	MOC-1/4_T2_N5	75-100	
1	Z-602	*Globigerinita glutinata*	MOC-1/4_T2_N5	75-100	
1	Z-603	*Globigerinita glutinata*	MOC-1/4_T2_N5	75-100	
1	Z-604	*Globigerinita glutinata*	MOC-1/4_T2_N3	150-200	
1	Z-605	*Globigerinita glutinata*	MOC-1/4_T2_N3	150-200	
1	Z-606	*Globigerinita glutinata*	MOC-1/4_T2_N3	150-200	
1	Z-607	*Globorotalia scitula*	MOC-1/4_T2_N3	150-200	
1	Z-608	*Globorotalia scitula*	MOC-1/4_T2_N3	150-200	
1	Z-609	*Neogloboquadrina*	MOC-1/4_T2_N8	0-25	

Sta. #	DNA ID	species	Net type	Depth (m)	Remarks
		dutertrei			
1	Z-610	*Neogloboquadrina dutertrei*	MOC-1/4_T2_N8	0-25	
1	Z-611	*Pulleniatina obliquiloculata*	MOC-1/4_T2_N8	0-25	
1	Z-612	*Globigerinoides sacculifer*	MOC-1/4_T2_N8	0-25	
1	Z-613	*Globigerina humilis*	MOC-1/4_T2_N7	25-50	
1	Z-614	*Globigerina humilis*	MOC-1/4_T2_N7	25-50	
1	Z-615	*Globigerinita glutinata*	MOC-1/4_T2_N7	25-50	
1	Z-616	*Globigerinita glutinata*	MOC-1/4_T2_N7	25-50	
1	Z-617	*Globigerinita glutinata*	MOC-1/4_T2_N7	25-50	
1	Z-618	*Globigerinita glutinata*	MOC-1/4_T2_N7	25-50	
1	Z-619	*Globigerinita glutinata*	MOC-1/4_T2_N7	25-50	
1	Z-620	*Globigerinita glutinata*	MOC-1/4_T2_N7	25-50	
1	Z-621	*Globigerinita glutinata*	MOC-1/4_T2_N7	25-50	
1	Z-622	*Globigerinita glutinata*	MOC-1/4_T2_N7	25-50	
1	Z-623	*Globigerinita glutinata*	MOC-1/4_T2_N7	25-50	
1	Z-624	*Globigerinita glutinata*	MOC-1/4_T2_N7	25-50	
1	Z-625	*Globigerinita glutinata*	MOC-1/4_T2_N7	25-50	
1	Z-626	*Globigerinita glutinata*	MOC-1/4_T2_N7	25-50	
1	Z-627	*Neogloboquadrina dutertrei*	MOC-1/4_T2_N7	25-50	
1	Z-628	*Pulleniatina obliquiloculata*	MOC-1/4_T2_N7	25-50	
1	Z-629	*Globorotalia inflata*	MOC-1/4_T2_N7	25-50	
1	Z-630	*Globorotalia inflata*	MOC-1/4_T2_N7	25-50	
1	Z-631	*Globorotalia inflata*	MOC-1/4_T2_N7	25-50	
1	Z-632	*Globigerinoides sacculifer*	MOC-1/4_T2_N7	25-50	
1	Z-633	*Globigerinoides sacculifer*	MOC-1/4_T2_N7	25-50	
1	Z-634	*Globigerinoides sacculifer*	MOC-1/4_T2_N7	25-50	
1	Z-635	*Globigerinoides sacculifer*	MOC-1/4_T2_N7	25-50	
1	Z-636	*Globigerinoides sacculifer*	MOC-1/4_T2_N7	25-50	
1	Z-637	*Globigerinoides sacculifer*	MOC-1/4_T2_N7	25-50	
1	Z-638	*Globigerinoides ruber*	MOC-1/4_T2_N8	0-25	pink shell
1	Z-639	*Globigerinoides ruber*	MOC-1/4_T2_N8	0-25	pink shell

Sta. #	DNA ID	species	Net type	Depth (m)	Remarks
1	Z-640	*Globigerinoides ruber*	MOC-1/4_T2_N8	0-25	white shell
1	Z-641	*Globigerinoides ruber*	MOC-1/4_T2_N8	0-25	white shell
1	Z-642	*Globigerinoides ruber*	MOC-1/4_T2_N8	0-25	white shell
1	Z-643	*Globigerinoides ruber*	MOC-1/4_T2_N8	0-25	white shell
1	Z-644	*Globigerinoides ruber*	MOC-1/4_T2_N6	50-75	white shell
1	Z-645	*Globigerinoides ruber*	MOC-1/4_T2_N6	50-75	white shell
1	Z-646	*Globigerinoides ruber*	MOC-1/4_T2_N6	50-75	white shell
1	Z-647	*Globigerinella aequilateralis*	MOC-1/4_T2_N8	0-25	
1	Z-648	*Globigerinella aequilateralis*	MOC-1/4_T2_N8	0-25	
1	Z-649	*Globigerinella aequilateralis*	MOC-1/4_T2_N8	0-25	
1	Z-650	*Globigerinella aequilateralis*	MOC-1/4_T2_N8	0-25	
1	Z-651	*Globigerinella aequilateralis*	MOC-1/4_T2_N6	50-75	
1	Z-652	*Globigerinella aequilateralis*	MOC-1/4_T2_N6	50-75	
1	Z-653	*Globigerinella aequilateralis*	MOC-1/4_T2_N6	50-75	
1	Z-654	*Globigerinella aequilateralis*	MOC-1/4_T2_N6	50-75	
1	Z-655	*Globigerinella aequilateralis*	MOC-1/4_T2_N6	50-75	
1	Z-656	*Globigerinella aequilateralis*	MOC-1/4_T2_N6	50-75	
1	Z-657	*Globigerinella aequilateralis*	MOC-1/4_T2_N6	50-75	
1	Z-658	*Globigerinella aequilateralis*	MOC-1/4_T2_N6	50-75	
1	Z-659	*Globigerinella aequilateralis*	MOC-1/4_T2_N6	50-75	
1	Z-660	*Globigerinella aequilateralis*	MOC-1/4_T2_N6	50-75	
1	Z-661	*Globigerinella aequilateralis*	MOC-1/4_T2_N7	25-50	
1	Z-662	*Globigerinella aequilateralis*	MOC-1/4_T2_N7	25-50	
1	Z-663	*Globigerinella aequilateralis*	MOC-1/4_T2_N7	25-50	
1	Z-664	*Globigerinella*	MOC-1/4_T2_N7	25-50	

Sta. #	DNA ID	species	Net type	Depth (m)	Remarks
		aequilateralis			
1	Z-665	*Globigerinella aequilateralis*	MOC-1/4_T2_N7	25-50	
1	Z-666	*Globigerinella aequilateralis*	MOC-1/4_T2_N7	25-50	
1	Z-667	*Globigerinella aequilateralis*	MOC-1/4_T2_N7	25-50	
1	Z-668	*Globigerinella aequilateralis*	MOC-1/4_T2_N7	25-50	
1	Z-669	*Globorotalia hirsuta*	MOC-1/4_T2_N1	400-500	Left coiling
1	Z-670	*Globorotalia hirsuta*	MOC-1/4_T2_N1	400-500	Right coiling
1	Z-671	*Globorotalia hirsuta*	MOC-1/4_T2_N1	400-500	Right coiling
1	Z-672	*Globorotalia hirsuta*	MOC-1/4_T2_N1	400-500	Right coiling
1	Z-673	*Globorotalia tumida*	MOC-1_T2_N4	200-400	
1	Z-674	*Globorotalia tumida*	MOC-1_T2_N4	200-400	
1	Z-675	*Globorotalia tumida*	MOC-1_T2_N4	200-400	
1	Z-676	*Globorotalia tumida*	MOC-1_T2_N4	200-400	
1	Z-677	*Globorotalia truncatulinoides*	MOC-1_T2_N4	200-400	Right coiling
1	Z-678	*Globorotalia truncatulinoides*	MOC-1_T2_N4	200-400	Right coiling
1	Z-679	*Globorotalia truncatulinoides*	MOC-1_T2_N4	200-400	Left coiling
1	Z-680	*Globorotalia truncatulinoides*	MOC-1_T2_N4	200-400	Left coiling
1	Z-681	*Globorotalia truncatulinoides*	MOC-1_T2_N4	200-400	Left coiling
1	Z-682	*Globorotalia truncatulinoides*	MOC-1_T2_N4	200-400	Left coiling
1	Z-683	*Globorotalia truncatulinoides*	MOC-1_T2_N4	200-400	Left coiling
1	Z-684	*Globorotalia truncatulinoides*	MOC-1_T2_N4	200-400	Left coiling
1	Z-685	*Globorotalia truncatulinoides*	MOC-1_T2_N4	200-400	Left coiling
1	Z-686	*Globorotalia truncatulinoides*	MOC-1_T2_N4	200-400	Left coiling
1	Z-687	*Globorotalia truncatulinoides*	MOC-1_T2_N4	200-400	Left coiling
1	Z-688	*Globorotalia truncatulinoides*	MOC-1_T2_N4	200-400	Left coiling
1	Z-689	*Globorotalia*	MOC-1_T2_N4	200-400	Left coiling

Sta. #	DNA ID	species	Net type	Depth (m)	Remarks
		truncatulinoides			
1	Z-690	*Globorotalia truncatulinoides*	MOC-1_T2_N4	200-400	Left coiling
1	Z-691	*Globorotalia truncatulinoides*	MOC-1_T2_N4	200-400	Left coiling
1	Z-692	*Globorotalia truncatulinoides*	MOC-1_T2_N4	200-400	Left coiling
1	Z-693	*Globorotalia truncatulinoides*	MOC-1_T2_N4	200-400	Left coiling
1	Z-694	*Globorotalia truncatulinoides*	MOC-1_T2_N4	200-400	Left coiling
1	Z-695	*Globorotalia truncatulinoides*	MOC-1_T2_N4	200-400	Left coiling
1	Z-696	*Globorotalia truncatulinoides*	MOC-1_T2_N4	200-400	Left coiling
1	Z-697	*Globorotalia truncatulinoides*	MOC-1_T2_N4	200-400	Left coiling
1	Z-698	*Globorotalia truncatulinoides*	MOC-1_T2_N4	200-400	Left coiling
1	Z-699	*Globorotalia truncatulinoides*	MOC-1_T2_N4	200-400	Left coiling
1	Z-700	*Globorotalia truncatulinoides*	MOC-1_T2_N4	200-400	Left coiling
1	Z-701	*Globorotalia truncatulinoides*	MOC-1_T2_N4	200-400	Left coiling
1	Z-702	*Globorotalia truncatulinoides*	MOC-1_T2_N4	200-400	Left coiling
1	Z-703	*Globorotalia truncatulinoides*	MOC-1_T2_N4	200-400	Left coiling
1	Z-704	*Globorotalia hirsuta*	MOC-1_T2_N4	200-400	splendid
1	Z-705	*Globorotalia hirsuta*	MOC-1_T2_N4	200-400	splendid
1	Z-706	*Globorotalia hirsuta*	MOC-1_T2_N4	200-400	splendid
1	Z-707	*Globorotalia hirsuta*	MOC-1_T2_N4	200-400	splendid
1	Z-708	*Globorotalia hirsuta*	MOC-1_T2_N4	200-400	splendid
1	Z-709	*Globorotalia hirsuta*	MOC-1_T2_N4	200-400	splendid
1	Z-710	*Globorotalia hirsuta*	MOC-1_T2_N4	200-400	splendid
1	Z-711	*Globorotalia hirsuta*	MOC-1_T2_N4	200-400	splendid
1	Z-712	*Globorotalia hirsuta*	MOC-1_T2_N4	200-400	splendid
1	Z-713	*Globorotalia hirsuta*	MOC-1_T2_N4	200-400	splendid
1	Z-714	*Globorotalia hirsuta*	MOC-1_T2_N4	200-400	splendid
1	Z-715	*Globorotalia hirsuta*	MOC-1_T2_N4	200-400	splendid
1	Z-716	*Globorotalia hirsuta*	MOC-1_T2_N4	200-400	splendid

Sta. #	DNA ID	species	Net type	Depth (m)	Remarks
1	Z-717	*Globorotalia hirsuta*	MOC-1_T2_N4	200-400	splendid
1	Z-718	*Globorotalia hirsuta*	MOC-1_T2_N4	200-400	splendid
1	Z-719	*Globorotalia hirsuta*	MOC-1_T2_N4	200-400	splendid
1	Z-720	*Globorotalia hirsuta*	MOC-1_T2_N4	200-400	splendid
1	Z-721	*Globorotalia truncatulinoides*	MOC-1_T2_N3	400-600	left coiling
1	Z-722	*Globorotalia truncatulinoides*	MOC-1_T2_N3	400-600	left coiling
1	Z-723	*Globorotalia truncatulinoides*	MOC-1_T2_N3	400-600	left coiling
1	Z-724	*Globorotalia truncatulinoides*	MOC-1_T2_N3	400-600	left coiling
1	Z-725	*Globorotalia truncatulinoides*	MOC-1_T2_N3	400-600	left coiling
1	Z-726	*Globorotalia truncatulinoides*	MOC-1_T2_N3	400-600	left coiling
1	Z-727	*Globorotalia truncatulinoides*	MOC-1_T2_N3	400-600	left coiling
1	Z-728	*Globorotalia truncatulinoides*	MOC-1_T2_N3	400-600	left coiling
1	Z-729	*Globorotalia truncatulinoides*	MOC-1_T2_N3	400-600	left coiling
1	Z-730	*Globorotalia truncatulinoides*	MOC-1_T2_N3	400-600	Right coiling
1	Z-731	*Globorotalia hirsuta*	MOC-1_T2_N3	400-600	
1	Z-732	*Globorotalia hirsuta*	MOC-1_T2_N3	400-600	
1	Z-733	*Globorotalia hirsuta*	MOC-1_T2_N3	400-600	
1	Z-734	*Globorotalia hirsuta*	MOC-1_T2_N3	400-600	
1	Z-735	*Globorotalia hirsuta*	MOC-1_T2_N3	400-600	
1	Z-736	*Globorotalia hirsuta*	MOC-1_T2_N3	400-600	
2	Z-737	*Hastigerina pelagica*	MOC-1_T3,4_N2	600-800	
2	Z-738	*Hastigerina pelagica*	MOC-1_T3,4_N2	600-800	
2	Z-739	*Globorotalia hirsuta*	MOC-1_T3,4_N2	600-800	
2	Z-740	*Hastigerina pelagica*	MOC-1_T3,4_N3	400-600	
2	Z-741	*Globorotalia hirsuta*	MOC-1_T3,4_N3	400-600	Left coiling
2	Z-742	*Globorotalia hirsuta*	MOC-1_T3,4_N3	400-600	Right coiling
2	Z-743	*Globorotalia hirsuta*	MOC-1_T3,4_N3	400-600	Right coiling
2	Z-744	*Globorotalia truncatulinoides*	MOC-1_T3,4_N3	400-600	
2	Z-745	*Globorotalia inflata*	MOC-1_T3,4_N5	100-200	
2	Z-746	*Globorotalia inflata*	MOC-1_T3,4_N5	100-200	
2	Z-747	*Globorotalia inflata*	MOC-1_T3,4_N5	100-200	

Sta. #	DNA ID	species	Net type	Depth (m)	Remarks
2	Z-748	*Globorotalia hirsuta*	MOC-1_T3,4_N5	100-200	
2	Z-749	*Neogloboquadrina dutertrei*	MOC-1_T3,4_N6	50-100	
2	Z-750	*Globorotalia inflata*	MOC-1_T3,4_N6	50-100	
2	Z-751	*Orbulina universa*	MOC-1_T3,4_N6	50-100	
2	Z-752	*Globorotalia inflata*	MOC-1_T3,4_N7	25-50	
2	Z-753	*Orbulina universa*	MOC-1_T3,4_N7	25-50	
2	Z-754	*Orbulina universa*	MOC-1_T3,4_N7	25-50	
2	Z-755	*Globigerinella aequilateralis*	MOC-1_T3,4_N8	0-25	
2	Z-756	*Globigerinella aequilateralis*	MOC-1_T3,4_N8	0-25	
2	Z-757	*Neogloboquadrina dutertrei*	MOC-1_T3,4_N8	0-25	
2	Z-758	*Orbulina universa*	MOC-1_T3,4_N8	0-25	
2	Z-759	*Globigerinella aequilateralis*	MOC-1_T3,4_N8	0-25	
2	Z-760	*Globigerinoides ruber*	MOC-1_T3,4_N8	0-25	
2	Z-761	*Hastigerina pelagica*	MOC-1_T3,4_N8	0-25	
2	Z-762	*Hastigerina pelagica*	MOC-1_T3,4_N8	0-25	
3	Z-763	*Globigerinella aequilateralis*	Ring Net	0-20	
3	Z-764	*Globigerinoides sacculifer*	Ring Net	0-20	
3	Z-765	*Globigerinita glutinata*	Ring Net	0-20	
3	Z-766	*Orbulina universa*	Ring Net	0-20	
3	Z-767	*Orbulina universa*	Ring Net	0-20	
3	Z-768	*Orbulina universa*	Ring Net	0-20	
3	Z-769	*Orbulina universa*	Ring Net	0-20	
3	Z-770	*Globigerinoides sacculifer*	Ring Net	0-50	
3	Z-771	*Hastigerina pelagica*	Ring Net	0-50	
3	Z-772	*Hastigerina pelagica*	Ring Net	0-50	
3	Z-773	*Hastigerina pelagica*	Ring Net	0-50	
3	Z-774	*Hastigerina pelagica*	Ring Net	0-50	
3	Z-775	*Hastigerina digitata*	MOC-10_T3_N4	1000-2000	
3	Z-776	*Globorotalia truncatulinoides*	MOC-10_T3_N4	1000-2000	left coiling
3	Z-777	*Globorotalia truncatulinoides*	MOC-10_T3_N4	1000-2000	left coiling
3	Z-778	*Globorotalia truncatulinoides*	MOC-10_T3_N4	1000-2000	left coiling

