UNOLS

Post-Cruise Debrief Report R/V Hugh R. Sharp

2010-2011

Fleet Improvement Committee

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In 2009 the UNOLS Fleet Improvement Committee prepared eight debriefing questions to help determine how the unique features of the R/V *Sharp* have affected cruise operations and how these features were perceived by science users. These questions were asked of eight chief scientists after cruises they conducted in either 2010 or 2011. All users greatly appreciated the R/V *Sharp*'s flexible and novel design and felt that the new attributes were valuable and helped them to better meet their science objectives.

REPORT CONTENT

The R/V HUGH R. SHARP (Fig. 1) is a 146’ foot, state-of-the art, general-purpose, Regional Class, research vessel built by Dakota Creek Industries in Anacortes, Washington, and officially commissioned into service as part of the University-National Oceanographic Laboratory System (UNOLS) fleet in May 2006. By the end of 2011 the *Sharp* completed 1061 days of science at sea under the operation of the University of Delaware. These cruises served 44 principal investigators for projects funded by the National Science Foundation (492 days), Navy (217 days), National Oceanographic and Atmospheric Administration (182 days), and several other sources (170 days). The ship's regular operating region is the Delaware and Chesapeake Bays and adjacent coastal waters out to 200 nautical miles. However, work has been conducted as far north as the Gulf of Maine, as far south as Florida, and as far offshore as Bermuda. The *Sharp* was designed and outfitted with several innovative features and meets International Council for the Exploration of the Sea (ICES) Report 209 sound emission standards.

Fig. 1. The R/V Hugh R. Sharp at sea.

The *Sharp* has a shallow draft to facilitate estuarine operations and was designed to be acoustically quiet. A second major design goal was to maximize operational flexibility through modularity and convertibility of the interior spaces. Additionally, the *Sharp* has several unique

design features, including a novel over-the-side handling system with docking head for the CTD (Fig. 2), a retractable centerboard (Fig. 3), a convertible back deck/van space (Fig. 4) with a covered vestibule to connect the van and lab spaces, and a computer controlled dynamic positioning system that holds the ship on position using twin rotatable Z-Drives and a tunnel bow thruster.

Fig 2. (upper left) The over-the-side handling system and CTD docking head

Fig. 3 (above) An overhead view of the retractable centerboard

Fig. 4 (lower left) The interior of the standard UNOLS van that is used to accommodate specialized user lab space needs

In 2009 the UNOLS Fleet Improvement Committee prepared eight debriefing questions to help determine how the unique features of the *Sharp* have affected cruise objectives and to gather experiences of scientists who have used the new design features at sea (Table 1). These questions were asked of eight chief scientists after cruises they conducted in either 2010 or 2011.

Table 1. Debrief Questions for R/V Hugh R. Sharp Investigators 2010-2011.

No.	Design Feature, Explanation and Question Posed during Debrief Interviews
1	Size: In order to maintain operational flexibility and reduce overall life-cycle costs the *Sharp* was designed to stay below key regulatory size thresholds. The *Sharp* is less than 300 Domestic Gross Register Tons and 500 International Gross Tons, which are both volume measurements used by the shipping industry. This vessel is essentially as large as can be designed and stay within these limits. **Has the overall size of the vessel either enabled or hindered you in meeting the science objectives of your cruise? Please explain how with specific examples.**
2	Over-the-Side Handling System: The *Sharp* has been outfitted with a system that allows "hands free" launch and recovery of CTD and other systems on the starboard side using a docking head and motion controlled winch systems. **Has this system had a positive impact on your work and if so how? Are there any negative impacts associated with this system?**
3	Retractable Centerboard with Mounted Acoustic Transducers: The *Sharp* is fitted with a retractable centerboard that can be lowered to 2 meters below the keel and on which there are three 24" x 24" transducer bays for ship and science use. Transducers are changeable alongside. **Has this arrangement had any significant positive or negative impacts on your work?**
4	Acoustically Quiet: The *Sharp* was designed, engineered and built to be below ICES 209 noise limits at 8.0 knots. Radiated airborne noise within the ship is also designed to be at low levels. **Have you noticed any difference compared to other vessels, and has this had any positive or negative impacts on your work?**
5	Vans and Deck Space: The setup of the *Sharp* for any particular cruise is "modular" in that there is a choice between more deck space or more enclosed lab, berthing or storage space. The design of the *Sharp* incorporates the ability to fit two vans on the back deck for lab space or other uses. These vans are essentially integrated into the superstructure when installed. **If you have used the vans, how well did they accommodate your internal space requirements? Did this modularity have a positive or negative impact on your cruise planning and work at sea?**
6	Variable Berthing Capacity: The *Sharp* can accommodate science parties ranging from 14 to 20. By using the conference room as a two-person stateroom, 16 can be carried presently. In the future by using a 4-person berthing van the total can be 18 or 20. **Did your project have need for the full berthing capacity of *Sharp,* and what do you see as the benefits and drawbacks to the approaches available on *Sharp?***
7	Dynamic Positioning: The *Sharp* was designed and outfitted with dynamic positioning (DP) capabilities. This is accomplished by using twin rotatable Z-Drives, a tunnel bow thruster and a commercially available computer controlled dynamic positioning system. All of these components add cost, maintenance requirements and complexity to the operation of the vessel. **How important was the DP system to your work? How well did this system operate during your cruise(s)? Was noise from the DP system disruptive?**
8	Other Features: **Can you describe other design, outfitting or operational features of the *Sharp* that had significant positive or negative impacts on your work at sea? Should these features be requirements of other new Regional Class Research Vessels (RCRVs)? Were there any important design features missing that should be available on RCRVs?**

The feedback received from debriefings is summarized in Table 2 according to design feature to inform design recommendations for future Regional Class Research Vessels.

