Minutes of 29th International Research Ship Operators Meeting held October 10-13, 2016 at the National Research Council (CNR) on the Island of Capri, Italy

Tuesday 11 October

Registration

Welcome and Administrative Remarks

- The IRSO Chair Aodhan Fitzgerald welcomed the attendees and acknowledged the overwhelming interest in the meeting with over 100 delegates from 23 countries.

Round Table Introductions

Introduction to Anacapri and Meeting Hosts

- Giuseppe Magnifico/CNR provided a warm welcome to all IRSO attendees with an overview of the National Research Council (CNR) that manages the *R/V Minerva Uno* and *R/V Dallaporta*. The history of Capri as an international center for culture and higher education for research was highlighted.

Adoption of the agenda of the 29th meeting

Review of minutes of the 28th meeting.

- No changes to the minutes were proposed and they were adopted by consent.

Review of the IRSO Terms of Reference (ToR).

- No modifications to the ToR were proposed, however the delegates were invited to review them during the meeting period and propose edits at the close.

Review of the IRSO Website.

- Jon Alberts did a live demonstration of the website. Per Nieuwejaar stated that at the INMARTECH 2016 which was held the week of October 12, 2016 in Bergen, Norway, there was a suggestion by Jules Hummon from the University of Hawaii to establish an electronic collaboration site for INMARTECH technicians to share experiences and best practices, similar to that for UNOLS RVTEC. There was consensus agreement that since INMARTECH is a subcommittee of IRSO it would be appropriate to establish this collaboration space on the IRSO website and Jon Alberts will take this for action.

Dates for the 30th IRSO meeting.

- The JAMSTEC IRSO members graciously volunteered to host the 30th meeting in Japan and proposed Tuesday October 17 to Thursday October 19, 2017. The meeting delegates were asked to review their calendars and a final decision would be made at the end of the meeting.
- The IRSO 2017 (30th meeting) agenda will be posted on the IRSO web site.

Theme 1: Delegates Report of Activity

<u>New Member Presentation- CMRV presentation (Xia)</u>:

- 46 research vessels, the numbers increased significantly because most come from states that decided to join CMRV.
- Only four ships are older than 40 years.
- *Snow Dragon* is icebreaker, 167m, 75 berths
- *Dayang 01*, 104m, total berths 75
- *Xiangyanghong 01*, 100m, total berths 80, delivered in 2016
- *Xiangyanghong 03*, delivered in 2016
- *Xiangyanghong 10*, delivered 2014
- *Xiangyanghong 18*, 88m, 50 berths, delivered 2015
- *Donfanghong 2*, 96m, berths 195, delivered 1995
- *Shiyang 1*, 60 m, 72 berths, delivered 2009
- Objectives are to define common communications and coordination for Chinese marine research vessels.
- Coordination committee includes various states organizations and RV operators
- The Coordinator is State Ocean Administration (SOA)
- Operation Coordinator is National Ocean Technology Center (NOTC) under SOA
- Activities include offshore oceanography survey, polar sea exploration, etc.
- Days at sea: Regional 2015 1905, Global is 2405
- The CMRV Vision is to standardize and coordinate RV operations and construction.

Questions: Can you talk about your plan for more ships?

Answer: A plan is being drafted, the goal may be 60 ships total.

Question: Are you planning for a centralized approach?
Answer: Yes.

Question: Can you talk about Arctic work?
Answer: A new Polar vessel is under construction and the plan is delivery in about 2 years. The ship will be operated by the Chinese Polar Institute.

Question: Can you tell more about your deep-sea manned sub?
Answer: An RV supports the sub. A new vessel is under construction.

Question: Where do you build the ships?
Answer: All are constructed in China.

Question: Can you tell about cruise sharing?
Answer: The ideas are shared internally in China and then scheduled.

Comment: Appreciation was expressed for China participating in this conference.

Coffee break and poster session

Returning member presentation AFBI (Bill Clarke/Pieter-Jan Schoon:

- Agri-Food and biosciences institute
- Created 1 April 2006 as a non-departmental body
- Three core areas are Freshwater fisheries stocks, Coastal zone science, and Marine Fisheries Stock Assessment
- Operations are out of Belfast, have one old ship, year-round capability, main operational area includes: Malin Shelf and seas around Ireland.
- *R/V Corystes*, purpose built fisheries RV, 12 crew, 53 m, 5m draft, ices 209 compliant, 1280 tonne.
- Almost 30 years old, very stable, very fuel efficient due to single engine for most science work, low noise, deck space includes containers
- Problems are equipment is old; spare parts are hard to find and need to be made; remaining life is estimated at 2-3 years; operations are contracted out through public tender and private companies. Have gone to using a target cost contract to help control costs; has worked successfully for two years; approach is to have a target cost above which the manager has profit and expenditure above the target cost is cost shared but the success depends on how well the target cost has been defined.
- Future plans are in progress with a preferred option of a new build but still trying to get a clear indicator from the government whether funding will be made available.