Sta. #	DNA ID	species	Net type	Depth (m)	Remarks
3	Z-779	*Globorotalia truncatulinoides*	MOC-10_T3_N4	1000-2000	right coiling
3	Z-780	*Globorotalia hirstuta*	MOC-10_T3_N4	1000-2000	
3	Z-781	*Globorotalia hirstuta*	MOC-10_T3_N4	1000-2000	
3	Z-782	*Hastigerina pelagica*	Ring Net	0-200	
3	Z-783	*Hastigerina pelagica*	Ring Net	0-200	
3	Z-784	*Globorotalia truncatulinoides*	Ring Net	0-200	left coiling
3	Z-785	*Globorotalia truncatulinoides*	Ring Net	0-200	left coiling
3	Z-786	*Globorotalia truncatulinoides*	Ring Net	0-200	left coiling
3	Z-787	*Globigerinella aequilateralis*	Ring Net	0-200	
3	Z-788	*Globigerinita glutinata*	Ring Net	0-200	
3	Z-789	*Globigerinoides ruber*	Ring Net	0-200	
3	Z-790	*Globigerinita glutinata*	Ring Net	surface	
3	Z-791	*Orbulina universa*	Ring Net	surface	
3	Z-792	*Orbulina universa*	Ring Net	surface	
3	Z-793	*Neogloboquadrina dutertrei*	MOC-10_T3_N2	3000-4000	
3	Z-794	*Globorotalia truncatulinoides*	MOC-10_T3_N2	3000-4000	right coiling
3	Z-795	*Globigerinita glutinata*	MOC-10_T3_N2	3000-4000	
3	Z-796	*Globorotalia truncatulinoides*	MOC-1_T7_N8	0-25	right coiling
3	Z-797	*Globorotalia truncatulinoides*	MOC-1_T7_N8	0-25	right coiling
3	Z-798	*Orbulina universa*	MOC-1_T7_N7	25-50	
3	Z-799	*Orbulina universa*	MOC-1_T7_N7	25-50	
3	Z-800	*Orbulina universa*	MOC-1_T7_N6	50-100	
3	Z-801	*Orbulina universa*	MOC-1_T7_N6	50-100	
3	Z-802	*Orbulina universa*	MOC-1_T7_N6	50-100	
3	Z-803	*Orbulina universa*	MOC-1_T7_N6	50-100	
3	Z-804	*Globorotalia truncatulinoides*	MOC-1_T7_N4	200-400	left coiling
3	Z-805	*Globorotalia truncatulinoides*	MOC-1_T7_N4	200-400	left coiling
3	Z-806	*Globorotalia truncatulinoides*	MOC-1_T7_N4	200-400	right coiling
3	Z-807	*Globorotalia truncatulinoides*	MOC-1_T7_N4	200-400	right coiling

Sta. #	DNA ID	species	Net type	Depth (m)	Remarks
3	Z-808	*Globorotalia truncatulinoides*	MOC-1_T7_N4	200-400	right coiling
3	Z-809	*Globorotalia truncatulinoides*	MOC-1_T7_N4	200-400	right coiling
3	Z-810	*Globorotalia truncatulinoides*	MOC-1_T7_N4	200-400	right coiling
3	Z-811	*Globorotalia truncatulinoides*	MOC-1_T7_N4	200-400	right coiling
3	Z-812	*Globorotalia truncatulinoides*	MOC-1_T7_N4	200-400	right coiling
3	Z-813	*Globorotalia truncatulinoides*	MOC-1_T7_N4	200-400	right coiling
3	Z-814	*Globorotalia truncatulinoides*	MOC-1_T7_N4	200-400	right coiling
3	Z-815	*Globorotalia truncatulinoides*	MOC-1_T7_N4	200-400	right coiling
3	Z-816	*Globorotalia truncatulinoides*	MOC-1_T7_N4	200-400	right coiling
3	Z-817	*Globigerinella aequilateralis*	MOC-1_T7_N5	100-200	
3	Z-818	*Globorotalia truncatulinoides*	MOC-1_T7_N3	400-600	right coiling
3	Z-819	*Globorotalia truncatulinoides*	MOC-1_T7_N3	400-600	right coiling
3	Z-820	*Globorotalia truncatulinoides*	MOC-1_T7_N3	400-600	right coiling
3	Z-821	*Globorotalia truncatulinoides*	MOC-1_T7_N3	400-600	right coiling
3	Z-822	*Globorotalia truncatulinoides*	MOC-1_T7_N3	400-600	right coiling
3	Z-823	*Globorotalia truncatulinoides*	MOC-1_T7_N3	400-600	right coiling
3	Z-824	*Globorotalia truncatulinoides*	MOC-1_T7_N5	100-200	left coiling
3	Z-825	*Globorotalia truncatulinoides*	MOC-1_T7_N5	100-200	left coiling
3	Z-826	*Globorotalia truncatulinoides*	MOC-1_T7_N5	100-200	left coiling
3	Z-827	*Globorotalia truncatulinoides*	MOC-1_T7_N5	100-200	left coiling
3	Z-828	*Globorotalia truncatulinoides*	MOC-1_T7_N5	100-200	left coiling

Sta. #	DNA ID	species	Net type	Depth (m)	Remarks
3	Z-829	*Globorotalia truncatulinoides*	MOC-1_T7_N5	100-200	left coiling
3	Z-830	*Globorotalia truncatulinoides*	MOC-1_T7_N5	100-200	left coiling
3	Z-831	*Globorotalia truncatulinoides*	MOC-1_T7_N5	100-200	left coiling
3	Z-832	*Globorotalia truncatulinoides*	MOC-1_T7_N5	100-200	left coiling
3	Z-833	*Globorotalia truncatulinoides*	MOC-1_T7_N5	100-200	left coiling
3	Z-834	*Globorotalia truncatulinoides*	MOC-1_T7_N5	100-200	left coiling
3	Z-835	*Globorotalia truncatulinoides*	MOC-1_T7_N5	100-200	left coiling
3	Z-836	*Globorotalia truncatulinoides*	MOC-1_T7_N5	100-200	right coiling
3	Z-837	*Globorotalia truncatulinoides*	MOC-1_T7_N5	100-200	right coiling
3	Z-838	*Globorotalia truncatulinoides*	MOC-1_T7_N5	100-200	right coiling
3	Z-839	*Globorotalia truncatulinoides*	MOC-1_T7_N5	100-200	right coiling
3	Z-840	*Globorotalia truncatulinoides*	MOC-1_T7_N5	100-200	right coiling
3	Z-841	*Globorotalia truncatulinoides*	MOC-1_T7_N5	100-200	right coiling
3	Z-842	*Globorotalia truncatulinoides*	MOC-1_T7_N5	100-200	right coiling
3	Z-843	*Globorotalia truncatulinoides*	MOC-1_T7_N5	100-200	right coiling
3	Z-844	*Globorotalia truncatulinoides*	MOC-1_T7_N5	100-200	right coiling
3	Z-845	*Globorotalia truncatulinoides*	MOC-1_T7_N5	100-200	right coiling
3	Z-846	*Globorotalia truncatulinoides*	MOC-1_T7_N5	100-200	right coiling
3	Z-847	*Globorotalia truncatulinoides*	MOC-1_T7_N5	100-200	right coiling
3	Z-848	*Globorotalia truncatulinoides*	MOC-1_T7_N5	100-200	right coiling
3	Z-849	*Globorotalia truncatulinoides*	MOC-1_T7_N5	100-200	right coiling

Sta. #	DNA ID	species	Net type	Depth (m)	Remarks
3	Z-850	*Globorotalia truncatulinoides*	MOC-1_T7_N5	100-200	right coiling
3	Z-851	*Globorotalia truncatulinoides*	MOC-1_T7_N5	100-200	right coiling
3	Z-852	*Globorotalia truncatulinoides*	MOC-1_T7_N5	100-200	right coiling
3	Z-853	*Globorotalia truncatulinoides*	MOC-1_T7_N5	100-200	right coiling
3	Z-854	*Globorotalia truncatulinoides*	MOC-1_T7_N5	100-200	right coiling
3	Z-855	*Globorotalia truncatulinoides*	MOC-1_T7_N5	100-200	right coiling
3	Z-856	*Globorotalia truncatulinoides*	MOC-1_T7_N5	100-200	right coiling
3	Z-857	*Globorotalia truncatulinoides*	MOC-1_T8_N5	100-200	left coiling
3	Z-858	*Globorotalia truncatulinoides*	MOC-1_T8_N5	100-200	left coiling
3	Z-859	*Globorotalia truncatulinoides*	MOC-1_T8_N5	100-200	left coiling
3	Z-860	*Globorotalia truncatulinoides*	MOC-1_T8_N5	100-200	left coiling
3	Z-861	*Globorotalia truncatulinoides*	MOC-1_T8_N5	100-200	left coiling
3	Z-862	*Globorotalia truncatulinoides*	MOC-1_T8_N5	100-200	left coiling
3	Z-863	*Globorotalia truncatulinoides*	MOC-1_T8_N5	100-200	left coiling
3	Z-864	*Globorotalia truncatulinoides*	MOC-1_T8_N5	100-200	left coiling
3	Z-865	*Globorotalia truncatulinoides*	MOC-1_T8_N5	100-200	left coiling
3	Z-866	*Globorotalia truncatulinoides*	MOC-1_T8_N5	100-200	right coiling, reddish cytoplasm
3	Z-867	*Globorotalia truncatulinoides*	MOC-1_T8_N5	100-200	right coiling, reddish cytoplasm
3	Z-868	*Globorotalia truncatulinoides*	MOC-1_T8_N5	100-200	right coiling, reddish cytoplasm
3	Z-869	*Globorotalia truncatulinoides*	MOC-1_T8_N5	100-200	right coiling, reddish cytoplasm
3	Z-870	*Globorotalia truncatulinoides*	MOC-1_T8_N5	100-200	right coiling, reddish cytoplasm

Sta. #	DNA ID	species	Net type	Depth (m)	Remarks
3	Z-871	*Globorotalia truncatulinoides*	MOC-1_T8_N5	100-200	right coiling, reddish cytoplasm
3	Z-872	*Globorotalia truncatulinoides*	MOC-1_T8_N5	100-200	right coiling, reddish cytoplasm
3	Z-873	*Globorotalia truncatulinoides*	MOC-1_T8_N5	100-200	right coiling, reddish cytoplasm
3	Z-874	*Globorotalia truncatulinoides*	MOC-1_T8_N5	100-200	right coiling, green color cytoplasm
3	Z-875	*Globorotalia truncatulinoides*	MOC-1_T8_N5	100-200	right coiling, green color cytoplasm
3	Z-876	*Globorotalia truncatulinoides*	MOC-1_T8_N5	100-200	right coiling, green color cytoplasm
3	Z-877	*Globorotalia truncatulinoides*	MOC-1_T8_N5	100-200	right coiling, green color cytoplasm
3	Z-878	*Globorotalia truncatulinoides*	MOC-1_T8_N5	100-200	right coiling, green color cytoplasm
3	Z-879	*Globorotalia truncatulinoides*	MOC-1_T8_N5	100-200	right coiling, green color cytoplasm
3	Z-880	*Globorotalia truncatulinoides*	MOC-1_T8_N5	100-200	right coiling, green color cytoplasm
3	Z-881	*Globorotalia truncatulinoides*	MOC-1_T8_N5	100-200	right coiling, green color cytoplasm
3	Z-882	*Globorotalia truncatulinoides*	MOC-1_T8_N5	100-200	right coiling, green color cytoplasm
3	Z-883	*Globorotalia truncatulinoides*	MOC-1_T8_N5	100-200	right coiling, green color cytoplasm
3	Z-884	*Globorotalia truncatulinoides*	MOC-1_T8_N5	100-200	right coiling, green color cytoplasm
3	Z-885	*Globorotalia truncatulinoides*	MOC-1_T8_N5	100-200	right coiling, green color cytoplasm
3	Z-886	*Globorotalia truncatulinoides*	MOC-1_T8_N5	100-200	right coiling, green color cytoplasm
3	Z-887	*Globorotalia truncatulinoides*	MOC-1_T8_N5	100-200	right coiling, green color cytoplasm
3	Z-888	*Globorotalia truncatulinoides*	MOC-1_T8_N5	100-200	right coiling, green color cytoplasm
3	Z-889	*Globorotalia truncatulinoides*	MOC-1_T8_N5	100-200	right coiling, green color cytoplasm
3	Z-890	*Globigerinella aequilateralis*	MOC-1_T8_N5	100-200	
3	Z-891	*Globigerinella aequilateralis*	MOC-1_T8_N5	100-200	

Sta. #	DNA ID	species	Net type	Depth (m)	Remarks
3	Z-892	*Globigerinella aequilateralis*	MOC-1_T8_N5	100-200	
3	Z-893	*Globigerinella aequilateralis*	MOC-1_T8_N5	100-200	
3	Z-894	*Globigerinella aequilateralis*	MOC-1_T8_N5	100-200	
3	Z-895	*Globigerinella aequilateralis*	MOC-1_T8_N5	100-200	
3	Z-896	*Hastigerina pelagica*	MOC-1_T8_N5	100-200	
3	Z-897	*Hastigerina pelagica*	MOC-1_T8_N5	100-200	
3	Z-898	*Globorotalia hirsuta*	MOC-1_T8_N5	100-200	
3	Z-899	*Orbulina universa*	MOC-1_T8_N5	100-200	
3	Z-900	*Orbulina universa*	MOC-1_T8_N5	100-200	
3	Z-901	*Orbulina universa*	MOC-1_T8_N5	100-200	
3	Z-902	*Globorotalia truncatulinoides*	MOC-1_T8_N4	200-400	left coiling
3	Z-903	*Globorotalia truncatulinoides*	MOC-1_T8_N4	200-400	left coiling
3	Z-904	*Globorotalia truncatulinoides*	MOC-1_T8_N4	200-400	left coiling
3	Z-905	*Globorotalia truncatulinoides*	MOC-1_T8_N4	200-400	left coiling
3	Z-906	*Globorotalia truncatulinoides*	MOC-1_T8_N4	200-400	left coiling
3	Z-907	*Globorotalia truncatulinoides*	MOC-1_T8_N4	200-400	left coiling
3	Z-908	*Globorotalia truncatulinoides*	MOC-1_T8_N4	200-400	left coiling
3	Z-909	*Globorotalia truncatulinoides*	MOC-1_T8_N4	200-400	left coiling
3	Z-910	*Globorotalia truncatulinoides*	MOC-1_T8_N4	200-400	left coiling
3	Z-911	*Globorotalia truncatulinoides*	MOC-1_T8_N4	200-400	right coiling
3	Z-912	*Globorotalia truncatulinoides*	MOC-1_T8_N4	200-400	right coiling
3	Z-913	*Globorotalia truncatulinoides*	MOC-1_T8_N4	200-400	right coiling
3	Z-914	*Globorotalia truncatulinoides*	MOC-1_T8_N4	200-400	right coiling
3	Z-915	*Globorotalia truncatulinoides*	MOC-1_T8_N4	200-400	right coiling

