KILO MOANA Post Cruise Debrief Questions and Feedback
Compiled by Question

Updated: November 12, 2004

Debriefs:

1.	Doug Capone:	22 Sep – 17 Oct 2002
2.	Bob Bidigare:	23 Nov – 27 Nov 2002
3.	Tom Gregory:	16 Dec – 21 Dec 2002
4.	Karin Bjorkman	8 Mar – 10 Mar 2003
5.	Tom Gregory	20 Mar – 24 Mar 2003
6.	Christopher Kelley	1 Apr – 3 Apr 2003
7.	Nancy Kachel	17 Apr – 9 May 2003 & 11 –29 Sep 2003
8.	Scott Stalin	20 May – 11 Jun 2003
9.	Brian Popp	18 June – 5 August 2003
10.	Ken Bruland	6 Aug – 8 September 2003
11.	Karin Bjorkman	30 Sep – 10 Oct 2003
12.	Tom Gregory	13 Oct – 17 Oct 2003
13.	Jerome Aucan	3 Nov – 7 Nov 2003
14.	Sadler, D (Karl – PI)	8 Nov – 12 Nov 2003
15.	Kelley, Christopher	15 Nov – 20 Nov 2003
16.	Fernando Santiago	08 Dec – 17 Dec 2003
17.	Ken Buesseler	7 Jan – 13 Jan 2004
18.	Mak Saito	22 Feb – 2 March
19.	Kenia Whitehead	5 Mar – 14 Mar 2004
20.	Mandujano, F. (Karl-PI)	18 Mar – 22 Mar 2004
21.	Martinez, Fernando	6 Apr – 9 May 2004
22.	Ken Buesseler	20 Jun – 10 Jul 2004 (2nd cruise – highlighted in yellow)
23.	William Cochlan	15 July – 24 Aug 2004

The RV KILO MOANA is the first SWATH vessel in the UNOLS fleet. The unique characteristics of this vessel make at-sea operations different than normally done on a standard monohull vessel. As well, the design of a SWATH vessel puts constrains on the layout and operation of the vessel. This questionnaire is to evaluate the use of a SWATH vessel for oceanographic research and aid in any decision process of constructing future SWATH vessels and improvements to this platform.

There are numerous scientific operations conducted during a research cruise. For the operations listed below, please describe:

1. The sea-state in which the operation was conducted,
   - *Up to 6ft seas*
   - *Winds 5-10knts, long swell ~ 20 sec period*
   - *Calm, most of way, last day 12-15 ft seas and 30 knot winds.*
   - *Calm 10-20 knots, SS3, rain*

- *6-8' seas. One day they have 16'-20' rollers.*
- *Weather was generally very good so little opportunity to observe ship in bad weather*
- *For most of the cruise the sea-state was remarkably good. There was one period, however, when near gale-force winds caused us to cease over-the-side operations for a 20 hour period. This was primarily because of safety issues related to launching and recovering the CTD rosette.*
- *We experienced a wide range of conditions during the periods of these cruises- from calm with gentle swells to 60 kt winds with 30 ft seas. During the worst conditions, the ship ran for protected waters.*
- *The sea-state throughout the cruise was generally calm.*
- *Moderate*
- *6-8 ft rising to 15 ft*
- *Note: sea state conditions on this cruise seldom, if at all exceeded about 10 ft.*

2. The method used,
   - *CTD deployments, Zooplankton tows, optical cast, underway sampling through ship's clean water system*
   - *CTD casts, free floating: productivity array, sediment trap array.*
   - *CTD, multibeam mapping, XBT, XCTD*
   - *CTD deployments, primary productivity array, floating sediment traps, Optical package frame stern A frame.*
   - *Short mapping cruises (two).*
   - *Recovery of moorings with large surface buoys and subsurface moorings. Multibeam surveys.*
   - *CTD, GoFlo deployments and multi-core operations.*
   - *CTD and multibeam*
   - *We did a lot of sampling with an underway clean surface pump system deployed off the starboard side of the ship for trace metal sampling. These were all day transects carried out at 6 to 9 knots. We also did deeper sampling with our own trace metal winch with 30-L GO-Flo bottles deployed over the stern off the A-frame. Finally, we utilized the ship's CTD rosette system.*
   - *We deployed and retrieved moorings (surface and sub-surface), in addition to conducting CTD operations for 30 days, sampled water for nutrient analyses and made 71 MARMAP bongo tows in total during our two cruises in the Gulf of Alaska in spring and fall of 2003.*
   - *ctd deployment, floating sediment traps, primary production array, moored sediment trap, net tows*
   - *During KM 0405 Saito cruise, biological and chemical sampling of surface and deep waters was carried out. CTD casts, Go-Flo trace metal water sampling casts using a sea-mac winch off the A-frame, and plankton net tows were conducted. These methods were generally efficient. The CTD operations controlled by the*

crane seem to have been worked out by the KM crew so that intensive sampling was straightforward. We have previously worked on the KM for Go-Flo sampling (KM 0311) and utilize our own trace metal clean sampling block attached to the A-Frame.

- *Slow towing seismic instruments, multibeam, and some CTD and underway water column profiling.*
- *CTD, primary production, floating traps.*
- *CTD: Operated in various conditions, but generally less than 10 ft swells. The ship was relatively stable but the deck layout and the crane could not be worse for conducting CTD operations. The CTD operations required the most number of people the scientist had ever seen on a research vessel, and the unsafe swinging conditions of the CTD/rosette (particularly during it's recovery) during the movement of the telescoping crane is unacceptable. The present crane should be replaced by an A- or J- frame system. The scientist's opinion is that safety is severely compromised with the present arrangement.*

  Towed fish for trace metal clean sampling: This system was a towed fish supplied by the Chief Scientist) which pumped water up onto the ship's lab. The fish was towed from the port side aft using a different telescoping crane. The fish was towed in all encountered conditions and the only effect was that the ship had to work at a slightly slower speed. This operation went very well.

  Floating sediment trap launch and recovery: the free-drifting sediment traps were launched by hand through the stern A – frame. This scientist wasn't aware of why it was done by hand, using many people, as opposed to using a capstan or winch, but he said the operation was slick and went well, primarily due to the well-trained Japanese scientists on board who had extensive experience doing such operations.

  Vertical net tows and vertical light profiles: these were both done through the stern A frame and went well.

  Throughout the cruise, a flow-through system was employed: The program brought their own flow-through system which was plumbed into the ship's intake and set up in the forward lab. It worked well.