Question: Has it been expensive to maintain ICES 209 compliance?
Answer: The ship has not been noise-tested in many years and no plans are in place to do so due to the age of the ship.

New member presentation Cefas (David Limpenny):

- The Center for Environment, Fisheries and Aquaculture Science: Vessel and Seabed Mapping Business Manager
- UK government agency (Defra), established for over 100 years, 480 staff, projects in more than 40 countries, a 73m *R/V Cefas Endeavour*
- Working for non-UK governments and private sector clients
- David has been at Cefas for 36 years, is now the National MPA program manager and now the Vessel and Seabed Mapping Business Manager
- Also running the national marine protected areas program
- Primary scientific capabilities include, fisheries and stock assessment, marine monitoring, oceanography, seabed mapping, modeling, etc.
- Launched in 2003, 73 m, 17 science, max 35 berths, management control by P&O Maritime Services, aim is for 285 days at sea and max 300, does not include mob/de-mob, 50/50 Fisheries/Environmental and 228-240 days nominally assigned to Defra
- Most work is around UK coast, but Cefas has a larger worldwide remit and programs are being developed in overseas areas including South Georgia and South Sandwich Islands. Brexit – may force looking further afield if required but there is enough work around the UK at the moment
- Declining government budgets are predicted, although now still 300 days per year, pessimistic future outlook, vessel management contract ends March 2019 and it will be a big decision step. Will be looking at a Cefas vessel platform approach with 100-140-day commitment.
- Options include no change, or continue ownership with other collaborators, or sell and lease back, or sell and meet program needs through use of other vessels
- Vessel program for 2016/2017 is quite full, are starting the 2017 scheduling process with some open opportunities

Question: Does Cefas receive funding from commonwealth fund?
Answer: No, but some funding is being received from other government programs.

Question: *Endeavor* is a very good ship, but Cefas also has quite a bit of good equipment. Can you talk about equipment?
Answer: Cefas has a good suite of equipment installed but also have coastal shelf observing systems.

New member presentation IPMA (Nuno Lourenco):

- The Portuguese Institute for the Ocean and Atmosphere
- Institute created in 2012 as a merger of the ocean and atmosphere institutes into one institution
- Mission is to provide technical and scientific support to national policy definition, operate and maintain infrastructure
- The scope includes fisheries, aquaculture, marine environment, seafood quality, geophysics, climate scenarios, aeronautic meteorology, meteorological forecasts, and marine geology for non-living resources
- Operate seismic network, meteorological radars, research fleet
- $40M Euro budget, 430 staff, IPMA is the acronym for the institute.
- 70 researchers, 138 papers, 78 research projects
- The fleet includes *NI Diplodus* and *NI Tellina* are small coastal ships, *NI Noruega* built in 1978, 47m, crew 18 and 12 techs, sails between 130 and 170 days per year, other research vessels include *NRP Auriga* and *Andromeda*, *NRP Gago Coutinho* and *D. Carlos*. A new ship is in progress with a budget of $12.9M Euro, but this is not enough money for a deep water vessel so they are promoting the acquisition program.
- Phase 1 under consideration is Acquisition of a new vessel through international tender
- Phase 2 would be refitting of a vessel and fitting it out through international tender
- Project status: Phase 1 was terminated and they have spent $9M Euro for refitting an existing vessel, built 1986, refit in 2013, 75m, Lloyds Class 100A1, 45 pax.
- This ship is being refit for fisheries work, and named *NI "Mar Portugal".* It will also be home for the ROV. Main operations will be fisheries, ROV, oceanography, and geophysical/geotechnical but will also do living marine resources assessment.
- Hull mountable systems installation is planned with a budget of about $3.5 – $5M Euro.
- It is viewed as a new platform for ocean research in Portugal.

Question: How long can you use it?
Answer: The plan is for 15 years of use; also now looking for money for a refit in 5 years.

Question: How many operating days do you expect in the next years? Also is there room for collaboration?
Answer: The changes in government have added risks. Portugal is part of a collaboration group for maintaining ocean observatories so some work and money will likely come from those programs. Continental shelf projects and research projects have historically been high but the issues are now having to doing everything though the tender process. The goal is to be part of Eurofleets.

Question: Does the ship have DP?

Answer: The ship is DP0. The future plans include a small gondola.