Sta. #	DNA ID	species	Net type	Depth (m)	Remarks
3	Z-916	*Globorotalia truncatulinoides*	MOC-1_T8_N4	200-400	right coiling
3	Z-917	*Globorotalia truncatulinoides*	MOC-1_T8_N4	200-400	right coiling
3	Z-918	*Globorotalia truncatulinoides*	MOC-1_T8_N4	200-400	right coiling
3	Z-919	*Globorotalia truncatulinoides*	MOC-1_T8_N4	200-400	right coiling
3	Z-920	*Globorotalia truncatulinoides*	MOC-1_T8_N4	200-400	right coiling
3	Z-921	*Globorotalia truncatulinoides*	MOC-1_T8_N4	200-400	right coiling
3	Z-922	*Globorotalia truncatulinoides*	MOC-1_T8_N4	200-400	right coiling
3	Z-923	*Globorotalia truncatulinoides*	MOC-1_T8_N4	200-400	right coiling
3	Z-924	*Globorotalia truncatulinoides*	MOC-1_T8_N4	200-400	right coiling
3	Z-925	*Globorotalia truncatulinoides*	MOC-1_T8_N4	200-400	right coiling
3	Z-926	*Globorotalia truncatulinoides*	MOC-1_T8_N3	400-600	left coiling
3	Z-927	*Globorotalia truncatulinoides*	MOC-1_T8_N3	400-600	left coiling
3	Z-928	*Globorotalia truncatulinoides*	MOC-1_T8_N3	400-600	right coiling
3	Z-929	*Globorotalia truncatulinoides*	MOC-1_T8_N3	400-600	right coiling
3	Z-930	*Globorotalia truncatulinoides*	MOC-1_T8_N3	400-600	right coiling
3	Z-931	*Globorotalia truncatulinoides*	MOC-1_T8_N3	400-600	right coiling
3	Z-932	*Globorotalia truncatulinoides*	MOC-1_T8_N6	50-100	right coiling
3	Z-933	*Globorotalia truncatulinoides*	MOC-1_T8_N6	50-100	right coiling
4	Z-934	*Orbulina universa*	Ring Net	0-200	
4	Z-935	*Orbulina universa*	Ring Net	0-200	
4	Z-936	*Globigerinella aequilateralis*	Ring Net	0-200	
4	Z-937	*Globigerinoides ruber*	Ring Net	0-200	
4	Z-938	*Globigerinoides ruber*	Ring Net	0-200	

Sta. #	DNA ID	species	Net type	Depth (m)	Remarks
4	Z-939	*Globigerinoides ruber*	Ring Net	0-200	
4	Z-940	*Globorotalia truncatulinoides*	Ring Net	0-200	right coiling
4	Z-941	*Globorotalia truncatulinoides*	Ring Net	0-200	right coiling
4	Z-942	*Globorotalia truncatulinoides*	Ring Net	0-200	right coiling
4	Z-943	*Globorotalia truncatulinoides*	Ring Net	0-200	right coiling
4	Z-944	*Globorotalia truncatulinoides*	Ring Net	0-200	right coiling
4	Z-945	*Globorotalia truncatulinoides*	Ring Net	0-200	right coiling
4	Z-946	*Globorotalia truncatulinoides*	MOC-10_T5_N4		right coiling
4	Z-947	*Globorotalia truncatulinoides*	MOC-10_T5_N4		right coiling
4	Z-948	*Globorotalia truncatulinoides*	MOC-10_T5_N4		right coiling
4	Z-949	*Globorotalia truncatulinoides*	MOC-10_T5_N4		right coiling
4	Z-950	*Globorotalia truncatulinoides*	MOC-10_T5_N4		right coiling
4	Z-951	*Globorotalia truncatulinoides*	MOC-10_T5_N4		right coiling
4	Z-952	*Orbulina universa*	MOC-1_T9_N5	100-200	
4	Z-953	*Orbulina universa*	MOC-1_T9_N5	100-200	
4	Z-954	*Orbulina universa*	MOC-1_T9_N5	100-200	
4	Z-955	*Orbulina universa*	MOC-1_T9_N5	100-200	
4	Z-956	*Orbulina universa*	MOC-1_T9_N5	100-200	
4	Z-957	*Orbulina universa*	MOC-1_T9_N5	100-200	
4	Z-958	*Orbulina universa*	MOC-1_T9_N5	100-200	
4	Z-959	*Orbulina universa*	MOC-1_T9_N5	100-200	
4	Z-960	*Orbulina universa*	MOC-1_T9_N5	100-200	
4	Z-961	*Orbulina universa*	MOC-1_T9_N5	100-200	
4	Z-962	*Orbulina universa*	MOC-1_T9_N5	100-200	
4	Z-963	*Orbulina universa*	MOC-1_T9_N5	100-200	
4	Z-964	*Orbulina universa*	MOC-1_T9_N5	100-200	
4	Z-965	*Orbulina universa*	MOC-1_T9_N5	100-200	
4	Z-966	*Orbulina universa*	MOC-1_T9_N5	100-200	
4	Z-967	*Orbulina universa*	MOC-1_T9_N5	100-200	
4	Z-968	*Orbulina universa*	MOC-1_T9_N5	100-200	

Sta. #	DNA ID	species	Net type	Depth (m)	Remarks
4	Z-969	*Orbulina universa*	MOC-1_T9_N5	100-200	
4	Z-970	*Orbulina universa*	MOC-1_T9_N5	100-200	
4	Z-971	*Orbulina universa*	MOC-1_T9_N5	100-200	
4	Z-972	*Orbulina universa*	MOC-1_T9_N5	100-200	
4	Z-973	*Orbulina universa*	MOC-1_T9_N5	100-200	
4	Z-974	*Orbulina universa*	MOC-1_T9_N5	100-200	
4	Z-975	*Orbulina universa*	MOC-1_T9_N5	100-200	
4	Z-976	*Orbulina universa*	MOC-1_T9_N5	100-200	
4	Z-977	*Orbulina universa*	MOC-1_T9_N5	100-200	
4	Z-978	*Orbulina universa*	MOC-1_T9_N5	100-200	
4	Z-979	*Orbulina universa*	MOC-1_T9_N5	100-200	
4	Z-980	*Orbulina universa*	MOC-1_T9_N5	100-200	
4	Z-981	*Orbulina universa*	MOC-1_T9_N5	100-200	
4	Z-982	*Orbulina universa*	MOC-1_T9_N5	100-200	
4	Z-983	*Orbulina universa*	MOC-1_T9_N5	100-200	
4	Z-984	*Orbulina universa*	MOC-1_T9_N5	100-200	
4	Z-985	*Orbulina universa*	MOC-1_T9_N5	100-200	
4	Z-986	*Globorotalia truncatulinoides*	MOC-1_T9_N5	100-200	right coiling
4	Z-987	*Globorotalia truncatulinoides*	MOC-1_T9_N5	100-200	right coiling
4	Z-988	*Globorotalia truncatulinoides*	MOC-1_T9_N5	100-200	right coiling
4	Z-989	*Globorotalia truncatulinoides*	MOC-1_T9_N5	100-200	right coiling
4	Z-990	*Globorotalia truncatulinoides*	MOC-1_T9_N5	100-200	right coiling
4	Z-991	*Globorotalia truncatulinoides*	MOC-1_T9_N5	100-200	right coiling
4	Z-992	*Globorotalia truncatulinoides*	MOC-1_T9_N5	100-200	right coiling
4	Z-993	*Globorotalia truncatulinoides*	MOC-1_T9_N5	100-200	right coiling
4	Z-994	*Globorotalia truncatulinoides*	MOC-1_T9_N5	100-200	right coiling
4	Z-995	*Globorotalia truncatulinoides*	MOC-1_T9_N5	100-200	right coiling
4	Z-996	*Globorotalia truncatulinoides*	MOC-1_T9_N5	100-200	right coiling
4	Z-997	*Globorotalia truncatulinoides*	MOC-1_T9_N5	100-200	right coiling
4	Z-998	*Globorotalia*	MOC-1_T9_N5	100-200	right coiling

Sta. #	DNA ID	species	Net type	Depth (m)	Remarks
		truncatulinoides			
4	Z-999	*Globorotalia truncatulinoides*	MOC-1_T9_N5	100-200	right coiling
4	Z-1000	*Globorotalia truncatulinoides*	MOC-1_T9_N5	100-200	right coiling
4	Z-1001	*Globorotalia truncatulinoides*	MOC-1_T9_N5	100-200	right coiling
4	Z-1002	*Globorotalia truncatulinoides*	MOC-1_T9_N5	100-200	right coiling
4	Z-1003	*Globorotalia truncatulinoides*	MOC-1_T9_N5	100-200	right coiling
4	Z-1004	*Globorotalia truncatulinoides*	MOC-1_T9_N5	100-200	right coiling
4	Z-1005	*Globorotalia truncatulinoides*	MOC-1_T9_N5	100-200	right coiling
4	Z-1006	*Globorotalia truncatulinoides*	MOC-1_T9_N5	100-200	right coiling
4	Z-1007	*Globorotalia truncatulinoides*	MOC-1_T9_N5	100-200	right coiling
4	Z-1008	*Globorotalia truncatulinoides*	MOC-1_T9_N5	100-200	right coiling
4	Z-1009	*Globorotalia truncatulinoides*	MOC-1_T9_N5	100-200	right coiling
4	Z-1010	*Globorotalia truncatulinoides*	MOC-1_T9_N5	100-200	right coiling
4	Z-1011	*Globorotalia truncatulinoides*	MOC-1_T9_N5	100-200	right coiling
4	Z-1012	*Globorotalia truncatulinoides*	MOC-1_T9_N5	100-200	right coiling
4	Z-1013	*Globorotalia truncatulinoides*	MOC-1_T9_N5	100-200	right coiling
4	Z-1014	*Globorotalia truncatulinoides*	MOC-1_T9_N5	100-200	right coiling
4	Z-1015	*Globorotalia truncatulinoides*	MOC-1_T9_N5	100-200	right coiling
4	Z-1016	*Globorotalia truncatulinoides*	MOC-1_T9_N5	100-200	right coiling
4	Z-1017	*Globorotalia truncatulinoides*	MOC-1_T9_N5	100-200	right coiling
4	Z-1018	*Globorotalia truncatulinoides*	MOC-1_T9_N5	100-200	left coiling
4	Z-	*Globorotalia*	MOC-1_T9_N5	100-200	left coiling

Sta. #	DNA ID	species	Net type	Depth (m)	Remarks
	1019	*truncatulinoides*			
4	Z-1020	*Globorotalia truncatulinoides*	MOC-1_T9_N5	100-200	left coiling
4	Z-1021	*Globorotalia truncatulinoides*	MOC-1_T9_N5	100-200	left coiling
4	Z-1022	*Globorotalia truncatulinoides*	MOC-1_T10_N4	200-400	left coiling
4	Z-1023	*Globorotalia truncatulinoides*	MOC-1_T10_N4	200-400	left coiling
4	Z-1024	*Globorotalia truncatulinoides*	MOC-1_T10_N4	200-400	left coiling
4	Z-1025	*Globorotalia truncatulinoides*	MOC-1_T10_N4	200-400	left coiling
4	Z-1026	*Globorotalia truncatulinoides*	MOC-1_T10_N4	200-400	left coiling
4	Z-1027	*Globorotalia truncatulinoides*	MOC-1_T10_N4	200-400	left coiling
4	Z-1028	*Globorotalia truncatulinoides*	MOC-1_T10_N4	200-400	left coiling
4	Z-1029	*Globorotalia truncatulinoides*	MOC-1_T10_N4	200-400	left coiling
4	Z-1030	*Globorotalia truncatulinoides*	MOC-1_T10_N4	200-400	left coiling
4	Z-1031	*Globorotalia truncatulinoides*	MOC-1_T10_N4	200-400	left coiling
4	Z-1032	*Globorotalia truncatulinoides*	MOC-1_T10_N4	200-400	left coiling
4	Z-1033	*Globorotalia truncatulinoides*	MOC-1_T10_N4	200-400	right coiling
4	Z-1034	*Globorotalia truncatulinoides*	MOC-1_T10_N4	200-400	right coiling
4	Z-1035	*Globorotalia truncatulinoides*	MOC-1_T10_N4	200-400	right coiling
4	Z-1036	*Globorotalia truncatulinoides*	MOC-1_T10_N4	200-400	right coiling
4	Z-1037	*Globorotalia truncatulinoides*	MOC-1_T10_N4	200-400	right coiling
4	Z-1038	*Globorotalia truncatulinoides*	MOC-1_T10_N4	200-400	right coiling
4	Z-1039	*Globorotalia truncatulinoides*	MOC-1_T10_N4	200-400	right coiling
4	Z-	*Globorotalia*	MOC-1_T10_N4	200-400	right coiling

Sta. #	DNA ID	species	Net type	Depth (m)	Remarks
	1040	*truncatulinoides*			
4	Z-1041	*Globorotalia truncatulinoides*	MOC-1_T10_N4	200-400	right coiling
4	Z-1042	*Globorotalia truncatulinoides*	MOC-1_T10_N4	200-400	right coiling
4	Z-1043	*Globorotalia truncatulinoides*	MOC-1_T10_N4	200-400	right coiling
4	Z-1044	*Globorotalia truncatulinoides*	MOC-1_T10_N4	200-400	right coiling
4	Z-1045	*Globorotalia truncatulinoides*	MOC-1_T10_N4	200-400	right coiling
4	Z-1046	*Globorotalia truncatulinoides*	MOC-1_T10_N4	200-400	right coiling
4	Z-1047	*Globorotalia truncatulinoides*	MOC-1_T10_N4	200-400	right coiling
4	Z-1048	*Globorotalia truncatulinoides*	MOC-1_T10_N4	200-400	right coiling
4	Z-1049	*Globorotalia truncatulinoides*	MOC-1_T10_N4	200-400	right coiling
4	Z-1050	*Globorotalia truncatulinoides*	MOC-1_T10_N4	200-400	right coiling
4	Z-1051	*Globorotalia truncatulinoides*	MOC-1_T10_N4	200-400	right coiling
4	Z-1052	*Globorotalia truncatulinoides*	MOC-1_T10_N4	200-400	right coiling
4	Z-1053	*Globorotalia truncatulinoides*	MOC-1_T10_N4	200-400	right coiling
4	Z-1054	*Globorotalia truncatulinoides*	MOC-1_T10_N4	200-400	right coiling
4	Z-1055	*Globorotalia truncatulinoides*	MOC-1_T10_N4	200-400	right coiling
4	Z-1056				No buffer
4	Z-1057	*Globorotalia truncatulinoides*	MOC-1_T10_N4	200-400	right coiling
4	Z-1058	*Globorotalia truncatulinoides*	MOC-1_T10_N4	200-400	right coiling
4	Z-1059	*Globorotalia truncatulinoides*	MOC-1_T10_N4	200-400	right coiling
4	Z-1060	*Globorotalia truncatulinoides*	MOC-1_T10_N4	200-400	right coiling
4	Z-	*Globorotalia*	MOC-1_T10_N4	200-400	right coiling

Sta. #	DNA ID	species	Net type	Depth (m)	Remarks
	1061	*truncatulinoides*			
4	Z-1062	*Globorotalia truncatulinoides*	MOC-1_T10_N4	200-400	right coiling
4	Z-1063	*Orbulina universa*	MOC-1_T10_N7	25-50	
4	Z-1064	*Orbulina universa*	MOC-1_T9_N7	25-50	
4	Z-1065	*Orbulina universa*	MOC-1_T9_N7	25-50	
4	Z-1066	*Orbulina universa*	MOC-1_T9_N7	25-50	
4	Z-1067	*Orbulina universa*	MOC-1_T9_N7	25-50	
4	Z-1068	*Globorotalia truncatulinoides*	MOC-1_T9_N7	25-50	right coiling
4	Z-1069	*Globorotalia truncatulinoides*	MOC-1_T9_N7	25-50	right coiling
4	Z-1070	*Globigerinoides ruber*	MOC-1_T9_N7	25-50	
4	Z-1071	*Globigerinoides sacculifer*	MOC-1_T9_N7	25-50	
4	Z-1072	*Globigerinoides sacculifer*	MOC-1_T9_N7	25-50	
4	Z-1073	*Orbulina universa*	MOC-1_T9_N7	25-50	
4	Z-1074	*Orbulina universa*	MOC-1_T9_N7	25-50	
4	Z-1075				No buffer
4	Z-1076	*Orbulina universa*	MOC-1_T9_N7	25-50	
4	Z-1077	*Orbulina universa*	MOC-1_T9_N7	25-50	
4	Z-1078	*Globigerinoides ruber*	MOC-1_T9_N5	100-200	
4	Z-1079	*Globigerinella aequilateralis*	MOC-1_T9_N5	100-200	
4	Z-1080	*Globigerinella aequilateralis*	MOC-1_T9_N5	100-200	
4	Z-1081				No buffer
4	Z-	*Globigerinella*	MOC-1_T9_N5	100-200	