3. Whether this method was done in a safer and more efficient way than would have been done on a monohull vessel,
   - *Current CTD deployment system considered unsafe, no accumulator on winch, wire twisting caused kinks requiring retermination.*
   - *Is more difficult because of high freeboard, users have devised handling procedures to mitigate problems, and so is no longer "worse" that monohull. Biggest problem is crane for CTD; pivot point is too high causing whiplash problems, also poor visibility over stern. Deep props prevent true sampling of upper 5m*
   - *All were safe, freeboard cause recovery problems*

- *Same as monohull except for ship's freeboard, personnel have been developing procedures to mitigate this problem*
- *All of our operations were carried out safely and worked great. The stability of the ship made the operations safer than off a monohull vessel. The manner in which the CTD is launched needs to be improved to make it safer. The current system is not as safe as it could or should be in rough water conditions.*
- *Go-Flo bottles are deployed between the pontoons on the fantail. While this allowed the sampling bottles to be relatively far away from the contaminated metal surfaces of the ship, the occasionally waves are channeled through the pontoons with considerable force making recovery of our bottles somewhat tricky – if one of these waves were to hit our bottles as it was being removed from the water we worried that if might either dislodge the bottle from the kelvar line and/or damage the bottle. Plankton tows also prove to be somewhat tricky due to the height of the aft deck from the water surface. In summary, there are new advantages of the SWATH design for Go-Flo sampling (distance from metal surfaces associated with the pontoons) combined with potentially new problems (wave channeling through the pontoons).*
- *No, ctd problems from ship heave.*
- *No – CTD operation has problems.*

4. Ways to improve the method used,
   - *Proposal to provide a moon-pool deployment system likely to improve safety*
   - *Moon pool for CTD is expected to be an improvement but concern expressed about air pressure surges through moon pool hatch and wave slap problems during recover and launch procedures.*
   - *Adapting procedures to constraints of the ship*
   - *Talk with the marine techs and the captain and mates of the ship. They are all aware of the problem and possible solutions.*
   - *A means to improve the may be to utilize small Go-Flo rosette systems that could both increase sampling efficiency (more bottles retrieved per cast) as well as the strength/durability of the sampling package.*
   - *One drawback of the wide footprint is that the ship is difficult to keep on station, and wire angle problems can become significant on deep casts. Future SWATH vessels should have increased maneuvering power to maintain station and vertical wire angle even under high wind conditions.*
   - *Need squirt boom on side of ship or other system.*
   - *Different crane or deploy from different part of ship.*

5. Whether the sea-keeping characteristics of the ship made it easier or more difficult to conduct the scientific operation,

- *Liked stability of the platform*
- *Easier.*
- *Never really had bad weather*
- *Not applicable*
- *Everything but the CTD launching and recovery was safer and easier.*
- *The sea-keeping characteristics of the Kilo Moana SWATH are certainly a big advantage of the new design. Although the sea-state was generally calm during KM0405, we did encounter some moderate to rough seas during KM0311. Much of my work at sea involves the analysis of trace metal speciation in real time, and having the stable platform of the SWATH design is a great asset in this regard. Where other monohulls are prone to significant rolling in moderate to rough seas, the SWATH design was quite stable allowing high throughput of samples to continue throughout the cruise.*
- *As good or better.*
- *No difference because of CTD operation.*

6. Whether the layout of the deck and lab space made it easier or more difficult to conduct the scientific operation.
   - *Deck space v good, lab space unprecedented, would like to have vans on upper deck but deck strength and ships carrying capacity may limit this option. Freezer space on ship is inadequate, barely adequate for 4 day cruises, need more chest and upright freezers/fridge space for longer cruises.*
   - *More lab space is good, deck space is getting better*
   - *Deck space/layout is fine. More lab space makes things easier*
   - *The one problem is that the 01 and 02 decks do not have the capability for tie-downs at 2 or 4 foot centers. This made it difficult to secure incubators and other equipment, and it required that we provide a standard 20 foot half-rack to mount our 14 foot analytical van onto so that it could be secured on the ship. It also meant that on the 02 level incubators were ties to railings. (Ken stressed that all new ships need to be equipped with these tie-downs.)*
   - *Furthermore, the wide footprint of the ship allows significant lab space for science, also an asset in the sampling intensive cruises I have been involved in. One drawback of the wide footprint is that the ship is difficult to keep on station, and wire angle problems can become significant on deep casts.*
   - *Easier.*
   - *Is good*

Please describe all of the different scientific operations conducted during the cruise. Examples are CTD casts, water sampling, coring (both piston and box), mooring deployment and recovery, towing of scientific packages (nets, CTD, ADCP, etc) and acoustic systems (ADCP, multibeam).

A. What were the most positive aspects of your research cruise on the R/V KILO MOANA with a SWATH hull form compared to your previous experience on a monohull?

- *Hard to say, high off water, crew great/worked around problems, space, backing down while sampling form stern allowed our getting good clean water.*
- *Liked stability of work platform, is very comfortable ship compared with Melville (recent cruise). Liked access to storage area, on working deck. Liked large labs.*
- *Space*
- *Space*
- *Lab space, accommodations*
- *Ship stability. For example, did work at several sites around the Hawaiian Islands where seas are often rough but could still map successfully (in comparison, monohull in similar situation won't be able to do this).*
- *It was a very stable platform to operate on, even in 6-8' seas. One day they have 16'-20' rollers.*
- *Ship is small and compact, but rides like a much larger monohull.*
- *The stability of the ship and the outstanding captain and crew were the most positive aspects.*
- *The most positive aspects of our experience were the skill and hard work and helpfulness of the captain and crew who did their best to make our time as scientifically productive and pleasant as possible during our stay. Compared to a monohull the Kilo Moana is comfortable and spacious in its staterooms and accommodations. The lab space on the SWATH is large compared to a monohull. There is also a luxurious amount of easy-access storage, which is wonderful. The computer network made it very easy to connect, network, share data, and access email. The display monitors in each stateroom allowed us access to the meteorological and navigational information, as well as the television monitoring system of important operational sites on the deck from our rooms at any time.*

- *No rough weather was encountered,but some swell, not too sure which sea state we had.*

- *It was much quieter and more stable.*
- *Stable platform to work in labs (safer with boiling acids/chemicals), well layout, plenty of fume hoods (more than 1 per lab); plenty of space, storage on same deck Capt and crew were always helpful. Galley was excellent, with specific praise for high quality supply of food/snacks for those working outside of regular meal hours.*
- *The ship was very stable and there was little motion when seas were <5 feet.*
- *The ship is comfortable both in terms of space and sea-worthiness, making it a great platform for research, especially on long cruises.*

- *Space and stability*
- *Good overall experience. As upper deck gets loaded with gear over time, the stability is a little less that earlier but still good overall. See multibeam comment below.*

- *Is comfortable, little roll.*
- *The stability of the ship, good engineers and good accessibility to the science stores.*
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B. What were the most negative aspects of your research cruise on the R/V KILO MOANA with a SWATH hull form compared to your previous experience on a monohull?

