Appendix A
TowCam System Photographs

Figure A1. Mobilization of TowCam and equipment at CGS in Taipei.

Figure A2. NTU TowCam on launch platform of OR1. Note how it is secured to the deck using the yellow cargo straps. Note plywood used to cover landing platform so that TowCam can easily be slid during launch and recovery.

Figure A3. NTU TowCam, side view with camera mounted (red arrow).

Figure A4. View of rear of NTU TowCam with 5-liter Niskin bottles mounted.

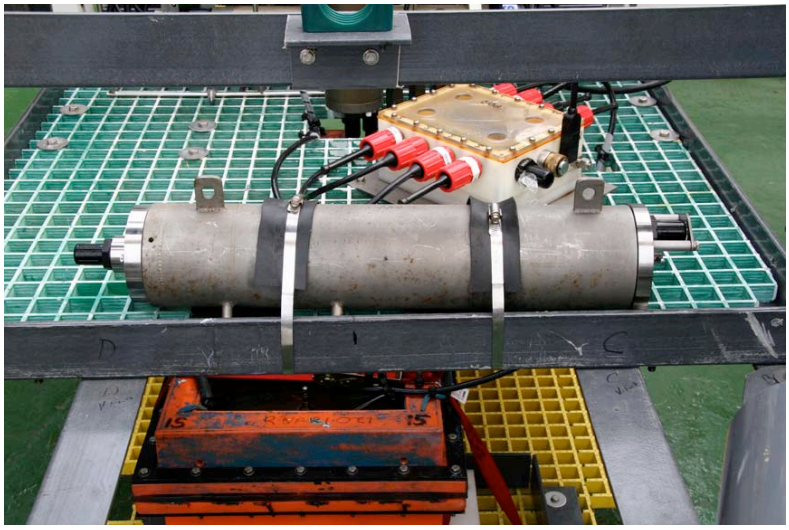


Figure A5. Benthos 383 strobe electronics housing on upper deck of NTU TowCam. Power junction box (Jbox) is behind it. One of the DSPL batteries (orange housing) can be seen in lower part of photograph, on lower deck of TowCam.

Figure A6. Mounting the Benthos 386 strobe heads on the NTU TowCam. 316 stainless ¼-28 hardware is used to mount strobes. A small nylon washer is used to slightly tilt the strobe head for optimal lighting at 4-5 m altitude. Note lock washers go on bolts just below heads to secure the bolt when tightened.

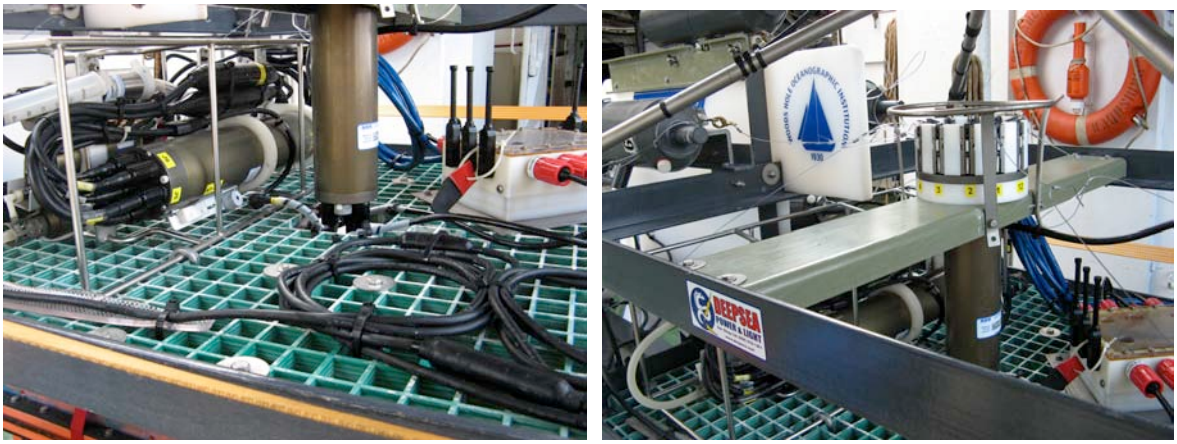


Figure A7. SBE25 CTD system (left) (on loan from WHOI MISO Facility) and SBE32 CRM pylon water bottle release system (right).