Sta. #	DNA ID	species	Net type	Depth (m)	Remarks
	1082	*aequilateralis*			
4	Z-1083	*Globigerinella aequilateralis*	MOC-1_T9_N5	100-200	
4	Z-1084	*Globigerinella aequilateralis*	MOC-1_T9_N5	100-200	
4	Z-1085	*Globigerinella aequilateralis*	MOC-1_T9_N5	100-200	
4	Z-1086	*Globigerinella aequilateralis*	MOC-1_T9_N5	100-200	
4	Z-1087	*Globigerinella aequilateralis*	MOC-1_T9_N5	100-200	
4	Z-1088	*Globigerinella aequilateralis*	MOC-1_T9_N5	100-200	
4	Z-1089	*Globigerinella aequilateralis*	MOC-1_T9_N5	100-200	
4	Z-1090	*Globigerinella aequilateralis*	MOC-1_T9_N5	100-200	
4	Z-1091	*Hastigerina pelagica*	MOC-1_T9_N8	0-25	
4	Z-1092	*Hastigerina pelagica*	MOC-1_T9_N8	0-25	
4	Z-1093	*Globigerinoides ruber*	MOC-1_T9_N8	0-25	
4	Z-1094	*Globigerinoides ruber*	MOC-1_T9_N8	0-25	
4	Z-1095	*Globigerinoides sacculifer*	MOC-1_T9_N8	0-25	
4	Z-1096	*Globigerinoides sacculifer*	MOC-1_T9_N8	0-25	
4	Z-1097	*Globigerinoides sacculifer*	MOC-1_T9_N8	0-25	
4	Z-1098	*Globigerinoides sacculifer*	MOC-1_T9_N8	0-25	
4	Z-1099	*Globigerinoides sacculifer*	MOC-1_T9_N8	0-25	
4	Z-1100	*Globigerinoides sacculifer*	MOC-1_T9_N8	0-25	
4	Z-1101	*Globigerinoides sacculifer*	MOC-1_T9_N8	0-25	
4	Z-1102	*Globigerinoides sacculifer*	MOC-1_T9_N8	0-25	
4	Z-	*Globigerinoides*	Ring Net	0-50	

Sta. #	DNA ID	species	Net type	Depth (m)	Remarks
	1103	*sacculifer*			
4	Z-1104	*Globigerinoides sacculifer*	Ring Net	0-50	
4	Z-1105	*Globigerinoides sacculifer*	Ring Net	0-50	
4	Z-1106	*Globigerinoides sacculifer*	Ring Net	0-50	
4	Z-1107	*Globigerinoides sacculifer*	Ring Net	0-50	
4	Z-1108	*Globigerinoides sacculifer*	Ring Net	0-50	
4	Z-1109	*Globigerinoides sacculifer*	Ring Net	0-50	
4	Z-1110	*Globigerinoides sacculifer*	Ring Net	0-50	
4	Z-1111	*Globigerinoides sacculifer*	Ring Net	0-50	
4	Z-1112	*Globigerinoides sacculifer*	Ring Net	0-50	
4	Z-1113	*Globigerinoides sacculifer*	Ring Net	0-50	
4	Z-1114	*Globigerinoides sacculifer*	Ring Net	0-50	
4	Z-1115	*Globigerinoides sacculifer*	Ring Net	0-50	
4	Z-1116	*Globigerinoides sacculifer*	Ring Net	0-50	
4	Z-1117	*Globigerinoides sacculifer*	Ring Net	0-50	
4	Z-1118	*Globigerinoides sacculifer*	Ring Net	0-50	
4	Z-1119	*Globigerinoides sacculifer*	Ring Net	0-50	
4	Z-1120	*Globigerinoides sacculifer*	Ring Net	0-50	
4	Z-1121	*Globigerinoides sacculifer*	Ring Net	0-50	
4	Z-1122	*Globigerinoides sacculifer*	Ring Net	0-50	
4	Z-1123	*Globigerinoides sacculifer*	Ring Net	0-50	
4	Z-	*Globigerinoides*	Ring Net	0-50	

Sta. #	DNA ID	species	Net type	Depth (m)	Remarks
	1124	*sacculifer*			
4	Z-1125	*Globigerinoides sacculifer*	Ring Net	0-50	
4	Z-1126	*Globigerinoides sacculifer*	Ring Net	0-50	
4	Z-1127	*Globigerinoides sacculifer*	Ring Net	0-50	
4	Z-1128	*Globigerinoides sacculifer*	Ring Net	0-50	
4	Z-1129	*Globigerinoides sacculifer*	Ring Net	0-50	
4	Z-1130	*Globigerinoides sacculifer*	Ring Net	0-50	
4	Z-1131	*Orbulina universa*	Ring Net	0-50	
4	Z-1132	*Orbulina universa*	Ring Net	0-50	
4	Z-1133	*Orbulina universa*	Ring Net	0-50	
4	Z-1134	*Globigerinoides ruber*	Ring Net	0-50	pink cytoplasm
4	Z-1135	*Globigerinoides ruber*	Ring Net	0-50	pink cytoplasm
4	Z-1136	*Globigerinoides ruber*	Ring Net	0-50	pink cytoplasm
4	Z-1137	*Globigerinoides ruber*	Ring Net	0-50	pink cytoplasm
4	Z-1138	*Globigerinoides ruber*	Ring Net	0-50	pink cytoplasm
4	Z-1139	*Globigerinita glutinata*	Ring Net	0-50	
4	Z-1140	*Globigerinita glutinata*	Ring Net	0-50	
4	Z-1141	*Globigerinita glutinata*	Ring Net	0-50	
4	Z-1142	*Globigerinita glutinata*	Ring Net	0-50	
4	Z-1143	*Globigerinita glutinata*	Ring Net	0-50	
4	Z-1144	*Globigerinita glutinata*	Ring Net	0-50	
4	Z-	*Globigerinella*	Ring Net	0-50	

Sta. #	DNA ID	species	Net type	Depth (m)	Remarks
	1145	*aequilateralis*			
4	Z-1146	*Globigerinella aequilateralis*	Ring Net	0-50	
4	Z-1147	*Globigerinella aequilateralis*	Ring Net	0-50	
4	Z-1148	*Globigerinella aequilateralis*	Ring Net	0-50	
4	Z-1149	*Globigerinella aequilateralis*	Ring Net	0-50	
4	Z-1150	*Globigerinita glutinata*	Ring Net	0-50	
5	Z-1151	*Orbulina universa*	Ring Net	0-35	
5	Z-1152	*Orbulina universa*	Ring Net	0-35	
5	Z-1153	*Orbulina universa*	Ring Net	0-35	
5	Z-1154	*Orbulina universa*	Ring Net	0-35	
5	Z-1155	*Orbulina universa*	Ring Net	0-35	
5	Z-1156	*Orbulina universa*	Ring Net	0-35	
5	Z-1157	*Orbulina universa*	Ring Net	0-35	
5	Z-1158	*Orbulina universa*	Ring Net	0-35	
5	Z-1159	*Orbulina universa*	Ring Net	0-35	
5	Z-1160	*Orbulina universa*	Ring Net	0-35	
5	Z-1161	*Orbulina universa*	MOC-1_T11,12_N8	0-25	
5	Z-1162	*Orbulina universa*	MOC-1_T11,12_N8	0-25	
5	Z-1163	*Orbulina universa*	MOC-1_T11,12_N8	0-25	
5	Z-1164	*Orbulina universa*	MOC-1_T11,12_N8	0-25	
5	Z-1165	*Orbulina universa*	MOC-1_T11,12_N8	0-25	
5	Z-	*Orbulina universa*	MOC-	0-25	

Sta. #	DNA ID	species	Net type	Depth (m)	Remarks
	1166		1_T11,12_N8		
5	Z-1167	*Globigerinoides ruber*	MOC-1_T11,12_N8	0-25	White shell
5	Z-1168	*Globigerinoides ruber*	MOC-1_T11,12_N8	0-25	Pink shell
5	Z-1169	*Globigerinoides ruber*	MOC-1_T11,12_N8	0-25	Pink shell
5	Z-1170	*Globigerinoides ruber*	MOC-1_T11,12_N8	0-25	Pink shell
5	Z-1171	*Globigerinoides ruber*	MOC-1_T11,12_N8	0-25	Pink shell
5	Z-1172	*Globigerinoides ruber*	MOC-1_T11,12_N8	0-25	Pink shell
5	Z-1173	*Globigerinoides ruber*	MOC-1_T11,12_N8	0-25	Pink shell
5	Z-1174	*Globigerinoides ruber*	MOC-1_T11,12_N8	0-25	Pink shell
5	Z-1175	*Globigerinoides ruber*	MOC-1_T11,12_N8	0-25	Pink shell
5	Z-1176	*Globigerinoides ruber*	MOC-1_T11,12_N8	0-25	Pink shell
5	Z-1177	*Globigerinoides ruber*	MOC-1_T11,12_N8	0-25	Pink shell
5	Z-1178	*Globigerinoides ruber*	MOC-1_T11,12_N8	0-25	Pink shell
5	Z-1179	*Globigerinoides ruber*	MOC-1_T11,12_N8	0-25	Pink shell
5	Z-1180	*Globigerinoides ruber*	MOC-1_T11,12_N8	0-25	Pink shell
5	Z-1181	*Globigerinoides ruber*	MOC-1_T11,12_N8	0-25	Pink shell
5	Z-1182	*Globigerinoides ruber*	MOC-1_T11,12_N8	0-25	Pink shell
5	Z-1183	*Globigerinoides sacculifer*	MOC-1_T11,12_N8	0-25	
5	Z-1184	*Globigerinoides sacculifer*	MOC-1_T11,12_N8	0-25	
5	Z-1185	*Globigerinoides sacculifer*	MOC-1_T11,12_N8	0-25	
5	Z-1186	*Globigerinoides sacculifer*	MOC-1_T11,12_N8	0-25	
5	Z-	*Globigerinoides*	MOC-	0-25	

Sta. #	DNA ID	species	Net type	Depth (m)	Remarks
	1187	*sacculifer*	1_T11,12_N8		
5	Z-1188	*Globigerinoides sacculifer*	MOC-1_T11,12_N8	0-25	
5	Z-1189	*Globigerinoides sacculifer*	MOC-1_T11,12_N8	0-25	
5	Z-1190	*Globigerinoides sacculifer*	MOC-1_T11,12_N8	0-25	
5	Z-1191	*Globigerinoides sacculifer*	MOC-1_T11,12_N8	0-25	
5	Z-1192	*Globigerinoides sacculifer*	MOC-1_T11,12_N8	0-25	
5	Z-1193	*Globigerinoides sacculifer*	MOC-1_T11,12_N8	0-25	
5	Z-1194	*Globigerinoides sacculifer*	MOC-1_T11,12_N8	0-25	
5	Z-1195	*Globigerinoides sacculifer*	MOC-1_T11,12_N8	0-25	
5	Z-1196	*Globigerinoides sacculifer*	MOC-1_T11,12_N8	0-25	
5	Z-1197	*Globigerinoides sacculifer*	MOC-1_T11,12_N8	0-25	
5	Z-1198	*Globigerinoides sacculifer*	MOC-1_T11,12_N8	0-25	
5	Z-1199	*Globigerinoides sacculifer*	MOC-1_T11,12_N8	0-25	
5	Z-1200	*Globigerinoides sacculifer*	MOC-1_T11,12_N8	0-25	
5	Z-1201	*Globigerinoides sacculifer*	MOC-1_T11,12_N8	0-25	
5	Z-1202	*Globigerinoides sacculifer*	MOC-1_T11,12_N8	0-25	
5	Z-1203	*Candeina nitida*	MOC-1_T11,12_N8	0-25	
5	Z-1204	*Candeina nitida*	MOC-1_T11,12_N8	0-25	
5	Z-1205	*Globorotalia menardii*	MOC-1_T11,12_N8	0-25	
5	Z-1206	*Neogloboquadrina dutertrei*	MOC-1_T11,12_N8	0-25	
5	Z-1207	*Neogloboquadrina dutertrei*	MOC-1_T11,12_N8	0-25	
5	Z-	*Candeina nitida*	MOC-1_T11_N7	25-50	

Sta. #	DNA ID	species	Net type	Depth (m)	Remarks
	1208				
5	Z-1209	*Candeina nitida*	MOC-1_T11_N7	25-50	
5	Z-1210	*Candeina nitida*	MOC-1_T11_N7	25-50	
5	Z-1211	*Candeina nitida*	MOC-1_T11_N7	25-50	
5	Z-1212	*Candeina nitida*	MOC-1_T11_N7	25-50	
5	Z-1213	*Candeina nitida*	MOC-1_T11_N7	25-50	
5	Z-1214	*Candeina nitida*	MOC-1_T11_N7	25-50	
5	Z-1215	*Neogloboquadrina dutertrei*	MOC-1_T11_N7	25-50	
5	Z-1216	*Neogloboquadrina dutertrei*	MOC-1_T11_N7	25-50	
5	Z-1217	*Neogloboquadrina dutertrei*	MOC-1_T11_N7	25-50	
5	Z-1218	*Neogloboquadrina dutertrei*	MOC-1_T11_N7	25-50	
5	Z-1219	*Neogloboquadrina dutertrei*	MOC-1_T11_N7	25-50	
5	Z-1220	*Neogloboquadrina dutertrei*	MOC-1_T11_N7	25-50	
5	Z-1221	*Neogloboquadrina dutertrei*	MOC-1_T11_N7	25-50	
5	Z-1222	*Orbulina universa*	MOC-1_T11_N7	25-50	thick shell
5	Z-1223	*Orbulina universa*	MOC-1_T11_N7	25-50	thick shell
5	Z-1224	*Orbulina universa*	MOC-1_T11_N7	25-50	thick shell
5	Z-1225	*Orbulina universa*	MOC-1_T11_N7	25-50	thick shell
5	Z-1226	*Orbulina universa*	MOC-1_T11_N7	25-50	thick shell
5	Z-1227	*Orbulina universa*	MOC-1_T11_N7	25-50	thick shell
5	Z-1228	*Orbulina universa*	MOC-1_T11_N7	25-50	thin shell (soap bubble)
5	Z-	*Orbulina universa*	MOC-1_T11_N7	25-50	thin shell (soap bubble)

Sta. #	DNA ID	species	Net type	Depth (m)	Remarks
	1229				
5	Z-1230	*Orbulina universa*	MOC-1_T11_N7	25-50	thin shell (soap bubble)
5	Z-1231	*Orbulina universa*	MOC-1_T11_N7	25-50	thin shell (soap bubble)
5	Z-1232	*Orbulina universa*	MOC-1_T11_N7	25-50	thin shell (soap bubble)
5	Z-1233	*Orbulina universa*	MOC-1_T11_N7	25-50	thin shell (soap bubble)
5	Z-1234	*Orbulina universa*	MOC-1_T11_N7	25-50	thin shell (soap bubble)
5	Z-1235	*Orbulina universa*	MOC-1_T11_N7	25-50	thin shell (soap bubble)
5	Z-1236	*Orbulina universa*	MOC-1_T11_N7	25-50	thin shell (soap bubble)
5	Z-1237	*Orbulina universa*	MOC-1_T11_N7	25-50	thin shell (soap bubble)
5	Z-1238	*Orbulina universa*	MOC-1_T11_N7	25-50	thin shell (soap bubble)
5	Z-1239	*Globigerinoides ruber*	MOC-1_T11_N7	25-50	
5	Z-1240	*Globigerinoides ruber*	MOC-1_T11_N7	25-50	
5	Z-1241	*Globigerinoides ruber*	MOC-1_T11_N7	25-50	
5	Z-1242	*Globigerinoides ruber*	MOC-1_T11_N7	25-50	
5	Z-1243	*Globigerinoides ruber*	MOC-1_T11_N7	25-50	
5	Z-1244	*Globigerinoides ruber*	MOC-1_T11_N7	25-50	pink shell
5	Z-1245	*Globigerinoides ruber*	MOC-1_T11_N7	25-50	pink shell
5	Z-1246	*Globigerinoides ruber*	MOC-1_T11_N7	25-50	pink shell
5	Z-1247	*Globigerinoides ruber*	MOC-1_T11_N7	25-50	pink shell
5	Z-1248	*Globigerinoides ruber*	MOC-1_T11_N7	25-50	pink shell
5	Z-1249	*Globigerinoides ruber*	MOC-1_T11_N7	25-50	pink shell
5	Z-	*Globigerinoides ruber*	MOC-1_T11_N7	25-50	pink shell