Most users found that the size of the *Sharp* was about right for their needs. All users greatly appreciated the ship's flexibility to accommodate more or fewer scientists due to its variable berthing arrangement. Some did comment that the ship space and ship crewing were at operational limits at maximum berthing, and that this number of scientists was not practical for longer cruises. Most of the scientists in our survey did not have scientific needs that required an acoustically quiet ship, but all users commented on how quiet the *Sharp* is compared to other ships and how this really had a positive impact on ship habitability.

Responses were overwhelming favorable on the novel features of the R/V *Sharp*. The over-the-side (OTS) handling system was well received. Several scientists commented on its ease of use and safety, and also mentioned that the system allowed them to sample in higher sea states than would be possible for other ships of this size. (One negative comment outside of this survey was received from a potential *Sharp* user who had concerns that the OTS design and proximity of the docking head to the rosette could increase low level contamination of samples collected using the rosette bottles.) Most users did not need the retractable centerboard feature but appreciated its value. The one scientist that did use the retractable centerboard really liked the design, and commented on the ease and speed in which equipment could be mounted or removed and how this was a great benefit to their science needs. The shallow draft was felt to be very valuable for estuarine operations although it does increase ship roll even with trim tabs. The stairs and ship design was ideal for a user who did a lot of diving operations. One user praised the load control system on the A-frame.

Users liked the flexibility of the van arrangements and deck space. Most users felt that the deck space was adequate for their needs even with two vans. The unique vestibule walkway design to connect the van and labs worked very well. The vestibule arrangement was especially valuable to users who worked in both specialized vans and lab spaces, and who needed the protection and safety moving between these spaces. One user praised the modular hoods and the flexibility of hood placement in the labs. Users indicated some improvements could be made in the design of connectivity between the van and lab spaces for running cables, transfer lines etc., in the freshwater supply to van and/or deck spaces.

Users who needed dynamic positioning were pleased with its operation. Users who had not used DP before commented on how this improved station keeping and was especially beneficial as the *Sharp* often does operations in confined areas or areas of high tidal currents. One comment was received indicating that the DP was not capable of holding the ship in position during rough weather.

Suggestions were made on other improvements to better accommodate current and future needs. A SEABEAM capability for bottom mapping would be useful. One user commented that the 9/16" trawl wire was undersized for some operations and expressed a future need to have a capability for dual cable operations (fiber optic and wire rope). Users mentioned that there was some room for improvement is a few specific areas: the underway data acquisition system and logging of data streams (e.g. winch data), internet capability, the ship's crane and the underway clean seawater system.

In summary, all users greatly appreciated the R/V *Sharp*'s flexible and novel design features and felt that these features were valuable and helped them to better meet their science objectives. Without exception, all users thought that the *Sharp* was a great ship and one of the most capable, if not the most capable, regional ship currently in the UNOLS fleet.