- *None really.*
- *Did not like getting around on the ship, going up and down between decks to go forward and aft. Ship needs an elevator. Positive pressure problems in accommodation makes opening doors difficult, seems to lead to breaking of door catches as people "force" doors. Drainage of water from sinks in labs is a problem and appears to be related to ship's trim. Needs fixing. High freeboard makes deployment of packages harder.*
- *Height of deck (freeboard)*
- *Hard to retrieve materials because of freeboard. Are getting experience to mitigate problem, crew of great help.*
- *Ship's freeboard, but are learning to deal with it.*
- *Experienced few negative aspects for mapping.*
- *The inability to recover surface mooring with large discus buoys other than using a small boat. This limits the sea state that this operation can occur in.*
- *Visibility of some rear deck areas from bridge needs to be improved, use of cameras would help. Alternatively a rear control station that can be used to drive the ship would solve the problem.*
- *The ctd package was deployed from the back deck, with the high deck and high crane, package swings were quite dangerous.*
- *None.*
- ***CTD Operations:*** *The single biggest problem for us was the traction winch/crane method of deploying CTD over the fantail, only 8 ft from the screws. It is worst system by far of any I have used on the eleven major vessels I have worked on. It is complicated to operate, and needs four people (three from the ship plus one scientist) to work in unison, and without error, to deploy or recover the package without injury to personnel or damage to equipment. The operators can't see the waves behind the fantail, and must rely on hand signals made by the marine technician. In heavy weather, the technician needs to be informed by the bridge of the fact that big swells are arriving, because he can't see them coming from his position. Besides giving the hand signals to the operators the marine technician is holding a tag line and supervising the actions of the scientist assisting him. Another, related, serious problem with the present CTD method is how high above the deck the CTD swings before it can be brought down. With less experienced operators and/or in strong wind and wave*

conditions, the CTD cage swings high over the heads of the rope handlers on deck for too long. During the time it is swinging, the two persons holding the tag line have limited ability to stabilize it. Also, there is little room for the scientist on the starboard tag line to maneuver out of harms way. The marine technicians are constantly aware of this, and helping the scientists to avoid danger, but it is still scary. The mates reported to me that their problems included: the need to stay pointed within 5° of the wind direction, and the limited range of maneuvers available to them because of the location of the CTD in the water relative to the screws.

The two situations that caused us to cease operations were: the inability of the ship to hold station so we could deploy, and the difficulty in deploying and, especially in retrieving the CTD. The high deck of the SWATH design exacerbated the difficulties imposed by the poorly designed placement of the CTD operations. The high deck on a SWATH increases the amount of time it takes to bring any instrument in or out. The high boxy design of the superstructure creates a lot of windage, so the ship keeps getting blown backwards over the CTD line, which at vertical is only 8 ft. from the screws. This causes enormous problems for the bridge crew during operations. The disconnect between the motion of the SWATH-design vessel and the motion of the waves, which generally makes for a pleasant ride, makes it harder for the operators to work with the seas and to choose their moment to deploy of retrieve the package quickly and safely. At times the motion of the ship or swells would cause dangerous slackness in the wire, especially at depths of less that 10m, despite the best efforts of the operators. Such slack can lead to the wire jumping the sheaves, damaging the wire, and necessitating two re-terminations on our first cruse. A modification to one of the sheaves, plus the additional experience of the crew overcame some of these difficulties in the fall. Overall, the need to choose the best moment to take out or retrieve the package, added substantially to the time needed for a cast when conditions were rough.

In my opinion, the Kilo Moana needs a new, simpler, closer-to-the-deck system for deploying the CTD. Quick fixes to the present system are not going to solve the problems noted above. The use of an overhead boom, a J-frame, or even better, a squirt boom system over the starboard side would be a big improvement over the traction-winch/ crane now in use. This is the bread-and-butter operation of a lot of oceanographic research. This ship should be able to do it well, and with fewer personnel than it uses now

When the seas are building it becomes necessary to halt CTD operations at conditions where the wind is blowing ~25-30kts and the seas/swells are 10-12 ft. This is not too unlike the situation on most other research vessels, although I would have expected better. The more vexing problem is the amount of time this ship needs to wait for the sea state to come down before resumption of operations after the winds die down. Typically, in the Gulf of Alaska, the sea state is confused after a storm. This exacerbates the problems. I would estimate that it takes approximately 4 to 6 hours longer on the SWATH vessel to resume operations after a storm than it does on the monohulls I have experienced –including the R/V Alpha Helix.

Mooring Operations. *The deck arrangement and the height of the platform above the water both create problems for doing mooring operations on the SWATH vessel. The wide, yet shallow back deck necessitates a lot more moving around large pieces of equipment during operations. Equipment needed to be stored on other decks, so we needed more crane ops onto/off of the back deck before deployment or after retrievals. This takes extra time. The weather-protected bay is nice for laying out smaller pieces of equipment in order, and for easy storage of those items in large shipping containers.*

The height of the deck made retrieval of gear from the water much more difficult. It also creates a longer pendulum arm for equipment on the line to swing through. This causes trouble in rougher conditions, increasing the likelihood of banging expensive equipment into the ship and causing damage. The height of the ship also kept us waiting for conditions to improve so that we could make a needed small boat operation, even though conditions had been good enough for mooring operations.

MARAP/ Bongo operations are easier from the SWATH than from monohulls, as long as the ship heads into the wind.

- *One can get disoriented on the main deck sometimes.*
- *Elevation off water; significant distance to water – used boat hooks, grapples; tried to recover packages through center of ship and at stern – easier to do classic side recovery as monohulls; we now think it is no easier to do classic side recovery as monohulls; ship doesn't move but surface does; no line of sight from bridge to aft deck . Improvements over January cruise included deck camera's that were working. Sea state was also much calmer in June/July which made some of these deck ops easier. In heavy seas and with a small aft deck, it is hard to pull close to small objects in the ocean, hold position and recover them.*
- *CTD operations required too many scientists and crew (5 total). When seas were >6 feet (wind about 30 mph) the motion and vibrations on the ship were unusual, unpredictable and annoying.*
- *The height of the deck above the water surface can pose problems. Maintaining station under high winds is also difficult; apparently the maneuvering engines are undersize for this application.*
- *Positioning of ctd crane and height above water.*
- *No hull related negatives to speak of.*
- *Launching CTD*
- *The grey water system kept backing up, the AC system "rained" in both the labs and staterooms causing potential equipment problems had the scientists not set up plastic tents over all sensitive equipment, the Research Technicians were very pleasant but ineffectual, inadequate deck space available for incubators, the Chem. Lab lost overhead lighting half way through the cruise and it was never repaired (temporary lights were strung up, but dim), the moon pool is nonfunctional, the aft deck is too small, as is the forward lab, except on the main deck there were not 2' x 2' tie down points, the lab floor needs replacing, not enough eyebolts for wall lashing*