Sta. #	DNA ID	species	Net type	Depth (m)	Remarks
	1250				
5	Z-1251	*Globigerinoides ruber*	MOC-1_T11_N7	25-50	pink shell
5	Z-1252	*Globigerinoides ruber*	MOC-1_T11_N7	25-50	pink shell
5	Z-1253	*Globigerinoides ruber*	MOC-1_T11_N7	25-50	pink shell
5	Z-1254	*Globigerinoides ruber*	MOC-1_T11_N7	25-50	pink shell
5	Z-1255	*Globigerinoides ruber*	MOC-1_T11_N7	25-50	pink shell
5	Z-1256	*Globigerinoides ruber*	MOC-1_T11_N7	25-50	pink shell
5	Z-1257	*Globigerinoides ruber*	MOC-1_T11_N7	25-50	pink shell
5	Z-1258	*Globigerinoides ruber*	MOC-1_T11_N7	25-50	pink shell
5	Z-1259	*Globigerinoides ruber*	MOC-1_T11_N7	25-50	pink shell
5	Z-1260	*Globigerinoides ruber*	MOC-1_T11_N7	25-50	pink shell
5	Z-1261	*Globigerinoides ruber*	MOC-1_T11_N7	25-50	pink shell, 6 individuals
5	Z-1262	*Globigerinoides sacculifer*	MOC-1_T11_N7	25-50	
5	Z-1263	*Globigerinoides sacculifer*	MOC-1_T11_N7	25-50	
5	Z-1264	*Globigerinoides sacculifer*	MOC-1_T11_N7	25-50	
5	Z-1265	*Globigerinoides sacculifer*	MOC-1_T11_N7	25-50	
5	Z-1266	*Globigerinoides sacculifer*	MOC-1_T11_N7	25-50	
5	Z-1267	*Globigerinoides sacculifer*	MOC-1_T11_N7	25-50	
5	Z-1268	*Globigerinoides sacculifer*	MOC-1_T11_N7	25-50	
5	Z-1269	*Globigerinoides sacculifer*	MOC-1_T11_N7	25-50	
5	Z-1270	*Globigerinoides sacculifer*	MOC-1_T11_N7	25-50	
5	Z-	*Globigerinoides*	MOC-1_T11_N7	25-50	

Sta. #	DNA ID	species	Net type	Depth (m)	Remarks
	1271	*sacculifer*			
5	Z-1272	*Globigerinoides sacculifer*	MOC-1_T11_N7	25-50	
5	Z-1273	*Globigerinoides sacculifer*	MOC-1_T11_N7	25-50	
5	Z-1274	*Globigerinoides sacculifer*	MOC-1_T11_N7	25-50	
5	Z-1275	*Globigerinoides sacculifer*	MOC-1_T11_N7	25-50	
5	Z-1276	*Globigerinoides sacculifer*	MOC-1_T11_N7	25-50	
5	Z-1277	*Globigerinoides sacculifer*	MOC-1_T11_N7	25-50	
5	Z-1278	*Globigerinoides sacculifer*	MOC-1_T11_N7	25-50	7 individuals
5	Z-1279	*Globigerinella aequilateralis*	MOC-1_T11_N7	25-50	
5	Z-1280	*Orbulina universa*	MOC-1_T11,12_N5	100-200	
5	Z-1281	*Orbulina universa*	MOC-1_T11,12_N5	100-200	
5	Z-1282	*Orbulina universa*	MOC-1_T11,12_N5	100-200	
5	Z-1283	*Orbulina universa*	MOC-1_T11,12_N5	100-200	
5	Z-1284	*Orbulina universa*	MOC-1_T11,12_N5	100-200	
5	Z-1285	*Orbulina universa*	MOC-1_T11,12_N5	100-200	
5	Z-1286	*Orbulina universa*	MOC-1_T11,12_N5	100-200	
5	Z-1287	*Orbulina universa*	MOC-1_T11,12_N6	50-100	thick shell
5	Z-1288	*Orbulina universa*	MOC-1_T11,12_N6	50-100	thick shell
5	Z-1289	*Orbulina universa*	MOC-1_T11,12_N6	50-100	thin shell (babble), mixed with G. menardii!!
5	Z-1290	*Orbulina universa*	MOC-1_T11,12_N6	50-100	thin shell (babble), mixed with G. menardii!!
5	Z-1291	*Globorotalia truncatulinoides*	MOC-1_T11,12_N5	100-200	right coiling, mixed with G. menardii
5	Z-	*Globorotalia*	MOC-	50-100	

Sta. #	DNA ID	species	Net type	Depth (m)	Remarks
	1292	*truncatulinoides*	1_T11,12_N6		
5	Z-1293	*Neogloboquadrina dutertrei*	MOC-1_T11,12_N6	50-100	
5	Z-1294	*Neogloboquadrina dutertrei*	MOC-1_T11,12_N6	50-100	
5	Z-1295	*Hastigerina digitata*	MOC-1_T11,12_N6	50-100	
5	Z-1296	*Hastigerina digitata*	MOC-1_T11,12_N6	50-100	
5	Z-1297	*Globigerinella aequilateralis*	MOC-1_T11,12_N6	50-100	
5	Z-1298	*Globorotalia truncatulinoides*	MOC-1_T11,12_N6	50-100	right coiling
5	Z-1299	*Globorotalia truncatulinoides*	MOC-1_T11,12_N6	50-100	right coiling
5	Z-1300	*Globorotalia truncatulinoides*	MOC-1_T11,12_N6	50-100	right coiling
5	Z-1301	*Globorotalia truncatulinoides*	MOC-1_T11,12_N6	50-100	right coiling
5	Z-1302	*Globorotalia truncatulinoides*	MOC-1_T11,12_N6	50-100	right coiling
5	Z-1303	*Globorotalia truncatulinoides*	MOC-1_T11,12_N6	50-100	right coiling
5	Z-1304	*Globorotalia truncatulinoides*	MOC-1_T11,12_N6	50-100	right coiling
5	Z-1305	*Globorotalia truncatulinoides*	MOC-1_T11,12_N6	50-100	right coiling
5	Z-1306	*Globorotalia truncatulinoides*	MOC-1_T11,12_N6	50-100	right coiling
5	Z-1307	*Globorotalia truncatulinoides*	MOC-1_T11,12_N6	50-100	right coiling
5	Z-1308	*Globorotalia truncatulinoides*	MOC-1_T11,12_N6	50-100	right coiling
5	Z-1309	*Globorotalia truncatulinoides*	MOC-1_T11,12_N6	50-100	right coiling
5	Z-1310	*Globorotalia truncatulinoides*	MOC-1_T11,12_N6	50-100	right coiling
5	Z-1311	*Globorotalia truncatulinoides*	MOC-1_T11,12_N6	50-100	right coiling
5	Z-1312	*Globorotalia truncatulinoides*	MOC-1_T11,12_N6	50-100	right coiling
5	Z-	*Globorotalia*	MOC-	50-100	right coiling

Sta. #	DNA ID	species	Net type	Depth (m)	Remarks
	1313	*truncatulinoides*	1_T11,12_N6		
5	Z-1314	*Globorotalia truncatulinoides*	MOC-1_T11,12_N6	50-100	right coiling
5	Z-1315	*Hastigerina pelagica*	MOC-1_T11,12_N4	200-400	
5	Z-1316	*Hastigerina pelagica*	MOC-1_T11,12_N4	200-400	
5	Z-1317	*Hastigerina pelagica*	MOC-1_T11,12_N4	200-400	
5	Z-1318	*Hastigerina pelagica*	MOC-1_T11,12_N4	200-400	
5	Z-1319	*Globorotalia truncatulinoides*	MOC-1_T11,12_N4	200-400	right coiling
5	Z-1320	*Globorotalia truncatulinoides*	MOC-1_T11,12_N4	200-400	right coiling
5	Z-1321	*Globorotalia truncatulinoides*	MOC-1_T11,12_N4	200-400	right coiling
5	Z-1322	*Globorotalia truncatulinoides*	MOC-1_T11,12_N4	200-400	right coiling
5	Z-1323	*Globorotalia truncatulinoides*	MOC-1_T11,12_N4	200-400	right coiling
5	Z-1324	*Globorotalia truncatulinoides*	MOC-1_T11,12_N4	200-400	right coiling
5	Z-1325	*Globorotalia truncatulinoides*	MOC-1_T11,12_N4	200-400	right coiling
5	Z-1326	*Globorotalia truncatulinoides*	MOC-1_T11,12_N4	200-400	right coiling
5	Z-1327	*Globorotalia truncatulinoides*	MOC-1_T11,12_N4	200-400	right coiling
5	Z-1328	*Globorotalia truncatulinoides*	MOC-1_T11,12_N4	200-400	right coiling
5	Z-1329	*Globorotalia truncatulinoides*	MOC-1_T11,12_N4	200-400	right coiling
5	Z-1330	*Globorotalia truncatulinoides*	MOC-1_T11,12_N4	200-400	right coiling
5	Z-1331	*Globorotalia truncatulinoides*	MOC-1_T11,12_N4	200-400	right coiling
5	Z-1332	*Globorotalia truncatulinoides*	MOC-1_T11,12_N4	200-400	right coiling
5	Z-1333	*Globorotalia truncatulinoides*	MOC-1_T11,12_N4	200-400	right coiling
5	Z-	*Globorotalia*	MOC-	200-400	right coiling

Sta. #	DNA ID	species	Net type	Depth (m)	Remarks
	1334	*truncatulinoides*	1_T11,12_N4		
5	Z-1335	*Globorotalia truncatulinoides*	MOC-1_T11,12_N4	200-400	right coiling
5	Z-1336	*Globorotalia truncatulinoides*	MOC-1_T11,12_N4	200-400	right coiling
5	Z-1337	*Globorotalia truncatulinoides*	MOC-1_T11,12_N4	200-400	right coiling
5	Z-1338	*Globorotalia truncatulinoides*	MOC-1_T11,12_N4	200-400	right coiling
5	Z-1339	*Globorotalia truncatulinoides*	MOC-1_T11,12_N4	200-400	right coiling
5	Z-1340	*Globorotalia truncatulinoides*	MOC-1_T11,12_N4	200-400	right coiling
5	Z-1341	*Globorotalia truncatulinoides*	MOC-1_T11,12_N4	200-400	right coiling
5	Z-1342	*Globorotalia truncatulinoides*	MOC-1_T11,12_N4	200-400	right coiling
5	Z-1343	*Globorotalia truncatulinoides*	MOC-1_T11,12_N4	200-400	right coiling
5	Z-1344	*Globorotalia truncatulinoides*	MOC-1_T11,12_N4	200-400	right coiling
5	Z-1345	*Globorotalia truncatulinoides*	MOC-1_T11,12_N4	200-400	right coiling
5	Z-1346	*Globorotalia truncatulinoides*	MOC-1_T11,12_N4	200-400	right coiling
5	Z-1347	*Globorotalia truncatulinoides*	MOC-1_T11,12_N4	200-400	right coiling
5	Z-1348	*Globorotalia truncatulinoides*	MOC-1_T11,12_N4	200-400	right coiling
5	Z-1349	*Globorotalia truncatulinoides*	MOC-1_T11,12_N4	200-400	right coiling
5	Z-1350	*Globorotalia truncatulinoides*	MOC-1_T11,12_N4	200-400	right coiling
5	Z-1351	*Globorotalia truncatulinoides*	MOC-1_T11,12_N4	200-400	right coiling
5	Z-1352	*Globorotalia truncatulinoides*	MOC-1_T11,12_N4	200-400	right coiling
5	Z-1353	*Globorotalia truncatulinoides*	MOC-1_T11,12_N4	200-400	right coiling
5	Z-1354	*Globorotalia truncatulinoides*	MOC-1_T11,12_N4	200-400	right coiling
5	Z-	*Globorotalia*	MOC-	200-400	right coiling

Sta. #	DNA ID	species	Net type	Depth (m)	Remarks
	1355	*truncatulinoides*	1_T11,12_N4		
5	Z-1356	*Orbulina universa*	MOC-1_T11,12_N4	200-400	
5	Z-1357	*Hastigerina pelagica*	MOC-1_T9_N8	0-25	Station 4
5	Z-1358	*Hastigerina digitata*	MOC-1_T13_N7	25-50	
5	Z-1359	*Globigerinella aequilateralis*	MOC-1_T13_N7	25-50	
5	Z-1360	*Hastigerina digitata*	MOC-1_T13_N8	0-25	
5	Z-1361	*Globigerinoides sacculifer*	MOC-1_T13_N8	0-25	
5	Z-1362	*Globigerinoides sacculifer*	MOC-1_T13_N8	0-25	
5	Z-1363	*Globigerinoides sacculifer*	MOC-1_T13_N8	0-25	
5	Z-1364	*Neogloboquadrina dutertrei*	MOC-1_T13_N8	0-25	
5	Z-1365	*Neogloboquadrina dutertrei*	MOC-1_T13_N8	0-25	
5	Z-1366	*Globorotalia truncatulinoides*	MOC-1_T13_N8	0-25	right coiling
5	Z-1367	*Candeina nitida*	Ring Net 75		
5	Z-1368	*Candeina nitida*	Ring Net 75		
5	Z-1369	*Candeina nitida*	Ring Net 75		
5	Z-1370	*Neogloboquadrina dutertrei*	Ring Net 75		
5	Z-1371	*Neogloboquadrina dutertrei*	Ring Net 75		
5	Z-1372	*Globorotalia menardii*	MOC-1_T13_N1	800-1000	
5	Z-1373	*Hastigerina pelagica*	MOC-1_T13_N3	400-600	
5	Z-1374	*Hastigerina pelagica*	MOC-1_T13_N3	400-600	
5	Z-1375	*Neogloboquadrina dutertrei*	MOC-1_T13_N6	50-100	
5	Z-	*Orbulina universa*	MOC-1/4_T6_N7	70-90	

Sta. #	DNA ID	species	Net type	Depth (m)	Remarks
	1376				
5	Z-1377	*Orbulina universa*	MOC-1/4_T6_N7	70-90	
5	Z-1378	*Orbulina universa*	MOC-1/4_T6_N7	70-90	
5	Z-1379	*Globigerinoides sacculifer*	MOC-1/4_T6_N7	70-90	
5	Z-1380	*Neogloboquadrina dutertrei*	MOC-1/4_T6_N7	70-90	
5	Z-1381	*Neogloboquadrina dutertrei*	MOC-1/4_T6_N7	70-90	
5	Z-1382	*Neogloboquadrina dutertrei*	MOC-1/4_T6_N7	70-90	
5	Z-1383	*Orbulina universa*	MOC-1/4_T6_N4	120-150	
5	Z-1384				No buffer
5	Z-1385	*Orbulina universa*	MOC-1/4_T6_N4	120-150	
5	Z-1386	*Globorotalia menardii*	MOC-1/4_T6_N4	120-150	
5	Z-1387	*Globorotalia menardii*	MOC-1/4_T6_N4	120-150	
5	Z-1388	*Globorotalia menardii*	MOC-1/4_T6_N4	120-150	
5	Z-1389	*Hastigerina digitata*	MOC-1_T13_N5	100-200	
5	Z-1390	RADIOLARIAN	MOC-1_T13_N3	400-600	
5	Z-1391	RADIOLARIAN	MOC-1_T13_N3	400-600	
5	Z-1392	RADIOLARIAN	MOC-1_T13_N3	400-600	
5	Z-1393	RADIOLARIAN	MOC-1_T13_N3	400-600	
5	Z-1394	RADIOLARIAN	MOC-1_T13_N3	400-600	
5	Z-1395	RADIOLARIAN	MOC-1_T13_N5	100-200	
5	Z-1396	RADIOLARIAN	MOC-1_T13_N5	100-200	
5	Z-	RADIOLARIAN	MOC-1_T13_N6	50-100	

Sta. #	DNA ID	species	Net type	Depth (m)	Remarks
	1397				
5	Z-1398	RADIOLARIAN	MOC-1_T13_N6	50-100	
5	Z-1399	*Candeina nitida*	Ring Net	0-40	
5	Z-1400	*Candeina nitida*	Ring Net	0-40	
5	Z-1401	*Candeina nitida*	Ring Net	0-40	
5	Z-1402	*Candeina nitida*	Ring Net	0-40	
5	Z-1403	*Candeina nitida*	Ring Net	0-40	
5	Z-1404	*Candeina nitida*	Ring Net	0-40	
5	Z-1405	*Candeina nitida*	Ring Net	0-40	
5	Z-1406	*Candeina nitida*	Ring Net	0-40	
5	Z-1407	*Candeina nitida*	Ring Net	0-40	
5	Z-1408	*Candeina nitida*	Ring Net	0-40	
5	Z-1409	*Candeina nitida*	Ring Net	0-40	
5	Z-1410	*Candeina nitida*	Ring Net	0-40	
5	Z-1411	*Candeina nitida*	Ring Net	0-40	
5	Z-1412	*Candeina nitida*	Ring Net	0-40	
5	Z-1413	*Candeina nitida*	Ring Net	0-40	
5	Z-1414	*Candeina nitida*	Ring Net	0-40	5 individuals
5	Z-1415	*Orbulina universa*	Ring Net	0-40	thin shell (soap babble)
5	Z-1416	*Orbulina universa*	Ring Net	0-40	thin shell (soap babble)
5	Z-1417	*Orbulina universa*	Ring Net	0-40	thin shell (soap babble)
5	Z-	*Orbulina universa*	Ring Net	0-40	thin shell (soap babble)