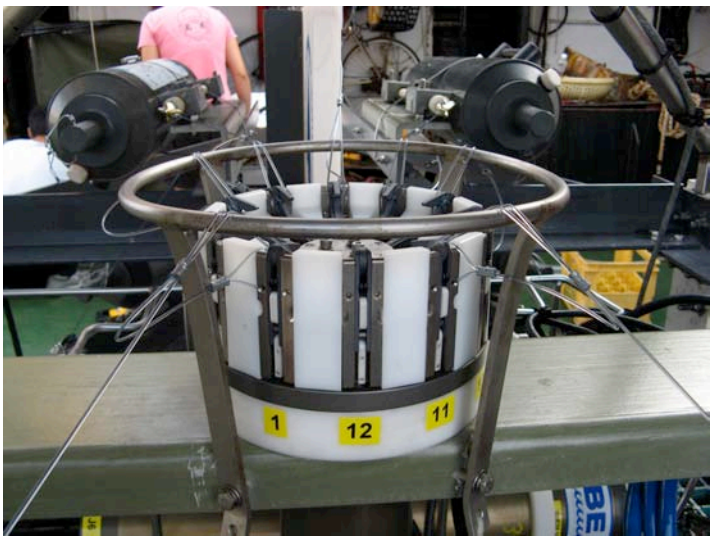


Figure A8. Top of SBE32 pylon showing monofilament lanyards from the Niskin bottles.

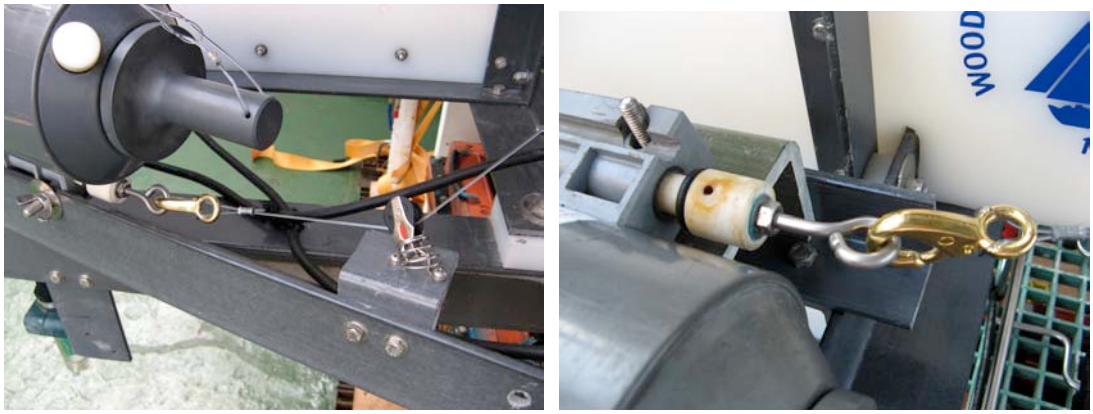


Figure A9. Details of monofilament lanyards and rigging of water bottle releases.

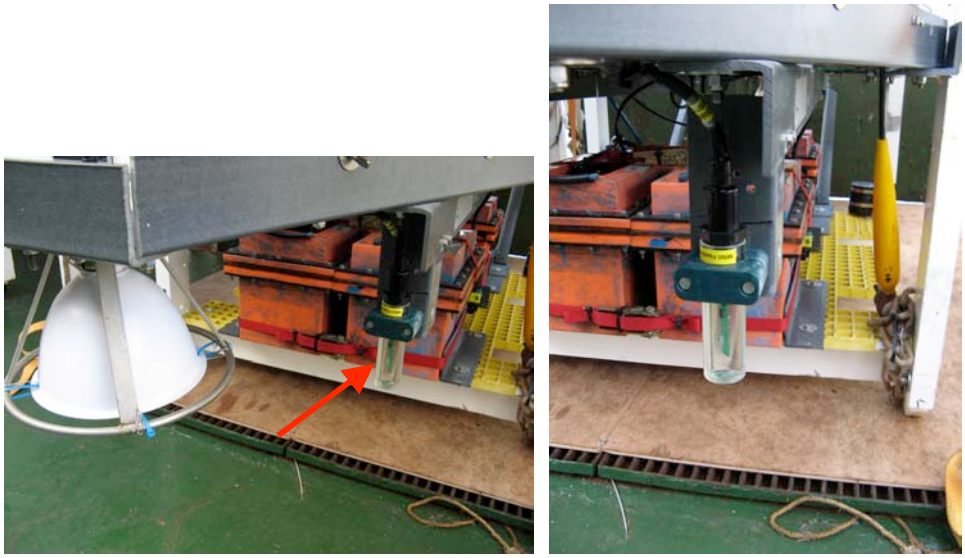


Figure A10. Rear Benthos 386 strobe head inside conical reflector and stainless protector cage, and flashbird (red arrow). (right) close up of Flashbird.