C. Did you have difficulty loading/unloading the scientific gear from the ship?

- *Yes. Steep gangplank was dangerous.*
- *High freeboard, and consequently steep gangplank made loading by hand too difficult, needed to use crane. Aircraft style luggage loading conveyor belt would help ease this problem.*
- *Deck height caused hand-loading problems, need to use crane, as gangplank too steep, likes idea of conveyor belt loading system. KM crane does not reach far enough on to the dock.*
- *Hard to hand-carry onto ship--crane for everything slows operation down. Need more capacity for loading*
- *Schedule of ship work made crane hard to get, but ship's freeboard precludes hand loading. Ship needs an alternate loading system -- cargo conveyor belt?*
- Work involved mapping only; used mainly shipboard gear and brought little gear aboard.
- *No. Crane is not as long as needed. Gear must be put close to dock for crane to pick it up.*
- *No, I did not personally have problems loading and unloading. The size of the aft deck and, in particular, the staging bay was adequate for our purposes. Jim Mofett loaded a van and may not agree that the crane was adequate.*
- *No, the loading and unloading went efficiently.*
- *Loading was more difficult than as is the case with the KOK (a monohull) however there was not a need to load a lot of equipment so it wasn't a real problem.*
- *On and off loading works went smoothly. The crew was extremely helpful to us in quickly completely a big job (2 full truckloads).*
- *No problems – lifting lots of pallets, containers, large winch, etc but there was a lot of gear and it could not all be loaded in one work day (which ended at 3:30 for most crew).*
- *No*
- *No*
- *No*
- *For hand loading height above dock is a problem*
- *These operations went very well and efficiently. All equipment was preloaded on pallets or in very large, plastic 'fish-box' containers, and the crew was very helpful with loading and unloading operations. They worked without stop until it was completed pre- and post-cruise.*

D. Were the labs adequate (location, size, accessibility) for you?

- *No problem.*
- *Liked labs, "splendid" lots of space and the fact that they were compartmentalized. They need to have freezers installed, -20 and –80 C, drainage from sinks is badly affected by ship trim, and problem needs to be rectified.*

- *Yes*
- *Yes*
- *Yes*
- Yes, didn't even begin to utilize available space.
- *Plenty of space and easy access.*
- *The size and locations of the laboratories were more than adequate for our purposes. The stability of the ship made work at sea quite easy. Although this is probably my personal taste, I thought that the laboratories lacked convenient storage space. Among the six science laboratories, there were only 2 cabinets with 3 drawers each making it impractical to safely store for easy access small parts and supplies needed for many chemical analyses. It was not easy to move the CTD package into the wet lab for sampling because the door to the wet lab was not large enough to easily accommodate the package. This will limit the usefulness of the ship. For example, we used a 24-bottle rosette. A 36-bottle rosette would certainly not fit and thus the ship is unlikely to be used for large-scale physical oceanography survey cruises (e.g., WOCE), which use these larger CTD packages (see also concerned about turbulence created by ship and sampling upper 5 m).*
- *Labs were fine.*
- *The lab space is large, with flexible layouts. There should be a hood and a sink that drains to the outside in each lab. The DIW system works well.*
- *Freezers, cold storage -> great range – clean and empty. Yes, lab size was adequate for group, but pluses and minuses to having so many separate spaces.*
- *Yes*
- *Very much so. The generous lab space is an asset for chemical and biological sampling.*
- *Yes*
- *Yes.*
- *Plenty of room to meet needs. The main computer room, geophysical data is acquired, is pretty packed with gear and so it could use space to layout large maps.*
- *Yes*
- *The forward lab is too small.*

E. Were the underway systems (thermosalinograph, running seawater) working adequately?

- *Some minor plumbing problems fixed.*
- *Yes*
- *Were O.K. but not enough flow for on underway system for multiple users, may need larger pump.*
- *Yes*
- *Yes*
- *N/A*
- *Not used.*
- *The underway system mostly worked adequately. There was a quirk with the logging system for the fluorometer that caused it to stop logging data. Fortunately, since one could monitor data generated by the underway system from virtually any room on the ship, the failure of the system could be corrected easily. However, it required that someone walk to the IMET lab and reboot the interface.*
- *Yes.*
- *The Underway System. The easy access to its data is extremely useful. The amount of water flowing through seems to fluctuate widely over a 24-hour period, which was troublesome and needed monitoring.*

  The Seawater System. The seawater hoses for washing down nets lacks sufficient pressure to do the job easily. The pressure needs to be increased. The same is true for the sea- water supply in the CTD bay, where we were trying to wash sieves.

- *Still having problems. Working better than in January. Especially important to this project was ADCP which was now OK*
- *The sensors are after the pump which is believe to be heating the water. There is enough of a temperature change to be a concern.*
- *Yes*
- *Yes*
- *Yes, running seawater was used extensively.*
- *Yes*
- *Not applicable.*
- *Thermosalinograph sensor is being warmed by pump as is mounted too close*
- *The project brought their own system which was plumbed into the ship's clean under way system. All worked well.*

F. Were communications with the bridge, winch and crane operators easy to conduct?

- *VHF works. But used phones. Could be better. Moving the CTD up one deck will be a very noisy place.*
- *Yes, but bridge wing operating system is inadequate when recovering over the side equipment. Need to improve readout etc. on repeater units used on bridge wings.*
- *Good, but bridge wing repeater units need more information on them and better visibility*
- *Yes*
- *Yes*
- *Used preplanned tracklines which Captain and mates had available on bridge at beginning of cruise. Communicated with bridge after every line finished using phone in lab--this worked out easily.*
- *Communications with the bridge, etc. was fine; no problems.*
- *No. The CTD winch operator on shallow casts simply stayed next to the winch on the 01 deck. The area was exposed to weather and loud. It was thus difficult for the winch operator to communicate with the CTD laboratory. Winch operations were conducted from the doghouse on the 02 deck during deep casts where external noise was not an issue. Launch and recovery was still performed from the 01 station because visibility of the back deck from the doghouse was limited. Although there is closed circuit television throughout the ship, the visibility of the back deck from the bridge was limited. This affected several operations. A crewmember was stationed on the aft deck for all over-the-side operations (CTD, GoFlo, Multicore) to monitor wire angle because it was not visible to the bridge. Perhaps an aft control station is necessary; certainly dynamic positioning would have been useful. During recovery of in situ arrays, which were done form the port aft corner of the ship, communications with the bridge was particularly difficult. The package being recovered and the aft deck were not visible from the bridge. Science and technician staff had to describe the package location and progress of recovery to the bridge, which was difficult when they were handling lines. An aft control station and more closed circuit cameras would help this situation.*
- *Yes, communications were excellent*
- *There is a big problem with communications between the winch operator and the CTD lab. The installed system is not operational, so walkie- talkies are used. The biggest problem with that is that the winch operator is standing outside next to the winch, not sitting in a winch house. Therefore, he is in a very noisy location, where he has difficulty hearing what the operator is saying, or with being heard by the operator. This situation is bound to cause serious damage to, or even loss of the CTD package in the foreseeable future.*
- *There should be an easy way for people on the back deck to talk to the bridge during operations, other than by unreliable walkie-talkies, possibly by voice-activated microphones or even squawk- boxes.*

- *No problems – needed to figure out how to chase people down in different labs*

- *Yes*
- *Yes*
- *Yes*
- *Yes*
- *Worked out well.*
- *Yes*
- *Yes, yes and yes*

G. Were the accommodations adequate (e.g., size, location, accessibility)?

- *Great. Some noise. 01 deck noisy. Main ok.*
- *Liked cabins but aft cabins by winch are too noisy*
- *Noise problems in aft cabins near winch, also no sound insulation between cabins*
- *Yes, but noise problems from the winch in the aft cabins by the winch*
- *Yes, except for winch noise in aft, starboard cabins*

  Experiences in both PI and regular staterooms were positive.