Sta. #	DNA ID	species	Net type	Depth (m)	Remarks
	1418				
5	Z-1419	*Orbulina universa*	Ring Net	0-40	thin shell (soap babble)
5	Z-1420	*Orbulina universa*	Ring Net	0-40	thin shell (soap babble)
5	Z-1421	*Orbulina universa*	Ring Net	0-40	thin shell (soap babble)
5	Z-1422	*Orbulina universa*	Ring Net	0-40	thin shell (soap babble)
5	Z-1423	*Orbulina universa*	Ring Net	0-40	thin shell (soap babble)
5	Z-1424	*Orbulina universa*	Ring Net	0-40	thin shell (soap babble)
5	Z-1425	*Orbulina universa*	Ring Net	0-40	thick shell (opaque)
5	Z-1426	*Orbulina universa*	Ring Net	0-40	thick shell (opaque)
5	Z-1427	*Orbulina universa*	Ring Net	0-40	thick shell (opaque)
5	Z-1428	*Orbulina universa*	Ring Net	0-40	thick shell (opaque)
5	Z-1429	*Orbulina universa*	Ring Net	0-40	thick shell (opaque)
5	Z-1430	*Orbulina universa*	Ring Net	0-40	thick shell (opaque)
5	Z-1431	*Globorotalia menardii*	Ring Net	0-40	
5	Z-1432	*Neogloboquadrina dutertrei*	Ring Net	0-40	
5	Z-1433	*Neogloboquadrina dutertrei*	Ring Net	0-40	
5	Z-1434	*Neogloboquadrina dutertrei*	Ring Net	0-40	
5	Z-1435	*Neogloboquadrina dutertrei*	Ring Net	0-40	
5	Z-1436	*Neogloboquadrina dutertrei*	Ring Net	0-40	
5	Z-1437	*Globigerinoides sacculifer*	Ring Net	0-40	
5	Z-1438	*Globigerinoides sacculifer*	Ring Net	0-40	
5	Z-	*Globigerinoides*	Ring Net	0-40	

Sta. #	DNA ID	species	Net type	Depth (m)	Remarks
	1439	*sacculifer*			
5	Z-1440	*Globigerinoides sacculifer*	Ring Net	0-40	
5	Z-1441	*Globigerinoides sacculifer*	Ring Net	0-40	
5	Z-1442	*Globigerinoides sacculifer*	Ring Net	0-40	
5	Z-1443	*Globorotalia truncatulinoides*	Ring Net	0-40	right coiling
5	Z-1444	*Globorotalia truncatulinoides*	Ring Net	0-40	right coiling
5	Z-1445	*Globorotalia truncatulinoides*	Ring Net	0-40	right coiling
5	Z-1446	*Globorotalia truncatulinoides*	Ring Net	0-40	right coiling
5	Z-1447	*Globorotalia truncatulinoides*	Ring Net	0-40	right coiling
5	Z-1448	*Globorotalia truncatulinoides*	Ring Net	0-40	right coiling
5	Z-1449	*Globigerinoides pyramidalis*	MOC-1/4_T6_N8	0-70	
5	Z-1450	*Candeina nitida*	Reeve Net	0-200	
5	Z-1451	*Candeina nitida*	Reeve Net	0-200	
5	Z-1452	*Candeina nitida*	Reeve Net	0-200	
5	Z-1453	*Candeina nitida*	Reeve Net	0-200	
5	Z-1454	*Candeina nitida*	Reeve Net	0-200	
5	Z-1455	*Candeina nitida*	Reeve Net	0-200	
5	Z-1456	*Candeina nitida*	Reeve Net	0-200	
5	Z-1457	*Candeina nitida*	Reeve Net	0-200	
5	Z-1458	*Candeina nitida*	Reeve Net	0-200	
5	Z-1459	*Candeina nitida*	Reeve Net	0-200	
5	Z-	*Candeina nitida*	Reeve Net	0-200	

Sta. #	DNA ID	species	Net type	Depth (m)	Remarks
	1460				
5	Z-1461	*Candeina nitida*	Reeve Net	0-200	
5	Z-1462	*Candeina nitida*	Reeve Net	0-200	
5	Z-1463	*Candeina nitida*	Reeve Net	0-200	
5	Z-1464	*Candeina nitida*	Reeve Net	0-200	
5	Z-1465	*Candeina nitida*	Reeve Net	0-200	
5	Z-1466	*Candeina nitida*	Reeve Net	0-200	12 individuals
5	Z-1467	*Globigerinoides ruber*	Reeve Net	0-200	Pink shell
5	Z-1468	*Globigerinoides ruber*	Reeve Net	0-200	Pink shell
5	Z-1469	*Globigerinoides ruber*	Reeve Net	0-200	Pink shell
5	Z-1470	*Globigerinoides ruber*	Reeve Net	0-200	Pink shell
5	Z-1471	*Globigerinoides ruber*	Reeve Net	0-200	Pink shell
5	Z-1472	*Globigerinoides ruber*	Reeve Net	0-200	Pink shell
5	Z-1473	*Globigerinoides ruber*	Reeve Net	0-200	Pink shell
5	Z-1474	*Globigerinoides ruber*	Reeve Net	0-200	Pink shell
5	Z-1475	*Globigerinoides ruber*	Reeve Net	0-200	Pink shell
5	Z-1476	*Globigerinoides ruber*	Reeve Net	0-200	
5	Z-1477	*Globigerinoides ruber*	Reeve Net	0-200	
5	Z-1478	*Globorotalia menardii*	Reeve Net	0-200	
5	Z-1479	*Globorotalia menardii*	Reeve Net	0-200	
5	Z-1480	*Neogloboquadrina dutertrei*	Reeve Net	0-200	
5	Z-	*Neogloboquadrina*	Reeve Net	0-200	

Sta. #	DNA ID	species	Net type	Depth (m)	Remarks
	1481	*dutertrei*			
5	Z-1482	*Neogloboquadrina dutertrei*	Reeve Net	0-200	
5	Z-1483	*Globorotalia truncatulinoides*	Reeve Net	0-200	right coiling
5	Z-1484	*Globorotalia truncatulinoides*	Reeve Net	0-200	right coiling
5	Z-1485	*Globorotalia truncatulinoides*	Reeve Net	0-200	right coiling
5	Z-1486	*Globorotalia truncatulinoides*	Reeve Net	0-200	right coiling
5	Z-1487	*Globorotalia truncatulinoides*	Reeve Net	0-200	right coiling
5	Z-1488	*Globorotalia truncatulinoides*	Reeve Net	0-200	right coiling
5	Z-1489	*Globorotalia truncatulinoides*	Reeve Net	0-200	right coiling
5	Z-1490	*Globorotalia truncatulinoides*	Reeve Net	0-200	right coiling
5	Z-1491	*Globorotalia truncatulinoides*	Reeve Net	0-200	right coiling
5	Z-1492	*Globigerinita glutinata*	Reeve Net	0-200	
5	Z-1493	*Globigerinita glutinata*	Reeve Net	0-200	
5	Z-1494	*Globigerinita glutinata*	Reeve Net	0-200	
5	Z-1495	*Globigerinita glutinata*	Reeve Net	0-200	
5	Z-1496	*Globigerinita glutinata*	Reeve Net	0-200	
5	Z-1497	*Orbulina universa*	Reeve Net	0-200	
5	Z-1498	*Orbulina universa*	Reeve Net	0-200	
5	Z-1499	*Orbulina universa*	Reeve Net	0-200	
5	Z-1500	*Orbulina universa*	Reeve Net	0-200	
5	Z-1501	*Globigerinoides sacculifer*	Reeve Net	0-200	
5	Z-	*Globigerinoides*	Reeve Net	0-200	

Sta. #	DNA ID	species	Net type	Depth (m)	Remarks
	1502	*sacculifer*			
5	Z-1503	*Globigerinoides sacculifer*	Reeve Net	0-200	
5	Z-1504	*Globigerinoides sacculifer*	Reeve Net	0-200	
5	Z-1505	*Globigerinoides sacculifer*	Reeve Net	0-200	
5	Z-1506	*Globigerinoides conglobatus*	Reeve Net	0-200	
5	Z-1507	*Candeina nitida*	MOC-1/4_T6_N8	0-70	
5	Z-1508	*Candeina nitida*	MOC-1/4_T6_N8	0-70	
5	Z-1509	*Candeina nitida*	MOC-1/4_T6_N8	0-70	
5	Z-1510	*Candeina nitida*	MOC-1/4_T6_N8	0-70	
5	Z-1511	*Candeina nitida*	MOC-1/4_T6_N8	0-70	
5	Z-1512	*Candeina nitida*	MOC-1/4_T6_N8	0-70	
5	Z-1513	*Candeina nitida*	MOC-1/4_T6_N8	0-70	
5	Z-1514	*Neogloboquadrina dutertrei*	MOC-1/4_T6_N8	0-70	
5	Z-1515	*Neogloboquadrina dutertrei*	MOC-1/4_T6_N8	0-70	
5	Z-1516	*Neogloboquadrina dutertrei*	MOC-1/4_T6_N8	0-70	
5	Z-1517	*Neogloboquadrina dutertrei*	MOC-1/4_T6_N8	0-70	
5	Z-1518	*Neogloboquadrina dutertrei*	MOC-1/4_T6_N8	0-70	
5	Z-1519	*Orbulina universa*	MOC-1/4_T6_N8	0-70	
5	Z-1520	*Orbulina universa*	MOC-1/4_T6_N8	0-70	
5	Z-1521	*Globigerinoides ruber*	MOC-1/4_T6_N8	0-70	pink shell
5	Z-1522	*Globigerinoides ruber*	MOC-1/4_T6_N8	0-70	pink shell
5	Z-	*Globigerinoides ruber*	MOC-1/4_T6_N8	0-70	pink shell

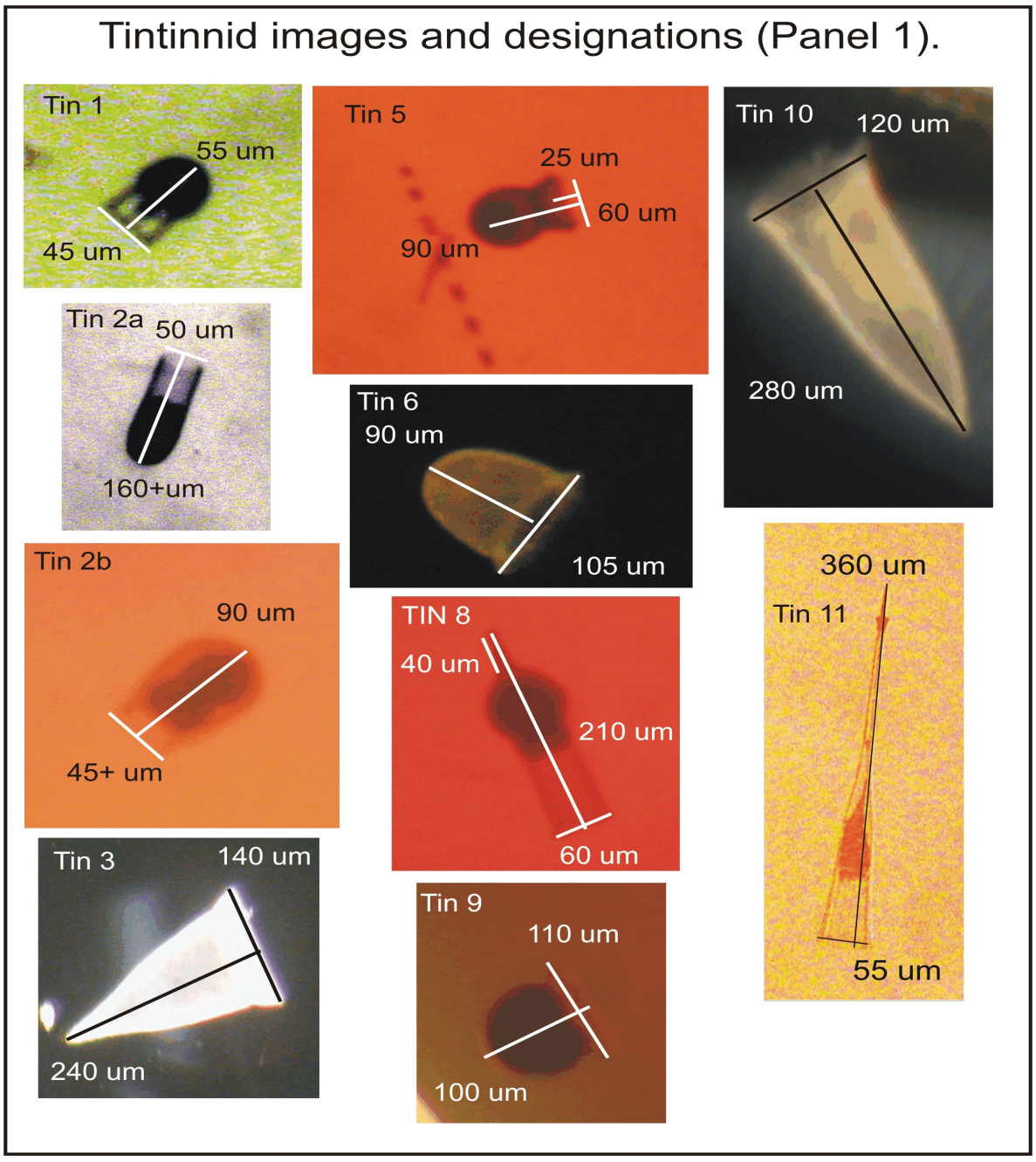
Sta. #	DNA ID	species	Net type	Depth (m)	Remarks
	1523				
5	Z-1524	*Globigerinoides ruber*	MOC-1/4_T6_N8	0-70	pink shell
5	Z-1525	*Globigerinoides ruber*	MOC-1/4_T6_N8	0-70	pink shell
5	Z-1526	*Globigerinoides ruber*	MOC-1/4_T6_N8	0-70	pink shell
5	Z-1527	*Globigerinoides ruber*	MOC-1/4_T6_N8	0-70	
5	Z-1528	*Globigerinoides ruber*	MOC-1/4_T6_N8	0-70	
5	Z-1529	*Globigerinoides ruber*	MOC-1/4_T6_N8	0-70	
5	Z-1530	*Globigerinoides ruber*	MOC-1/4_T6_N8	0-70	
5	Z-1531	*Globigerinoides ruber*	MOC-1/4_T6_N8	0-70	
5	Z-1532	*Globigerinoides ruber*	MOC-1/4_T6_N8	0-70	
5	Z-1533	*Globigerinoides ruber*	MOC-1/4_T6_N8	0-70	
5	Z-1534	*Globigerinoides ruber*	MOC-1/4_T6_N8	0-70	
5	Z-1535	*Globigerinoides sacculifer*	MOC-1/4_T6_N8	0-70	
5	Z-1536	*Globigerinoides sacculifer*	MOC-1/4_T6_N8	0-70	
5	Z-1537	*Globigerinoides sacculifer*	MOC-1/4_T6_N8	0-70	
5	Z-1538	*Globigerinoides sacculifer*	MOC-1/4_T6_N8	0-70	
5	Z-1539	*Globigerinoides sacculifer*	MOC-1/4_T6_N8	0-70	
5	Z-1540	*Globigerinoides sacculifer*	MOC-1/4_T6_N8	0-70	
5	Z-1541	*Globigerinoides sacculifer*	MOC-1/4_T6_N8	0-70	