Figure A11. Down-looking altimeter (red arrow) on lower deck of TowCam.

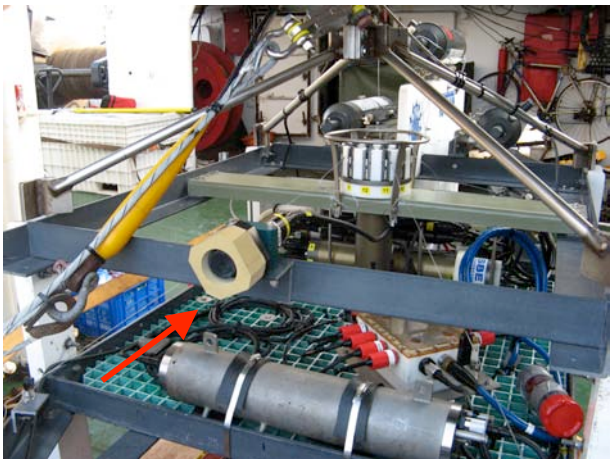
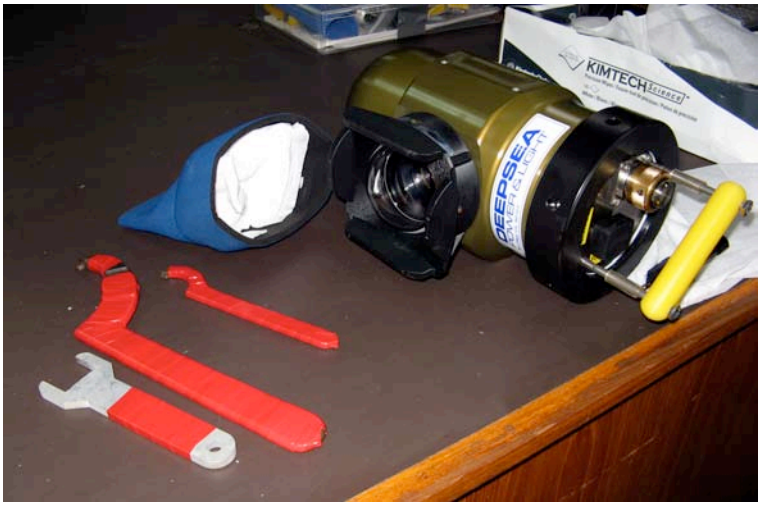
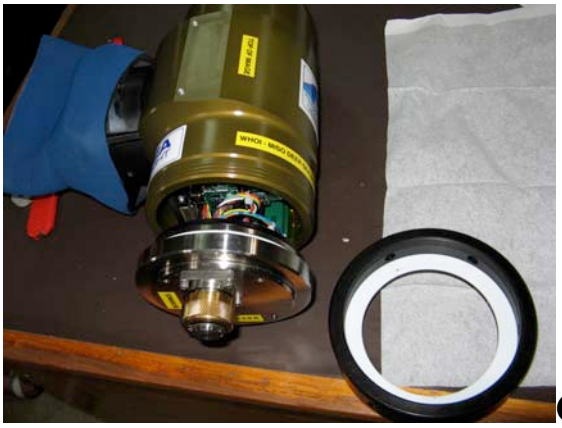


Figure A12. Forward altimeter for obstacle avoidance (red arrow). Beige foam block is a syntactic foam collar that helps reduce side-lobe acoustic energy from the altimeter.