- *For scientist and new people the ship is maze-like and similar looking halls, and so nice to have arrows pointing to areas of interest or "you are here" like maps*

- *All accommodations were easily accessible and adequate.*
- *Yes, particularly for the chief scientist.*
- *Accommodations are the best ever. Everyone enjoyed them. The galley set up is very good, and the food was exceptional.*
- *Nicer than most*

- *Yes*

- *Yes*

- *Yes*

- *Yes, but noisy by winch. Also, room to room insulation insufficient.*

- *Chief scientist room fine. Other rooms fairly small.*

- *Yes, except some bathrooms are too small.*

- *The accommodations were standard for a ship, but not as nice as the accommodations on the new AGORS. One noted problem was that while all staterooms have desks, they overhead lighting was not sufficient for using the desks, they need other lighting at the actual desks. Air conditioning system in the cabins*

leaked (poured!) very badly in warm waters; no effort was made to fix this problem while steaming to the colder waters of the North Pacific from Hawaii and on the return trip.

H. Was the computer network system adequate?
- Ease of hook-up
- Initial start-up
- Adequate access points across various labs, meeting rooms, staterooms and other areas.

- *Computer stuff all excellent*
- *Liked system, would like wire readouts on screen, currently work around by having a TV camera pointing at the meter wheel read out*
- *The computer network is the best in terms of number of terminals. The flat screens throughout the ship are incredibly valuable, and the various display options are getting better each cruise.*
- *The computer network worked fine.*
- *Shipboard computers were used to collect and process mapping data, these were excellent. There was an issue related to image quality of monitors in staterooms—this may now be resolved.*
- *Hook up was easy and quick.*
- *The computer network and the closed circuit television systems to monitor science data were excellent and enhanced the scientific exchange of information. The system was better than any other UNOLS ship on which I have sailed. Having a central large hard drive with access from any room on the ship kept vital information within reach at all times. The only improvement that might be considered is a wireless network.*
- *This service was outstanding.*
- *The computer network is extremely easy to set-up and use. One problem we encountered was that we were never successful in printing to two of the four printers. This should be addressed.*
- *Easy hook-up; would like more frequent (>3 per day e-mail transfers for updates to tracking information of packages in water. We were able to request more frequent (>3 per day) e-mail transfers for updates to tracking information of packages in water. However, the Chief Scientist was keeping a web site at WHOI with daily updates from the cruise. There were many problems sending files >100kb. Tried to get this changed during cruise, at least for specific emails (500-1000kb) but this did not work well. I'd try to arrange this file size issue in advance and encourage UH to support this type of activity, as the attention to the web site was high, especially for these daily updates. It seems a pity if we discourage "live" coverage of cruise activities due to file size limitations for a very limited number of email transfers. For examples, see daily updates at -<http://www.whoi.edu/science/MCG/cafethorium/website/cruises/vertigo.html>*

- *Yes*
- *There was little use of the system on this cruise, but there are no complaints.*
- *Yes the computer network system is excellent*
- *Yes.*
- *Ease of hook-up straightforward (good instructions). Initial start-up straightforward (good instructions). Adequate access points across various labs, meeting rooms, staterooms and other areas. Yes, plenty. Note Some video monitors set up to duplicate data acquisition monitors varied in quality around the ship.*
- *Yes.*
- *The computer network was not adequate because the network had viruses that the technical staff never succeeded in purging. The shipboard computers did not have up- to-date virus definitions and some of the scientific computers eventually had to be disconnect from the network to purge the viruses or ensure that they did not become infected since they were essential to running some of the scientific equipment (e.g., autoanalyzers, spectrophotometers). At least one of the the scientific computers brought onboard was rendered useless by the contamination.*

I. What is the habitability of the lounge, staterooms, mess deck, and fitness room?

- *Habitability O.K., but didn't use lounge. Liked TV screens in rooms and ability to tune into cameras reporting meter wheel parameters etc.*
- *Lounge couch is very uncomfortable, also lounge needs sound insulation for adjoining cabins*
- *All are now improved since my first cruise (Oct 2002). The lounge has new furniture, making it possible to enjoy it! Stateroom has improved with more storage space, shelving etc. Mess deck is good. Fitness room not used*
- *The lounge was undergoing renovations and was closed during the cruise. All other areas were fine.*
- *Habitability of staterooms was fine. Mess room is layout is rows of booths in long room. Several people noticed that this layout limited conversations to individual booths and was not conducive for interactions among personnel at mealtime.*
- *All were great.*
- *The lounge was extremely comfortable and of adequate size. The usefulness of the lounge was enhanced by the closed circuit television system since the programs in the lounge were available in virtually any room on the ship. The lounge furniture was very comfortable and the lounge was quiet. Apparently, however, sound in the*

lounge could be heard in the stateroom immediately next to the lounge. Extra soundproofing should be considered. The staterooms were excellent – spacious and comfortable. The mess deck is well located and comfortable. The fitness room is small but well equipped. The fitness room would be more useful is it had free weights and better ventilation.

- *Excellent – with the exception that the fitness room was a bit confined. It would have been nice to have a rowing machine owned by the ship.*
- *Accommodations are the best ever. Everyone enjoyed them. The galley set up is very good, and the food was exceptional.*
- *Chris was too busy to use lounge, fitness room, etc and only used the mess deck. He does not like the mess deck on the Kilo Moana compared to other ships he's been on.*
- *All were adequate, but better equipment in the fitness room would be an improvement.*
- *Excellent*
- *Excellent*
- *OK but mess tables are too narrow.*
- *Most common area pretty nice. Had full ship but had no problem accessing common areas.*
- *Fine*
- *Nice, see above, nice, and adequate, but the fitness room was rather small.*

J. Are there any noise and vibration feedback concerns?

- *None*
- *None*
- *Yes noise, no vibration problems*
- *No, except for the cabin noise level*
- *Minimal noise and vibrations compared to monohulls.*
- *The staterooms numbered 01-12 and 01-14 have excessive noise and vibration when the trawl winch was operating. The noise was particularly severe in the head. The noise level most likely exceeds safety standards and these staterooms should be designated as requiring hearing protection.*
- *The CTD operations with the existing crane used to launch the CTD caused an excessive amount of noise to the 4 aft rooms on the port side in which 8 scientists were berthed. This would have been more of a problem if CTD operations would have been 24 hours a day. (Ken also implied the crane used for the CTD operations is not appropriate and led to sometimes dangerous operations.)*