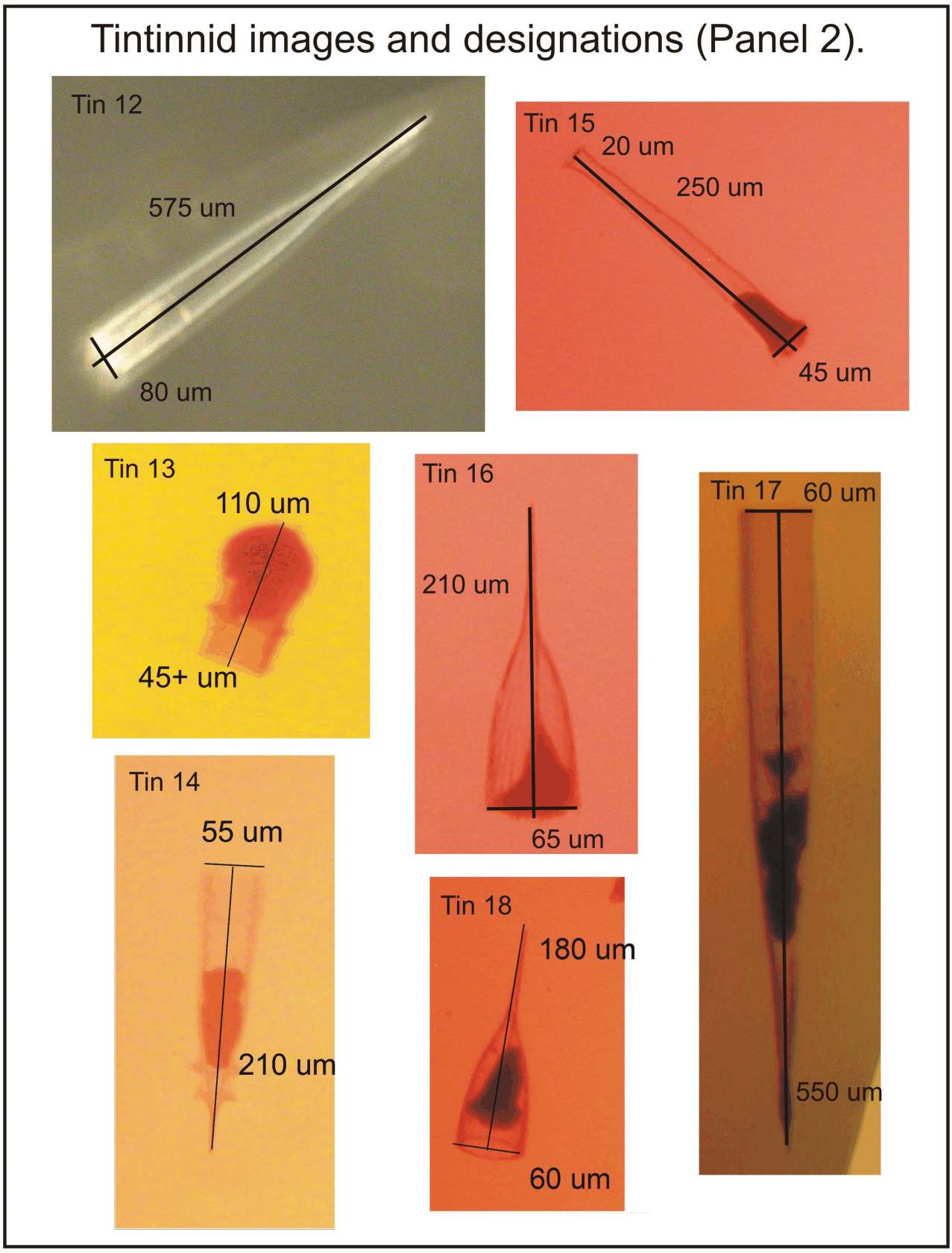
APPENDIX 4. Colonial radiolarians collected by diving that have had pieces preserved for DNA (frozen) and morphological (formalin and EtOH) analyses.

CMarZ (April10-30th, 2006)								
Sample Name	**Sation**	**Dive**	**Lat**	**Long**	**Date**	**Remark**	**Formalin**	**Etoh**
Rad1	3	3	24.84	-60.14	4/19/06	Night	Y	Y
Rad2	3	3	24.84	-60.14	4/19/06	Night	Y	Y
Rad3	3	3	24.84	-60.14	4/19/06	Night	Y	N
Rad4	3	3	24.84	-60.14	4/19/06	Night	Y	N
Rad5	3	4	24.98	-60.54	4/20/06	Day	Y	Y
Rad6	3	4	24.98	-60.54	4/20/06	Day	Y	N
Rad7	3	4	24.98	-60.54	4/20/06	Day	Y	N
Rad8	3	4	24.98	-60.54	4/20/06	Day	Y	Y
Rad9	3	4	24.98	-60.54	4/20/06	Day	Y	Y
Rad10	3	4	24.98	-60.54	4/20/06	Day	Y	Y
Rad11	3	4	24.98	-60.54	4/20/06	Day	Y	Y
Rad13	3	5	24.96	-60.68	4/21/06	Day	Y	Y
Rad14	3	5	24.96	-60.68	4/21/06	Day	Y	Y
Rad15	3	5	24.96	-60.68	4/21/06	Day	Y	Y
Rad16	3	5	24.96	-60.68	4/21/06	Day	Y	N
Rad17	3	5	24.96	-60.68	4/21/06	Day	Y	Y
Rad18	3	5	24.96	-60.68	4/21/06	Day	Y	Y
Rad19	3	5	24.96	-60.68	4/21/06	Day	Y	Y
Rad20	3	5	24.96	-60.68	4/21/06	Day	Y	Y
Rad21	3	5	24.96	-60.68	4/21/06	Day	Y	N
Rad22	3	5	24.96	-60.68	4/21/06	Day	Y	Y
Rad23	3	5	24.96	-60.68	4/21/06	Day	Y	Y
Rad27	4	6	19.82	-54.72	4/23/06	Day	Y	N
Rad28	4	6	19.82	-54.72	4/23/06	Day	Y	Y
Rad29	4	6	19.82	-54.72	4/23/06	Day	Y	Y
Rad30	4	7	19.82	-54.47	4/24/06	Night	Y	Y
Rad31	4	7	19.82	-54.47	4/24/06	Night	Y	Y
Rad32	4	7	19.82	-54.47	4/24/06	Night	N	Y
							Total	48

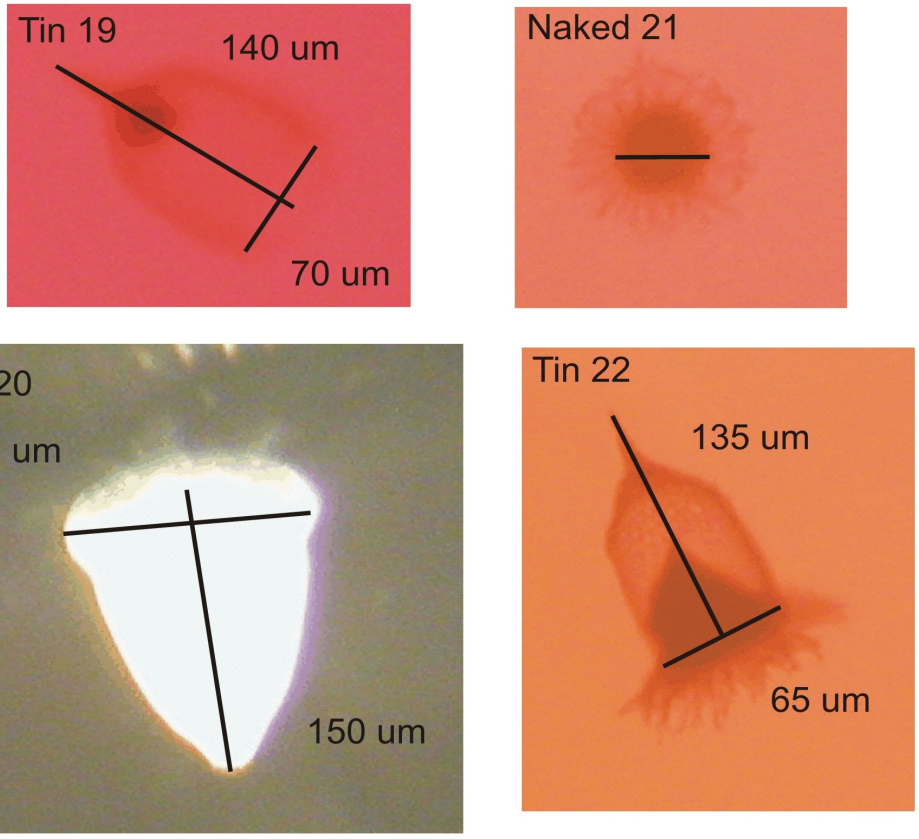
APPENDIX 5. Tintinnid images and designations followed by preliminary ID to family and genus if possible. Picture includes measurements of lorica length and lorica oral opening. Note: Non-live pictures are from Lugol's preserved samples and color is not indicative of living tintinnid.

TIN 1
Preliminary ID – Famliy: Dictyocystidae, Genus: *Dictocysta*
TIN 2a
Preliminary ID – Family: Undellidae, Genus: *Undella*
TIN 2b
Preliminary ID – Family: Undellidae, Genus: *Proplectella*
TIN 3
Preliminary ID – Family: Cyttarocylidiae. Although ID is weak.
TIN 4 (No Figure)
Preliminary ID – This is probably same as TIN 2
TIN 5
Preliminary ID – Family: Codonellidae, Genus: *Codennella*
TIN 6
Preliminary ID – Family: Petalotrichidae?
TIN 7 (No Figure)
Preliminary ID – No ID yet. Need to look at preserved sample.
TIN 8
Preliminary ID – Family: Codonellopsidae, Genus: *Codonellopsis*
TIN 9
Preliminary ID – Family: Petalotrichidae, Genus: *Petalotricha*
TIN 10
Preliminary ID – No tentative ID yet
TIN 11
Preliminary ID – Family: Rhabdonellidae, Genus: *Rhabdonella*
TIN 12
Preliminary ID – Family: Xystonellidae, Genus: *Xystonella*
TIN 13
Preliminary ID – Family: Undellidae, Genus: *Amplectella*
TIN 14
Preliminary ID – Family: Xystonellidae, Genus: *Xystoneliopsis*
TIN 15
Preliminary ID – Family: Tintinnidae, Genus: *Eutintinnus*
TIN 16
Preliminary ID – Family: Rhabdonellidae, Genus: *Rhabdonella*
TIN 17
Preliminary ID – Family: Xystonellidae, Genus: *Xystonella*
TIN 18
Preliminary ID – Family: Rhabdonellidae, Genus: *Rhabdonella*
TIN 19
Preliminary ID – No preliminary ID yet
TIN 20
Prelilminary ID – No preliminary ID yet
NAKED 21
Preliminary ID – No preliminary ID yet
TIN 22
Preliminary ID – No preliminary ID yet
TIN 23 (No Figure)
Preliminary ID – No preliminary ID


Tintinnid images and designations (Panel 1).
Tin 1
55 um
45 um
Tin 5
25 um
60 um
90 um
Tin 10
120 um
280 um
Tin 2a
50 um
160+um
Tin 6
90 um
105 um
Tin 2b
90 um
45+ um
TIN 8
40 um
210 um
60 um
360 um
Tin 11
55 um
Tin 3
140 um
240 um
Tin 9
110 um
100 um


Tintinnid images and designations (Panel 2).
Tin 12
575 um
80 um
Tin 15
20 um
250 um
45 um
Tin 13
110 um
45+ um
Tin 16
210 um
65 um
Tin 17
60 um
550 um
Tin 14
55 um
210 um
Tin 18
180 um
60 um

Tintinnid images and designations (Panel 3).



APPENDIX 6. MOCNESS Deployment Log. Summary of 1-m, 10-m and 1/4-m MOCNESS Tows (local Date/Time). Net bar containment flaps and side deflector flags were installed on the 1–m MOCNESS starting with tow #3.

TOW	STATION	DATE	TIME (local)	LATITUDE (N) Start/End	LONGITUDE (W) Start/End	Depths Sampled (m)	Volume Filtered (m^3)	Comments
1-m MOCNESS Tows								
1	1	13 April 06	0619	33° 31.467 33° 35.900	69° 57.678 69° 53.460	Net 0: 0000-1000 Net 1: 1000-0800 Net 2: 0800-0600 Net 3: 0600-0400 Net 4: 0400-0200 Net 5: 0200-0100 Net 6: 0100-0050 Net 7: 0050-0025 Net 8: 0025-0000	1784.1 1034.9 1154.8 1319.3 1155.1 655.1 414.0 384.5 504.9	No net responses on any net, but only one bar up at end.
2	1	14 April 06	1803	33° 37.589 33° 33.904	69° 31.554 69° 38.33	Net 0: 0000-0993 Net 1: 0993-0797 Net 2: 0797-0600 Net 3: 0600-0400 Net 4: 0400-0200 Net 5: 0200-0100 Net 6: 0100-0050 Net 7: 0050-0025 Net 8: 0025-0000	1652.9 802.4 924.9 820.4 1193.6 471.7 264.0 178.0 272.2	
3	2	16 April 06	0042	29° 59.711 29° 53.241	70° 01.648 70° 04.464	Net 0: 0000-0998 Net 1: 0998-0790 Net 2: 0790-0600 Net 3: 0600-0400 Net 4: 0400-0200 Net 5: 0200-0100 Net 6: 0100-0050 Net 7: 0050-0025 Net 8: 0025-0000	912.8 667.2 942.9 1218.2 961.3 667.4 547.5 312.1 288.8	
4	2	16 April 06	0658	29° 52.09 29° 51.405	70° 04.530 70° 08.427	Net 0: 0000-1000 Net 1: 1000-0800	1233.7 782.8	Net 8 may have closed early.

TOW	STATION	DATE	TIME (local)	LATITUDE (N) Start/End	LONGITUDE (W) Start/End	Depths Sampled (m)	Volume Filtered (m^3)	Comments
						Net 2: 0800-0594 Net 3: 0594-0400 Net 4: 0400-0195 Net 5: 0200-0100 Net 6: 0100-0050 Net 7: 0050-0025 Net 8: 0025-0000	754.8 821.9 896.0 412.1 203.7 150.9 305.8	Spontaneous net response at surface.
5	3	19 April 06	0904	25° 00.027 24° 52.667	59° 56.727 60° 08.148	Net 0: 0000-3300-0200 Net 1: 0200-0000 Net 2: Net 3: Net 4: Net 5: Net 6: Net 7: Net 8:	2618.2 4278.8 2730.9 1219.5 1561.6 2546.2 1880.0 2210.2 1965.4	None of nets worked right. Cables with swaged fittings not loaded in toggle correctly.
6	3	20 April 06	1114	24° 49.348 24° 49.445	60° 26.812 60° 26.800	Net 0: 0000-0070 Net 1: Net 2: Net 3: Net 4: Net 5: Net 6: Net 7: Net 8:	923.3	Lost signal when net at 70m.
7	3	20 April 06	1244	24° 52.133 24° 57.692	60° 29.228 60° 32.159	Net 0: 0000-1000 Net 1: 1000-0800 Net 2: 0800-0600 Net 3: 0600-0400 Net 4: 0400-0200 Net 5: 0200-0100 Net 6: 0100-0050 Net 7: 0050-0025 Net 8: 0025-0000	2626.4 1065.1 1091.8 1058.6 1019.9 806.7 410.8 373.3 407.2	

TOW	STATION	DATE	TIME (local)	LATITUDE (N) Start/End	LONGITUDE (W) Start/End	Depths Sampled (m)	Volume Filtered (m^3)	Comments
8	3	20 April 06	1903	24° 59.966 25° 03.294	60° 30.776 60° 35.552	Net 0: 0000-1000-0800 Net 1: 0800-0600 Net 2: 0588-0400 Net 3: 0400-0200 Net 4: 0200-0100 Net 5: 0100-0050 Net 6: 0050-0025 Net 7: 0025-0000 Net 8: did not fish	3068.0 1484.1 1093.2 976.6 1159.6 872.2 634.1 200.8 436.1	Frame banged going out. Clipped the net response going in. Two bars left at top at surface.
9	4	23 April 06	1521	19° 49.227 19° 45.723	54° 43.585 54° 37.532	Net 0: 0000-1000 Net 1: 1000-0800 Net 2: 0800-0600 Net 3: 0600-0400 Net 4: 0400-0200 Net 5: 0200-0100 Net 6: 0100-0050 Net 7: 0050-0025 Net 8: 0025-0000	2655.6 363.1 1005.2 908.2 946.3 1230.3 1019.2 409.1 259.1	No net response with net 1 until 15 minutes later. Bar must have hung up and then dropped. Part of catch went into net 0 until bar dropped completely.
10	4	23 April 06	2152	19° 47.123 19° 49.426	54° 35.625 54° 28.627	Net 0: 0000-1000 Net 1: 1000-0800 Net 2: 0800-0595 Net 3: 0595-0400 Net 4: 0400-0200 Net 5: 0200-0100 Net 6: 0100-0050 Net 7: 0050-0025 Net 8: 0025-0000	4219.5 1189.9 927.7 852.1 989.3 892.9 479.7 269.6 326.7	
11	5	25 April 06	0916	14° 00.174 14° 01.042	54° 59.976 54° 55.089	Net 0: 0000-1000 Net 1: 1000-0799 Net 2: 0799-0600 Net 3: 0600-0400 Net 4: 0400-0198	1801.2 922.4 839.2 944.6 1043.7	Lots of water through net 7 at 25m because winch shut down due to

TOW	STATION	DATE	TIME (local)	LATITUDE (N) Start/End	LONGITUDE (W) Start/End	Depths Sampled (m)	Volume Filtered (m^3)	Comments
						Net 5: 0198-0100 Net 6: 0100-0050 Net 7: 0050-0025 Net 8: 0025-0000	475.3 666.4 1125.2 216.3	burning smell in winch room.
12	5	25 April 06	1725	14° 02.499 14° 05.102	54° 53.482 54° 48.879	Net 0: 0000-1000 Net 1: 1000-0800 Net 2: 0800-0600 Net 3: 0600-0400 Net 4: 0400-0200 Net 5: 0200-0100 Net 6: 0100-0050 Net 7: 0050-0025 Net 8: 0025-0000	2093.2 1017.0 703.5 1189.4 1385.7 650.1 341.9 364.1 361.1	
13	5	27 April 06	1216	14° 24.772 14° 25.119	53° 56.494 53° 52.530	Net 0: 0000-0547 Net 1: 0547-0527 Net 2: 0527-0516 Net 3: 0515-0496 Net 4: 0496-0488 Net 5: 0489-0477 Net 6: 0477-0473 Net 7: 0473-0464 Net 8: 0464-0461	2232.5 366.5 261.6 379.1 389.4 222.3 288.9 294.3 252.1	Special "Staircase" tow.
10-m MOCNESS Tows								
1	1	14 April 06 15 April 06	1606 0745	33 38.552 33 40.243	-69 47.717 -69 13.418	Net 0: 0000-5000 Net 1: 5000-4000 Net 2: 4000-3000 (lost bucket) Net 3: broken tab Net 4: 3000-1000	66763.1 147296.9 71942.6 85192.9 69562.8	Net 2 lost codend. Net 3 closed at same time as net 2 due to broken tab. Net 3 contents only contaminants.