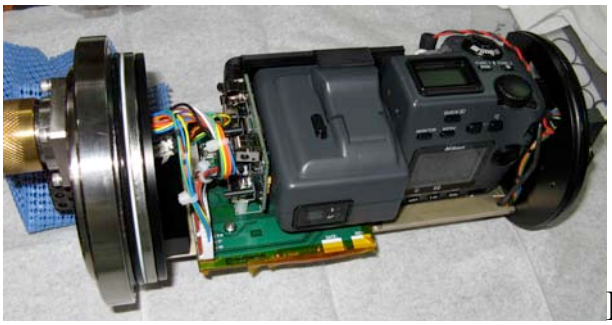


A

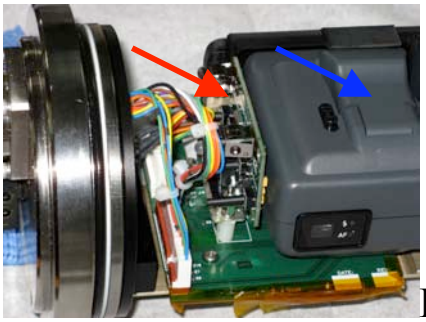
B



C



D

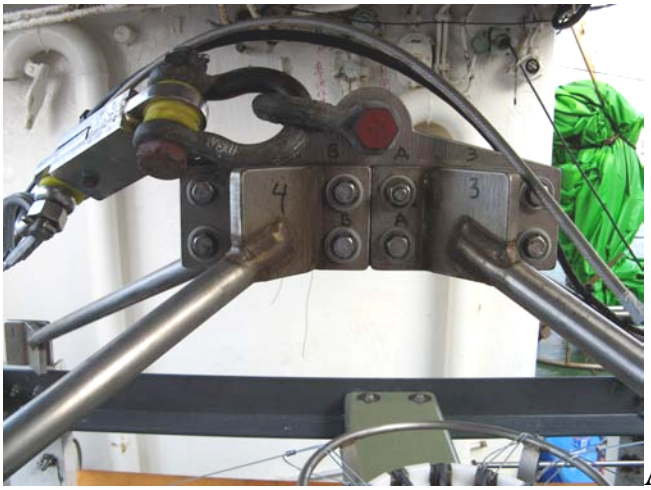


E

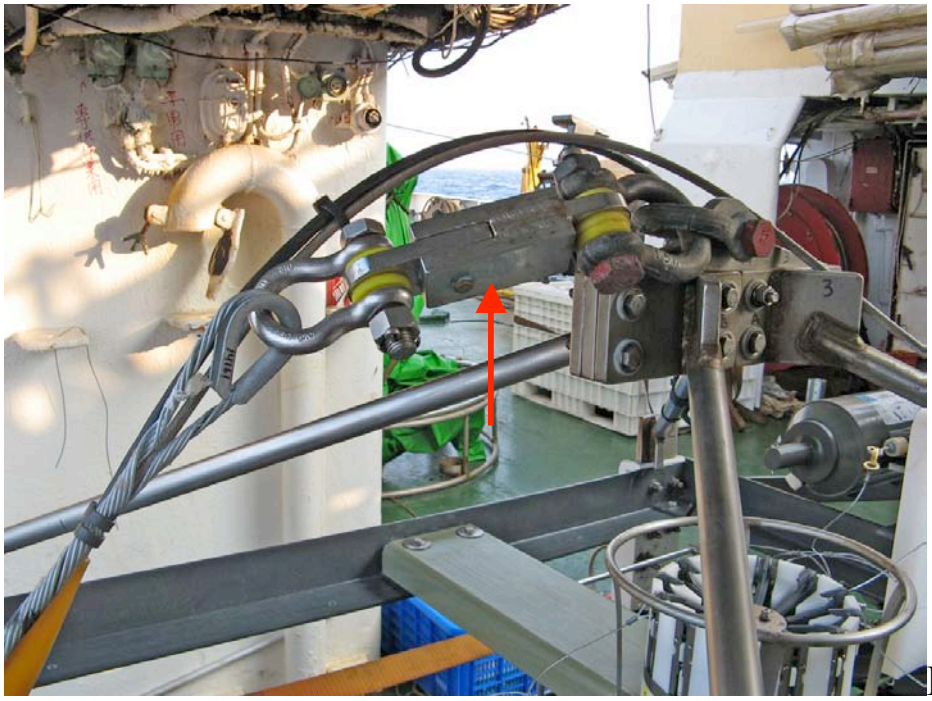
Figure A13. NTU digital deep-sea camera (s/n6003B). A) Camera and specialty tools for opening housing and tightening connectors on Jbox. B) Camera end cap and yellow removal handle. 5-pin dummy plug shown at right of handle. C) Camera housing partly opened with Delrin retaining ring at right. D) Camera chassis removed from housing. E) Detail of Digisnap card installed on camera's mother board (red arrow), blue arrow points to Nikon995 camera module.