Table 2. Chief Scientist's responses to debriefing questions

Cruise P. I.	Bryne & Nordahl	Sommerfield	(Kirchman/Cotttrel	Luther
Question	Debrief #1	Debrief #2	Debiref #3	Biogeochemistry Debiref #4
Vessel Size:	The Sharp meets their needs, the overall size is good and the cost reasonable. Did 24/7 ops, 13 scientists onboard. A negative is the smaller crew for ops, e.g. gear handling. The low freeboard makes for wet deck in rough seas. The shallow draft leads to significant roll- the trim tabs help somewhat.	Sharp is the right size for his work that is mostly at the interface of rivers and the coastal ocean he also said the ship is fairly comfortable offshore. The Ship is headed to the shipyard for some work to stabilize it so not everyone thinks the ride is fairly comfortable	Sharp is just about right for what we do. It is comfortable and safer than Cape Henlopen. Van space used heavily	The size has allowed us to do what we normally have done, but I have found deployment of moorings and other equipment much easier than the R/V Cape Henlopen and some other vessels as the deck size are wonderful for a range of work
Over the side Handling System:	CTDs made every third station, hence ~ 150/cruise. Handling system viewed positively. Better than without the system. Do not have severe weather in May and June so no comment on system performance in poor conditions. No negative impacts.	He really likes the CTD crane besides allowing deployment of the CTD in rougher weather; it makes the whole operation safer. He says almost everyone he talks to is very happy with the CTD handling system.	The handling system is great. At first it took a little while for the crew to get used to using it. This is past now. The system is reliable but a little overkill in terms of roll compensation	The major positive impact for the CTD launch and recovery is that it is all automatic and we don't have to bring it aboard and possible injuring ourselves in the process. Sampling is much easier and safer as the CTD can be brought within the garage doors on the ship for sampling from the bottles.
Retractable Centerboard with mounted acoustic transducers:	Ddin't use but like the shallow draft ,esp. as new NOAA Fisheries vessels draw 20' and have 'halo effect' with inaccessible areas. Can imagine how acoustics would be of value. Future plans to use HABCAM system to video bottom and transmit to ship via fiber optic, Seabeam capability for bottom mapping would be beneficial. If feasible would use the retractable centerboard.	He does not use this feature so he has no comment	Do not use	This is a good arrangement and has not impacted our science.
Acoustically Quiet	Not needed for scallop surveys. Sharp in much quieter than other ships, 'fishing capable'. Noted this is an expensive feature with significant maintenance costs. Other ship noise not normally heard is heard (eg stabilizer arms have noisy hydraulic lines, as used 90 deg elbows rather than smooth, tapered curves (now corrected?).	He says the ship really is quiet. He doesn't require the quiet but he really appreciates it.	It is noticeable that Sharp is quieter. This has a positive impact when working long hours.	This ship is VERY quiet and I know of no other ship that give such noise reduction comfort
Vans and deck space:	Likes the van arrangement. Has sink and measuring stations, with electronic equipment (e.g., scales) that transmit to main lab. A real plus over commercial boats formerly used. A second van would interfere with deck space now used for spare dredge. Freshwater supply could be better (currently limited to either deck or van use) and needs more flow. Semi-permanent connections for computer cables, etc between van and main lab would be very desirable to preclude stringing wires each time.	He also doesn't use vans in his work but he did say that there is adequate (lots of) deck space and it is clear deck space even when there are 2-25 foot vans on board. He fills 25-55 gallon drums as part of his work and there is still lots of deck space. The multi beam system is housed in a van so when that is used it goes on quickly and everything just plugs in. He also says the wet lab and the dry lab are good sized. He compares the deck space with the Wecoma.	We have used two configurations- one radioisotope van or two vans (isotope and general use). Deck space was not limiting and was used for incubators. Stern operations were not conducted. Breezeway is a good feature. It is nice for changing shoes when entering the isotope van. It is well lit when deck lights are off	We have used the trace metal clean van and normal van on one cruise and we were still able to have ample room to deploy a mooring. The vans provide much more space and allow for more science to be accomplished while at sea
Variable Berthing Capacity	They had 22 persons aboard. Didn't use conference room for extra berthing but for office area. Crowded at mealtime, but tolerable. Lauded the lone cook that accomodated this many people – excellent food.	They use 13 of the 14 standard bunks. Useful to have capability to get extra berthing by converting other space or adding a bunk van. Ship works well with 13 or 14 scientists but the galley only seats 10 so mealtimes are conjested.	Never maxed out berthing. 14 is plenty	We have used all the berths without needing the conference room. I don't see a reason to use the conference room or a berthing van.

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Dynamic Positioning:	Don't use it, save perhaps for CTDs (uncertain).	They put pumps overboard and they need to stay on station for 20 min or so. Usually the boat driver can hold station, but when the get in the high tidal current areas they use the DP. This feature is very nice when they need to be perpendicular to the currents. He thinks the DP works well.	Not important for our work. Not used	We have used the DP to make sure that our mooring is placed at the same position each year in the Delaware Bay. It met our expectations.
Other Features:	Wire (9/16th) light for dredging, ¾" better. A net reel would be nice. Endurance is good, adequate deck and lab space, and good support at sea and ashore. 24/7 internet with real-time data transfer ashore would be useful for communication/decision-making. Internet access poor (one shared computer on bridge). FIC should see what NOAA does re connectivity. The underway data acquisition system could be better and is difficult to access- may be a fleet-wide issue? Trawl winch data should be logged. Future plans for habitat mapping using HABCAM and scallop trawl sequentially will need capability for both fiber optic (large bending radius) and wire rope (smaller bending radius) thus two different sheaves on A-frame (Sharp currently has both wires on below-deck winches?)	He says the sharp is a very capable ship and everyone feels that way. However they are comparing to their previous ship the Cape Henlopen. He thinks this ship comparable to some of the other Intermediate Class UNOLS ships. He feels this is the ideal size for a coastal/inland waters ship. Some people have complained about stability but he doesn't think this is an issue. He thinks that 85% of the users do water column work and all think the hands free CTD is great. Overall he really likes this ship.	Features of Sharp that standout are its relative proportions of wet and dry labs, berthing space is right, galley is a little small, nice lounge/conference room. Technicians shack is easily accessible and centrally located. Short distance and direct connections between labs.	I believe that the R/V Sharp has wonderful capabilities for a RCRV and exceeds many other, if not all other, vessels in that class. The deck and lab (both wet and dry) space are laid out well and two vans can be accommodated easily with plenty of deck space still available. The berthing quarters are also as good if not better than most vessels that I have sailed on.