TOW	STATION	DATE	TIME (local)	LATITUDE (N) Start/End	LONGITUDE (W) Start/End	Depths Sampled (m)	Volume Filtered (m^3)	Comments
2	2	16 April 06 17 April 06	1529 0416	29 49.77 29 29.273	-70 14.292 -70 29.875	Net 0: 0000-4315 Net 1: 4315-3500? Net 2: 3500-2750? Net 3: 2750-2000? Net 4: 2000-1000?	153129.9 34545.8 49126.7 37129.0 16365.3	Trouble with winch and ship-handling during descent of net 0. Long haul. Only net 1 true catch for depth. Others contaminated by gap.
3	3	19 April 06 20 April 06	2334 0925	24 50.385 24 47.482	-60 4.8107 -60 21.917	Net 0: 0000-5000 Net 1: 5000-4000 Net 2: 4000-3000 Net 3: broken tab - bucket lost Net 4: 3000-1000	61591.1 28665.2 35051.2 44848.7 38979.5	Codend lost from net 3 but tab broke off and it didn't fish anyway. Net 4 opened prematurely and fished more. Contamination issue apparently solved due to modifications to net system (flaps).
4	3	21 April 06	0028 1126	25 03.367 25 03.049	-60 37.536 -60 58.849	Net 0: 0000-5000 Net 1: 5000-4000 Net 2: 4000-3000 Net 3: 3000-2000 Net 4: 2000-1000	39640.7 38176.7 64340.60 49301.40 53127.6	
5	4	23 April 06	0142 1256	20 00.03 19 49.387	-54 59.805 -54 44.379	Net 0: 0000-4500 Net 1: 4500-4000 Net 2: 4000-3000 Net 3: 3000-2000 Net 4: 2000-1000	64469.1 33551.2 55232.6 52965.2 55329.2	

TOW	STATION	DATE	TIME (local)	LATITUDE (N) Start/End	LONGITUDE (W) Start/End	Depths Sampled (m)	Volume Filtered (m^3)	Comments
6	5	25 April 06 26 April 06	2156 1001	14 05.83 14 12.948	-54 46.800 -54 27.378	Net 0: 0000-5000 Net 1: 5000-4000 Net 2: 4000-3000 Net 3: 3000-2000 Net 4: 2000-1000	78111.6 70880.3 40927.9 44480.8 40588.7	Net 1 possibly opened early (1000m). Seems contaminated by shallow species. Net 2 has depth-appropriate fauna, but little of it. Net 3 has mesopelagic fauna.
7	5	26 April 06 27 April 06	1401 0338	14 16.930 14 20.497	-54 21.960 -53 57.916	Net 0: 0000-5000 Net 1: 5000-4000 Net 2: 4000-3000 Net 3: 3000-1000 Net 4: 1000-0000	92206.6 54074.1 55370.8 114403.5 62573.2	Contamination minimal. Catch spectacular. Net 4 fished more shallow than usual on purpose.
1/4-m MOCNESS Tows								
1	1	13 April 06	1345	33° 37.270 33° 38.386	69° 51.803 69° 48.949	Net 0: 000-410 Net 1: Net 2: Net 3: Net 4: Net 5: Net 6: Net 7: Net 8:	315.8	Oblique tow down and up. Battery died on underwater unit.
2	1	14 April 06	1329	33° 35.803 33° 33.748	69° 24.606 69° 29.379	Net 0: 000-500 Net 1: 500-350 Net 2: 350-200 Net 3: 200-150 Net 4: 150-100	380.5 544.0 361.3 160.6 141.0	

TOW	STATION	DATE	TIME (local)	LATITUDE (N) Start/End	LONGITUDE (W) Start/End	Depths Sampled (m)	Volume Filtered (m^3)	Comments
						Net 5: 100-075 Net 6: 075-050 Net 7: 050-025 Net 8: 025-000	46.7 49.5 49.8 71.9	
3	1	14 April 06	2342	33° 34.251 33° 33.144	69° 38.859 69° 38.968	Net 0: 000-290 Net 1: Net 2: Net 3: Net 4: Net 5: Net 6: Net 7: Net 8:	653.5	Lost signal with underwater unit. Aborted tow.
4	2	15 April 06	1756	29° 59.994 29° 59.270	69° 59.92 69° 59.12	Net 0: 000-249 Net 1: Net 2: Net 3: Net 4: Net 5: Net 6: Net 7: Net 8:	186.9	Underwater unit stopped working. Used catch as 'live' tow.
5	5	26 April 06	1027	14° 13.542 14° 15.430	54° 26.688 54° 24.227	Net 0: 000-500 Net 1: 500-300 Net 2: 350-200 Net 3: 200-150 Net 4: 150-100 Net 5: 100-075 Net 6: 075-050 Net 7: 050-025 Net 8: 025-000	852.8 359.0 157.7 ng ng ng ng ng ng	Flow meter stopped working at 197m depth. Catch is good, but don't know volume filtered.
6	5	27 April 06	0612	14° 23.793 14° 28.635	53° 56.63 53° 55.039	Net 0: 000-350 Net 1: 350-230 Net 2: 230-170	668.4 152.6 186.5	Not much in nets. "Microbial paradise

TOW	STATION	DATE	TIME (local)	LATITUDE (N) Start/End	LONGITUDE (W) Start/End	Depths Sampled (m)	Volume Filtered (m^3)	Comments
						Net 3: 170-150 Net 4: 150-120 Net 5: 120-110 Net 6: 110-090 Net 7: 090-070 Net 8: 070-000	107.4 116.1 102.9 104.2 100.0 139.5	invisible to the naked eye.”

APPENDIX 7. Pelagic Fish.

Species	Station 1 Totals	Station 2 Totals	Station 3 Totals	Station 4 Totals	Station 5 Totals	Cruise Totals
Argyropelecus aculeatus	2	15	0	2	6	25
Argyropelecus gigas	0	0	0	0	5	5
Argyropelecus hemigymnus	2	12	10	11	13	48
Argyropelecus larva	0	0	2	1	4	7
Ariosomma leptocephalus	0	0	0	1	0	1
Aristostomias xenostoma	0	0	0	0	1	1
Astronesthes cf indicus	0	0	0	0	1	1
Astronesthes juvenile	0	0	0	0	2	2
Astronesthes micropogon	0	0	0	0	1	1
Astronesthes similis	0	0	0	0	1	1
Avocettina infans	0	2	0	0	0	2
bathylagid larva	0	0	0	0	0	0
Benthalbella infans	0	0	1	0	0	1
Benthosema suborbitale	0	2	0	0	8	10
Bolinichthys indicus	1	0	0	0	0	1
Bolinichthys juvenile	0	0	0	0	3	3
Bolinichthys photothorax	0	2	1	1	7	11
Bonapartia pedaliota	0	3	1	1	1	6
Bothid larva	2	0	10	0	11	23
Brama caribbea	0	0	0	0	1	1
Bregmaceros atlanticus	0	0	1	2	8	11
Ceratias holboelli	0	0	0	0	1	1
Ceratiid male	0	0	1	0	0	1
Ceratioid larva	0	0	0	1	0	1
Ceratoscopelus warmingii	1	1	10	9	31	52
Cetostoma regani	0	0	1	0	0	1
Chauliodus danae	0	2	4	2	0	8
Chauliodus sloani	1	3	0	1	0	5
Chiasmodon niger	1	0	0	0	0	1
Coccorella atlantica	0	1	0	0	0	1
Coryphaena hippurus	0	0	1	0	0	1
Cryptopsaras couesii	0	2	0	0	0	2
Cyclothone acclinidens	0	0	0	7	165	172
Cyclothone alba	0	0	1	2	0	3
Cyclothone braueri	138	412	214	142	367	1273
Cyclothone microdon	131	99	45	41	64	380
Cyclothone pallida	217	83	181	66	383	930
Cyclothone pseudopallida	18	52	1	0	23	94
Cyclothone (damaged)	1	0	1	1	0	3
Cyclothone larvae	0	10	0	0	0	10

Species	Station 1 Totals	Station 2 Totals	Station 3 Totals	Station 4 Totals	Station 5 Totals	Cruise Totals
Diaphus brachycephalus	0	0	1	1	6	8
Diaphus dumerilii	0	0	0	1	2	3
Diaphus effulgens	0	0	0	0	1	1
Diaphus cf. fragilis	0	0	0	1	0	1
Diaphus juv.	0	0	1	0	3	4
Diaphus lucidus	0	0	0	0	9	9
Diaphus rafinesquii	0	1	0	0	1	2
Diaphus roei	0	0	0	0	9	9
Diaphus subtilis	0	0	0	0	4	4
Diaphus taaningi	1	0	0	0	0	1
Diplophos taenia	0	0	0	0	1	1
Diretmus argenteus	0	0	0	1	0	1
Dolicholagus longirostris	1	1	0	0	2	4
Echeneid juvenile	0	0	0	1	0	1
Eel leptocephalus larva	1	2	5	3	14	25
epigonid larvae	0	0	0	1	0	1
Eurypharynx pelecanoides	0	0	0	0	2	2
Eustomias (Biradiostomias) sp. (dam)	0	0	0	1	0	1
Eustomias fissibarbis	0	1	0	0	0	1
Eustomias macrurus	0	0	0	0	1	1
Eustomias obscurus	1	1	0	0	0	2
Eustomias postlarva	0	0	0	1	0	1
Exocoetus obtusirostris	0	0	0	1	0	1
fish larvae - TBD	33	4	40	66	77	220
Gempylid juvenile	0	0	2	1	0	3
gigantactinid male	0	0	0	0	2	2
Gigantura indica	0	0	0	0	2	2
Gonichthys cocco	0	0	0	1	0	1
Gonostoma atlanticum	0	0	0	0	2	2
Himantolophid male	0	0	0	1	0	1
Howella brodiei	0	0	1	0	3	4
Hygophum benoiti	0	1	0	0	0	1
Hygophum hygomii	10	7	0	0	0	17
Hygophum macrochir	0	0	0	1	5	6
Hygophum reinhardtii	0	0	2	0	1	3
Hygophum taaningi	1	0	1	0	10	12
Hyporhamphus juvenile	0	0	0	0	3	3
Ichthyococcus ovatus	0	0	0	0	1	1
Idiacanthus fasciola	0	2	0	1	8	11
Lampadena luminosa	0	0	0	0	1	1
Lampanyctus alatus	0	0	0	0	2	2

	Station 1	Station 2	Station 3	Station 4	Station 5	Cruise
Species	Totals	Totals	Totals	Totals	Totals	Totals
Lampanyctus juvenile	0	0	0	0	2	2
Lampanyctus nobilis	0	0	0	0	8	8
Lampanyctus photonotus	0	0	12	3	4	19
Lampanyctus pusillus	0	8	0	1	2	11
Lepidophanes guentheri	0	2	1	2	75	80
Leptostomias sp. nov	0	0	0	0	1	1
Linophryne sp. male	1	1	0	0	0	2
Lobianchia dofleini	0	25	0	0	0	25
Lobianchia gemellarii	0	2	0	1	2	5
Lophiiform larva	0	1	0	0	0	1
Lophodolos acanthognathus	1	0	0	0	0	1
Macroparalepis cf "brevis"	0	0	1	0	0	1
Malacosteus niger	0	0	0	0	2	2
Margrethia obtusirostre	0	0	0	1	1	2
Maulisia juvenile	0	1	0	0	3	4
Melamphaes TBD	5	5	5	3	3	21
Melamphaid juvenile	0	0	2	0	0	2
Melanonus zugmayeri	1	1	0	0	1	3
Myctophid larvae	18	26	7	6	55	112
Nannobrachium atrum	0	0	2	0	0	2
Nannobrachium cuprarium	2	4	3	1	0	10
Nemichthyid leptocephalus	0	1	0	0	0	1
Nesiarchus nasutus	1	1	0	1	1	4
Notolychnus valdiviae	2	0	1	2	9	14
Notoscopelus resplendens	1	1	0	0	0	2
Omosudis lowei	1	0	0	0	0	1
oneirodid male	0	0	0	0	3	3
Paralepidid juvenile	1	1	0	0	0	2
Paralepis brevirostris	0	0	1	0	1	2
Perciform larva	1	2	0	0	0	3
Photonectes cf. achirus	0	0	0	0	1	1
Photonectes braueri	0	1	0	0	0	1
Photonectes dinema	0	1	0	0	0	1
Photostomias goodyeari	0	1	0	0	0	1
Platytroctes apus	0	1	0	0	0	1
Poromitra capito	0	0	0	1	0	1
Poromitra crassiceps	0	1	1	0	0	2
Pseudoscopelus "sp. A" cf. obtusifrons	0	1	0	0	0	1
red-tailed fish larva - TBD	1	0	0	0	0	1
Regalecus glesne	0	1	0	0	0	1
Rhadinesthes decimus	0	0	0	1	0	1

	Station 1	Station 2	Station 3	Station 4	Station 5	Cruise
Species	Totals	Totals	Totals	Totals	Totals	Totals
Rhynchactis male	0	0	1	0	0	1
Rondeletia bicolor	0	0	0	0	1	1
Saccopharynx leptocephalus	0	0	1	0	0	1
Scombroid larva	0	1	1	1	2	5
scopelarchid juvenile	0	0	0	0	1	1
Scopeloberyx opisthopterus	6	0	0	0	2	8
Scopeloberyx robustus	1	0	0	0	0	1
Scopelogadus mizolepis mizolepis	0	0	2	1	0	3
scorpaenid larva	0	0	0	0	1	1
Serrivomer beanii	0	1	1	0	2	4
Sigmops elongatum	1	0	0	0	3	4
spotted larvae - TBD	2	0	0	0	0	2
stalk-eyed larva	0	0	0	0	0	0
sternoptychid larvae	0	1	2	0	0	3
Sternoptyx diaphana	3	16	2	6	9	36
Sternoptyx juvenile	1	1	1	1	1	5
Stomias affinis	0	0	0	0	1	1
stomiid larvae	2	5	2	0	2	11
stomiiform larvae	0	20	0	0	0	20
Stylephorus chordatus	0	0	0	0	1	1
Tetraodontiform juvenile	1	0	0	0	0	1
Thunnus juvenile	0	0	0	1	0	1
Valencienellus tripunctulatus	0	2	6	0	5	13
Vinciguerria nimbaria	0	0	0	0	1	1
Vinciguerria poweriae	1	2	0	1	2	6
no. species	36	49	39	45	72	127
no. fish	617	859	594	408	1487	3965
biomass (g)	32.96	87.89	12.15	174.68	187.4	495.08