Figure A14. Spare parts boxes for NTU digital deep-sea camera (s/n6003B). (red arrow) Camera and strobe spares Orings, CF card, fuses, etc., (yellow arrow) spare dummies.

Figure A15. (left) Spare parts boxes for NTU digital deep-sea camera (s/n6003B) showing spare Nikon995 camera (red arrow). (right) Detail of camera cable connector Orings and Oring insertion tool (red arrow).



A

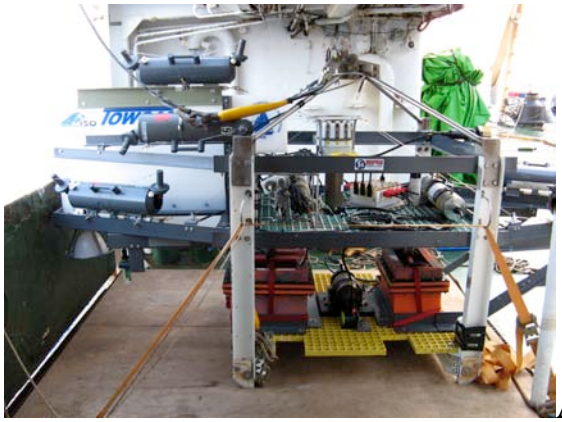


B

Figure A16. (A) Lifting bail on NTU TowCam. Always check to be sure bolts are tight and no cracks are appearing along welds. (B) Weak link (red arrow). Weak link brass bolt will shear at 5500# tension. If that happens, the safety line that is rigged above the weak link and connected to the lower frame of the TowCam will remain attached and the system will be hauled up by that line so that it is not lost. ALWAYS CAREFULLY MONITOR THE WIRE TENSION DURING A TOW TO BE SURE IT IS NORMAL. IF YOU GET HUNG UP AND NOTICE TENSION INCREASING SHARPLY. PAY OUT LINE TO DECREASE TENSION AND IMMEDIATELY STOP THE SHIP. TRY TO REVERSE COURSE SLOWLY, ALWAYS KEEPING TENSION LOWER THAN 4000A#. TRY TO GET UN-STUCK BY SLOWLY HAVING SHIP REVERSE DIRECTION OR PULL IN ANOTHER DIRECTION. KEEP TRACK OF THE WIRE OUT AND TENSION AND SHIP POSITION DURING THIS OPERATION.

Figure A17. Flying the TowCam from the winch 'dog house'. PC laptop computer with CTD display is on shelf (red arrow). SBE33 deck unit is behind laptop (blue arrow).

Figure A18. Battery chargers and cables for TowCam DSPL SeaBatteries.


A


B


C

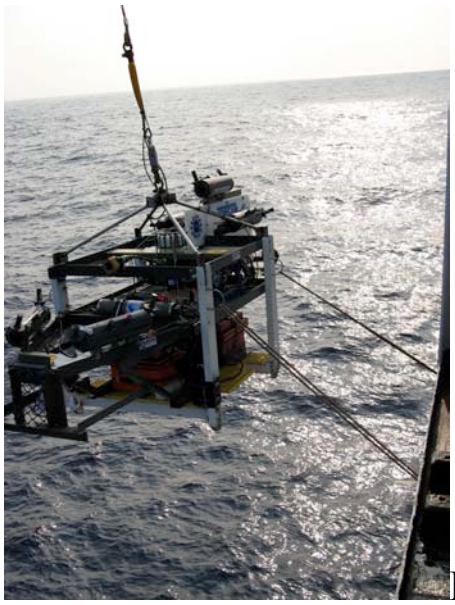

D

Figure A19. Deploying NTU TowCam from ORI side door on main deck, starboard side. TowCam is launched tail first (A) to avoid problems with low overhang on deck above platform. TowCam should be secured during launch using 3 tag lines (2 aft and 1 forward) to keep it from swinging (B). Once the frame has cleared the side of the ship (C), it must be turned, bow forward and the lines switched so that the port side of TowCam is secured by two tag lines as shown in (D) above. Lower slowly into water and zero the winch meter. Descend to 10 m and hold for several minutes to let the CTD pump purge any trapped air and so you see the altimeters registering numbers in the PC laptop screen. Then pay out wire at ~0.2m/sec (12 m/min) until ~300 m, then you can increase winch speed to ~0.3-0.4 m/sec (18-24 m/min) until 700 m. After 700 m you can descend at 0.5 m/sec (30 m/min). Lowering speeds may vary depending on sea state. DO NOT LET THE WIRE BOUNCE OR SNAP LOAD AS THIS CAN DAMAGE THE TERMINATION AND MAY TRIGGER THE WEAK LINK IF THE FORCES ARE GREAT ENOUGH.