- *Noise and Vibrations. Waves 12 ft or greater bang on the bottom of the deck between the hulls creating an enormous racket, and raise the moon pool plate alarmingly, even though it is permanently dogged down. The noise from the CTD winch caused scientist trying to sleep on the starboard side to use earplugs. When larger waves hit the ship, there is a vibration that occurs that is somewhat disconcerting. Occasionally it feels as though the ship is flexing between the hulls. In 12-22 ft swells or greater after a storm, the motion of the ship was jerky and irregular, causing us to break some equipment.*

- *Heard about cabins near CTD and decided not to occupy them during this test cruise. Noise from winch is tough for sleeping in some cabins*

- *NO.*
- *CTD winch cabins are very noisy – even more than normal background noise on a monohull – people can't sleep in these cabins – telling people to bring ear plugs to sleep in these cabins. Thin walls? Crane is also noisy in cabins in that area also.*
- *Staterooms near the winch and crane used for CTD operations were noisey. Vibrations from wave slap were annoying.*
- *No.*
- *A-frame slamming under rough conditions.*
- *Some rooms under winches are noisy but no worse than other ships. Thrusters quieter than monohulls.*
- *Noise in cabins from crane and CTD winch is a problem.*
- *Funny motion in rough seas, but relatively ok.*

K. Were there ship vibrations or other motions that made it difficult to work and live on the ship?

- *Ok.*
- *Ship was "super stable", no vibration concerns.*
- *None.*
- *No*
- *No.*
- *Hardly any vibrations or other motions—there was a slight sliding motion but people get used to it. Swath hull did not move as much as monohulls. Very pleasant to be on.*
- *No more than other ships. However, when it was rough, the waves slapping on the deck make significant vibrations. If this continued for 20 days, it would get old.*
- *None that were a problem.*
- *During a few of the rough weather days the waves would slam up against the underside of the "moon pool" area and cause a large noise and vibration that was*

disconcerting and, from what I understand, kept scientists awake who berthed in the internal aft cabins that were adjacent to the "moon pool" area.

- *We were forced into hiding three times on the September cruise. On the day with sustained winds over 50kts and over 60 kts gusts predicted, we broke off operations in calm winds, 6-7hrs early to avoid those conditions. Even in winds 30-35kts the SWATH design causes the ship to kite, and to become very difficult to maneuver. In winds over ~30kts, the bridge thankfully began to announce beforehand whenever we were going to come about, because it is such a slow process, we needed to be prepared to get hit by a big swell.*
- *It was disconcerting – events where unexpected – like running over animal in road. In rough seas sharp vibrations as waters hit deck between hull*
- *Again, vibrations from wave slap and unusual motions in higher winds and seas were annoying.*
- *No.*
- *No.*
- *No*
- *Had slightly unusual motion but you get used to it—overall less motion than other ships.*
- *No.*
- *Not at all.*

L. At any time, did you feel the ship was not sea-worthy at certain sea states? Were there times when you felt that you rather be on a monohull ship? A SWATH ship?

- *No.*
- *No.*
- *No*
- *No.*
- *No.*
- *No sea state problems experienced. [Heard second-hand that during an Alaskan squall with 10-15 ft seas and very high winds, the ship continued to map—this couldn't have been done this with monohull.]*
- *No although we did not experience heavy seas. We had sustained winds of 25-30 knot for at most 2-3 days on our cruise. The ship performed well under these conditions. Under these conditions, the ship was more stable than most monohull ships on which I have sailed. Arguably, it was even more stable than the*

Revelle/Atlantis under the conditions we experienced. For these conditions, I would prefer a SWATH ship because it allows more detailed sampling of the upper ocean.

- *Not at all, he felt completely safe.*
- *No.*
- *In high sea states – slapping against moon pool was unusual. Never felt un-sea-worthy but we did not operate in heavy seas.*
- *No. Prefer to be on a monohull during higher winds (>30 mph) and sea states (>6 ft)*
- *No.*
- *Only when wave slap*
- *Slapping in rough weather caused vibrations but once you got used to it it wasn't bad. Cruise had no extreme weather*
- *No, except when wave slap on the underside of the moon-pool cover.*
- *No, I think with a monohull we would have felt considerably more motion, but never had significant seas on this trip to be sure of this.*

M. Were deck crane and winch operations safe and efficient? Did it take more personnel to perform the operation that you expected?

- *Yes.*
- *CTD launching operations are not safe, needs a new approach*
- *See above for crane/freeboard comments, a frame was O.K.*
- *Yes, but takes more time because of wire fair lead & height of crane deployment (Note this cruise was deploying the CTD from the stern, the moon pool was not available yet)*
- *More people are needed to do the CTD.*
- *N/A.*
- *The deep sea winch with fly block was a useless piece of c###. The fairlead along the A-frame is foolish and not working properly for mooring work.*
- *The system for launch and recovery of the CTD package was inadequate in rough seas. The knuckle crane utilized required about a ~30 foot whip which resulted in excessive swing of the CTD package particularly during recovery when seas exceeded about 10 feet. I believe that the ship operator is aware of and is addressing this safety problem. A moon-pool was installed to alleviate this problem. However, it was clear that in even moderate seas that this system was inadequate for safe launch and recovery of the CTD package. The CTD was launched and recovered from the stern of the ship. I was concerned that turbulence created around the stern compromised water sampling near the sea surface. Analyses of total dissolved inorganic carbon on our cruise should reveal if this is a major concern. Furthermore, it took a winch operator, a crane operator, two persons on tag lines, a CTD lab operator and a marine technician to orchestrate*

launch and recovery. Arguably, the number of engineers and oilers on board were excessive although we were told that this high number was appropriate for a new ship, which required around-the-clock manning of the engine room.

- *Already discussed.*
- *See B above. It took 2 more crew members to do a CTD cast than on any monohull I have ever been aboard. (I have been chief scientist on 9). Usually, 2 scientists would deploy the CTD.*
- *Yes and No. It shouldn't take 5 people. CTD ops are a basic operation. Concerned about space with working around rosette. This is my MAJOR complaint about the KM. This ship needs something better than a crane to launch CTD package.*
- *N/A*
- *CTD operations went OK, but it takes too many people (5) for deployment and recovery. By coincidence, no operations were conducted during seas >6 ft.*
- *No.*
- *CTD takes more.*
- *CTD operations cumbersome and took more people than on other ships.*
- *CTD crane problems require more personnel for launching package.*
- *See above about the hazardous CTD operations. Also, the crew were relatively untrained in launching and recovering the semi-rigid inflatable. There appeared to be a lack of seamanship about the small boat operations in general.*