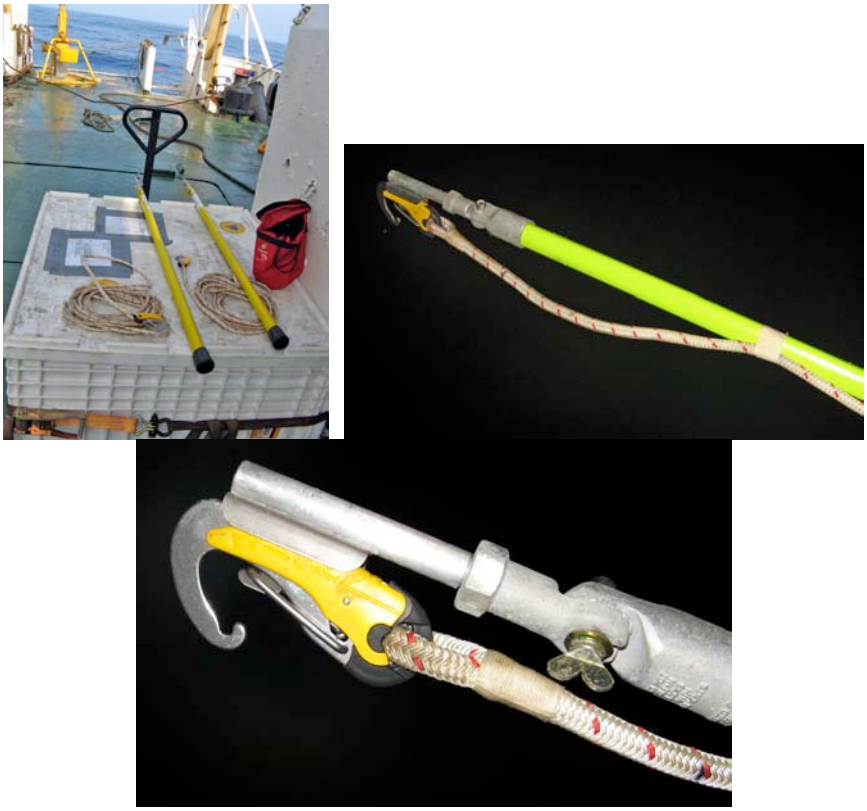


Figure A20. TowCam recovery poles showing detail of the snap hook engaged in the tip of the pole and rigged for recovery. Use only 2 wraps of masking tape to fix the line onto the poles.

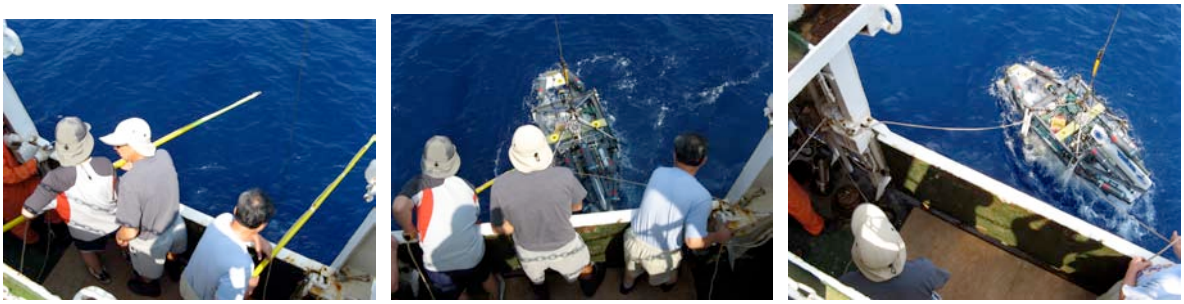


Figure A21. Recovering the NTU TowCam from starboard platform door on OR1. Have recovery poles and lines ready. Keep the TowCam top deck just above the surface but not fully out of the water in order to dampen the swing of the system. Hook into TowCam U-bolts ASAP when it reaches the surface. Cleat-off the lines to keep tension so that it does not swing. Once both lines are attached raise the system and guide it into the platform.