N. Were there any weight distributions problems with heavy science payload such as vans?

- *Not on ours but could be.*
- *No Problems.*
- *No, but drainage of sinks in labs may be related to ship trim problems, issue needs addressing*
- *No, but sometimes ballast problems are causing problems with the floor drains that back up and the deck gets wet..a potential slip risk if you will.*
- *No.*
- *N/A*
- *This was not an issue. Six surface moorings and some subsurface moorings were done. There was a concern of adequate space for the buoys. The upper deck had no 2'x2' tie downs and there was a question of whether the deck was made for holding things. In the end, some items were lashed to the rail.*
- *Not that I am aware.*
- *No.*
- *N/A*
- *N/A*

- *No. Not that I am aware of.*
- *No vans or heavy equipment were used.*
- *No. This is an important is as many monohull vessels become top heavy with additional vans, resulting in increased rolling. Not a problem on the SWATH design.*
- *No.*
- *Not applicable.*
- *Lab flooding problem from trim issues.*
- *One van, no problems.*

O. Was dynamic positioning used? And was it useful?

- *Didn't use.*
- *Not used.*
- *Not used.*
- *No.*
- *Not Used*
- *N/A*
- *Wanted to use it but it was not working.*
- *Dynamic positioning was not available on our cruise. The station-keeping ability of some of officers was much better than others although this did not compromise greatly over-the-side sampling. Station-keeping ability would be improved dramatically and the efficiency of operations improved if the ship had operational dynamic positioning. Noted that when crossing the dateline the DPS system screeen readouts were all corrupted, problem was solved when recrossing dateline.*
- *Unimportant for this cruise*
- *at the time, the bow thruster and the DP were not working, but the bridge officer managed to still keep the ship in position. however, a more precise positioning would have been really helpful for this mission, as our goal was to sample the bottom 200 meters of the water column, on a very steep ridge.*
- *The bridge crew reported to me that the dynamic positioning was rather underpowered, and not too helpful in holding station for us.*
- *No*
- *No*
- *N/A*
- *No. It was my understanding that it is not functional due to a software/design flaw.*

- *No.*
- *No.*
- *It was used for slow towing of deeptowed seismic system. It didn't work to well at slow speeds. Some difficulty maintaining dynamic positioning course and speed (system problems or crew getting used to it? One thruster had steering problems while in DP and acted erractically s crew di nav manually.*
- *No.*

P. Were the multibeam or acoustic Doppler systems working properly under all conditions?

- *Multibeam yes, ADCP no.*
- *Not Used.*
- *Multibeam worked well.*
- *Multibeam system was used by HMRG.*
- *Not used.*
- *Multibeam system worked marvelously. Sidescan data had streaks (people are actively working to solve the sidescan problem).*
- *Multibeam was working pretty well, especially for a new system.*
- *Multibeam was working properly but was used infrequently by our science staff. There is no acoustic Doppler system currently available on the ship. I suspect that this could be a problem for us in the future interpretation of our results.*
- *The acoustic doppler system was not operational.*
- *We were sorry to say that there is no Doppler installed yet.*
- *ADCP was working – it is necessary for next cruise. ADCP was working.*
- *Yes*
- *Not Used*
- *N/A*
- *Not used.*
- *Deeper might have help lead to very clean multibeam data.*
- *Yes.*

Q. Were any heavy gear deployments undertaken such as moorings or sediment sampling?

- *No.*
- *No.*
- *None.*
- *No*
- *No.*
- *N/A.*

- *A small multicoring rig and a very light in situ array were deployed. It was suggested to me by the marine technicians that an operational tension gauge on the trawl winch might have improved our ability to obtain successful multi-cores in deep water. I was unsure whether a tension gauge was available or whether it has simply failed. With the exception of visibility of the in situ recovery mentioned above, we had no difficulty deploying or recovering this equipment.*
- *No.*
- *We also deployed a light mooring (a 600 lb waverider buoy) The height of the deck above water was a worry (as well as for the CTD deployment/recovery)*
- *See B. above*
- *No.*
- *No. Many small pieces of gear were put in/out of water. This worked OK in the calm conditions, but would be hard in rough conditions.*
- *A floating optical sediment trap array was deployed and recovered during calm seas and no problems were incurred. The equipment was not particularly heavy.*
- *No.*
- *Yes.*
- *Not applicable.*
- *No.*
- *no*

R. Were there any pre-cruise planning measures and shore facility communications that were necessary and unique to the SWATH operations?

- *No.*
- *No.*
- *Boarding scientists need to be apprised of problems and solution to deployment procedures of gear from deck*
- *No.*
- *No.*
- *Not really. Cleared locations of nearshore work with Captain (water depth vs ship draft), but would have done this with a Monohull, too.*
- *No.*
- *The ship operator and the science support staff communicated well with the science party prior to the cruise. We were fortunate to be invited on a short, 2-day test cruise of the ship at which time Captain Drewry made himself available to answer specific questions about the new ship. Such a meeting was invaluable in planning but this would have been true of any ship. Our major concern was the height off the*

water of the main deck. This was not a problem for any operation we performed on our cruise.

- *Ken sent his technician, Jeff Smith, to Hawaii early to check out the ship and make arrangements. This proved helpful.*
- *No particular weight distribution problems. We had no vans.*
- *No, except for multibeam mapping: the tracklines should be created before the cruise. Chris had just come off another ship getting on the Kilo Moana and wasn't able to complete this prep work before departing. It was hectic doing it on the ship and they barely managed to keep up (a couple of times they came very close to wasting ship time).*
- *No*
- *No.*
- *No.*
- *No.*
- *No.*
- *Chief Scientist already familiar with ship.*
- *No.*
- *no*

S. What advice would you give a colleague that was going to sail on a SWATH vessel such as the R/V KILO MOANA?

- *Think about height impact, small boat use. Small boat use was difficult.*
- *None really, it was a great ship.*
- *Deck freeboard is different from a monohull.*
- *Think about freeboard and deployment issues.*
- *Rethink over the side operations. e.g. array spacing, need to submerge equipment while loading, since freeboard is higher need larger gaps. Ctd operations take longer because of handling problems. Moon pool was not used on this cruise as ctd frame had not been modified to pass through pool opening.*
- *No special advice, but expect a quieter and smoother ride than a monohull.*
- *Don't try to do mooring work from it.*
- *No exceptional advice is necessary unless they plan to perform over the side work that is atypical. If so, they may wish to visit the ship to see the platform and assess the feasibility of the operation with the marine technicians and the Master.*
- *A great ship to work on – although I still don't know what it would be like under really adverse conditions.*

- *I have communicated to colleagues that the SWATH would be a nice platform for a laboratory- intensive experiment in less intense wind and wave environments, but that for hydrographic surveys there are serious, time-consuming issues as discussed above. SWATH design vessels are not really suited for investigations in the confused sea states and stormy weather that is prevalent in the northern portions of the North Pacific.*

The ship needs to pump waste water tanks more often than on other ships. It ranges from every 6-8 hours to 24 hours. This information needs to brought to the Chief Scientist before the cruise since this could affect sampling strategies, especially for projects that stay at a fixed location. The reason for pumping so often is not known by Tom. Is it small tanks, stability questions, flow through water going into gray water via drains instead of dumped overboard?

- *It's a great ship but complete your prep work before you depart!*
- *Comfortable ship – lots of space; smaller deck area – harder to deploy equipment; good ship for lab work. good ship for lab work, lousy CTD ops.*
- *Be sure to tie-down equipment – don't assume stability is great when seas above 6 feet.*
- *I would mention the height of the fantail deck relative to the water, as well as recommending they plan their deployments carefully to make sure that there will not be complications based on the different layout and configurations of the SWATH vessel.*
- *Is a good ship for science.*
- *Visit ship to talk with Captain and have precruise meeting. Note: Get used to deck configuration (wide but not long) so can be prepare to layout gear effectively.*
- *CTD deployment has problems.*
- *Nothing unique to a SWATH relative to preparing for any cruise, but ensure that you have adequate means to secure deck items (e.g., incubators) on this particular ship (above the main deck) as there are no 2 by 2s available.*

T. Any additional comments?

- *None really, a great ship, overall "A" rating*
- *Is impressed with ship once samples are on board, can alleviate problems.*

- *Current CTD package has to be modified to safely recover it through the Moon pool. As is, there is risk for sampling bottles being damaged during recovery.*
- *Height of working deck above waterline would need to be taken into account if intended to tow seismic or other gear.*
- *The crew all worked together and were very help.*
- *Get rid of moon pool; it is dangerous. It was bent in due to waves hitting it. It had flown open once before this cruise. Belief that this setup is dangerous and someone will get hurt.*
- *The back deck is very short; hardly enough space to try and grab something in the water. Also, the screws for the engines are also right there.*
- *The deck is so high up that it was necessary to put a small boat in the water and use it to hook onto the surface buoy. The deck is also high enough that they would not like to lower instruments down from it during a mooring deployment.*
- *I would like to make special mention of the food on the ship, which was excellent. The cooks provided ample amounts of healthy, great tasting food. The chief steward (Debra Gall) is to be especially commended for her extraordinary effort at creating the varied menu. I would rank the food as good as many restaurants where I enjoyed eating. Throughout the cruise, we seemed to have to pump the bilge at an excessive rate. Either we had a particularly active crew on board or seawater was draining into the grey water. I suspect that several drains could be configured so that uncontaminated seawater may flow directly back into the ocean rather than the holding tank. O3 deck needs more tie down points. On this cruise these were needed for incubators. It would also have been useful if the uncontaminated seawater were available on this deck to use in incubators.*
- *The captain and crew were outstanding. The ship was remarkable under the conditions experienced. Did not need to tie everything down constantly as you do on a conventional ship. Science crew was able to rest on the one day the weather did get rough because the ride was so good.*
- *The captain and crew have many insightful things to say about the operational difficulties of the Kilo Moana. Please consider their comments, as well as mine seriously in your comparison of SWATH versus monohull vessels.*
  - *No new problems. Comments from last time is basically still true. While the height off the water is not an issue as they have learn to work around it. The Marine Techs are more familiar with the ship.*
- *Not a lot of winches – CTD and trawl – no hyrdo-winch – for multiple deployments, it would be nice to have more winches.*
- *Short cycle for holding waste (24 hours) – drains for seawater go into same system, as well as flow-through system – maybe put these overboard instead of into gray water. Need longer holding capacity. Poor capacity to generate water, especially while on station. We did have a pretty full ship (n=25*

scientists & 2 UH techs) but the ship should be designed to produce enough fresh water whether we are steaming or on station.

- *Q-water has too low production rate – not good enough quality. Suggest second Q system in port labs, both for back-up and to increase capacity. We solved this by bringing our own Q system on board, but this is not always possible.*

- *There were some miscommunications at end of cruise regarding expectations and requirements for swabs of Rad Van by the isotope users.*

- *KM seems better designed for geological studies than for biogeochemistry, but I noted that many of the 2005 cruises were for biology/geochemistry, where operations of water sampling gear, nets, etc. is top priority, so I think you may want to rethink who is the major user and modify to suit these other needs. For example, I found the Computer room to be a large waste of space. It seems like much of the bench space was consumed for equipment that runs unattended. I'd suggest making a small instrument/dry lab within this space that would be more useful to those of us who make chemical measurements at sea.*

-

- *Most of previous concerns have been addressed. Deployment/recovery of CTD is still a problem due to ship pitching and working off the stern. The cable is not jumping out of the sheeve due to the crew being more experience and careful but two are needed. Rosette can now be brought into wet lab.*

  Some of the labs get flooded due to water coming up through the floor drain. This appears to be only in certain ship orientations when underway. Didn't know of the cause.

  Found the gray water tanks filling too fast when water from the flow through system was rerouted to another sensor and then into the drain.

- *ships motion seemed a little less predictible than a monohull, although i do not have an extended life at sea experience.*

  I was hoping the ship would be less sensitive to surface wave, with the CTD deployed way in the back the ship, the vertical movement of the package due to ship motion was significantly more than on a way long monohull ship with the CTD deployed mid ship.

- *They had rough weather (gusts to 50 kts, 18-20 ft seas) during the cruise and couldn't work in these conditions. The ship is not very comfortable in heavy seas. The motion of the ship is jerky and hard to predict unlike that on of a monohull. Vibrations from wave slapping felt throughout the ship. Never felt that the ship was unsafe – just couldn't do any work.*

- *Censored – [personnel issue, see original]. The PAR sensor worked irratically.*
- *I like both the SWATH design and the R/V Kilo Moana. The benefits discussed here outweigh the problems brought up here. If given a choice, I would likely opt to use the KM for future cruises.*
- *No.*
- *No.*
- *Overall very capable and problems that came up could be solved*
- *No.*
- *First and foremost, it was a very successful cruise! The crew were very helpful, and collegial, if untrained in some matters. In addition they seemed interested in the science being conducted during the cruise. The engineering staff (in particular the young third engineer) led extensive tours of all hull and engineering spaces in this SWATH vessel from stem to stern and right down to the bilge. The marine technicians were also nice, but untrained in serving scientists and relatively ineffectual; two marine technicians would not normally be necessary on such a cruise, but in this case all they really did consistently was run the CTD operations The physical shape of the main lab was about the worst this scientist has seen for only two years of operation. The decking s need replacement, but the benches were fine. The ability to lash in the lab was compromised by a shortage of eyebolts for the wall mounted struts. The maintance of the research tech gear, especially the CTD and rosette, was bad, the equipment was very beat up and there was either severe shortage of spare parts or a reluctance of the techs to properly maintain the sampling gear (especially the Niskin bottles). The radiation lab was the "dirtiest" the scientist had ever encountered at sea, both in terms of contamination and general slovenliness. A separate report was prepared for the University of Hawaii Radiation Safety Officer outlining the open containers of scintillation fluid, glassware, pipette tips, etc. found under benches and in drawers. Unacceptable for any UNOLS vessel At the conclusion of the present cruise, it was left in a perfect condition for the next user.*