Theme 2: RV Builds, Modifications and Performance

Final Design of the *Aranda* refitting (Jukka Pajata):

- Modernization of *RV Aranda* from the Finnish Environment Institute
- Modernization Schedule 2015: research needs, then ship requirements, this month (RFP –October 2016) and then December 2016 they are signing ship yard contracts, and then start renovations.
- Mainly operating in the Baltic but has been in Arctic and Antarctic, Ice classed, the future ship plans include increasing the ship length to 66m, increasing the laboratories, will have new aft working deck and also new mast and echo sounding system, and an observation platform/room topside, new bow thrusters, new electric motors and a drop keel.
- Requirements include safety on working decks and in labs, low energy consumption, reduced ship self noise.
- This is important because the noise is pollution and IMO guidelines point out how to avoid noise which has an adverse impact on sea life; noise inside the ship is uncomfortable; and high self-noise reduces scientific performance.
- Sonar equation SPL = SL – PL Sound pressure level = source level – propagation loss
- *Aranda* is a noisy ship because it is operating with three propulsion motors, plus bow thrusters. It also has an electric motor which is being used to reduce the noise signature. They measured the noise both inside and outside the ship. The sources included airborne noise inside the ship. Plan is to go to a true diesel electric system. Main engine resilient mounting, elastic mounting of the generators, new propeller blades, operate at a constant pitch to avoid cavitation, will result in increased energy efficiency, will be trying to operate the electric motors batteries only for short periods, also plan to install on-line monitoring of self-noise.

OGS Explora Refit (Franco Coren):

- National Institute for Oceanography and Applied Geophysics in Trieste
- *M/N OGS Explora* built in 1973, 1408 Tonne
- Need $3.5M Euro per year to maintain *Explora* operations, cost per day is $15K Euro
- Research is focused around the Mediterranean, support seismic operations research, have been chartered by German companies, and has done surveys
- $1.75M Euro for refit in the shipyard, needed 223 days but the plan was 123 days, the target was to comply with special purpose requirements, was designed for 2d seismic operations

- Major issues were to increase berths from 12 to 24; needed to rebuild all HVAC plants; needed to split the cargo hold split in two, among many of issues.
- Needed to include five ISO containers; a new aft A-frame; new watertight boundaries; new cabins and have all new bathrooms.
- Needed an extended bridge and new lateral openings; new lab arrangements; a multi-beam system upgrade to 7150; new Sercel streamer with a 1500m active section; needed to have excess air compressor capability so the streamer can be extended.
- October 20, 2016 the refit was completed and she departed for Hobart on November 20, 2016 for an Antarctic mission.
- The plan is to operate the ship for another 4 years while looking to acquire another seismic vessel since now is a good time with the market being down.

Question: What sound sources are used?
Answer: Marine seismic sources such as air and water guns are being used.

Question: Are you replacing through a tender?
Answer: Yes, a tender will be issued for the new ship. Also will be publishing a tender for managing and operating the ships for the remainder of the four years.

RV Belgica refit and replacement- the final step (Lieven Naudits):

- The current ship has been working in a wide range of areas. Built in 1984. $51M Euros, 15 person crew, 16 science, $2.8M Euro/year is now $4M Euro per year so operating cost has doubled.
- Owned by the Belgian Federal State. Responsibility of the Belgian Science Policy.
- Generally, sails Monday – Friday. 175 sailing days per year is the average. In 2015 the ship had an engine room flooding event. The refit is taking much longer than planned. In 2013 and 2014 an attempt was made to get a new ship but the current ship was operating well so politicians would not support the request. Then in 2015 the costs increased due to the flooding event which effected the main engine, generators, pumps, electrical cabling.
- The flooding event resulted from a small hole in the hull caused by corrosion in an isolated compartment. Final cost was $1.5M Euro. Insurers paid an advance of $900K Euro, but refused to pay the $250K Euro VAT.
- Renewal of insurance after the flooding event resulted in 32% cost increase.
- 63 planned science days were lost with 17 programs affected.
- Received $1.0M Euro for obsolescence maintenance; replaced and automated the alarm and control systems in the engine room; replaced main engine and propeller; replaced the bridge controls on the portside and the hydraulic control systems; extended the fire and bilge alarm systems; replaced the CCTV system, replaced the kitchen with new floor, but there is still more to be done.

- Replacement of the living container i.e. berthing van. There are issues with acoustic standards for habitability.
- Regular maintenance is seven weeks per year, budgeted $1.028M Euro, with a standard dry dock, propeller shaft was removed and checked. Inspection showed there was a misalignment of the stern tube and the shaft so the engines were moved 7mm to starboard. Then during sea trials there was a hot bearing, found the realignment was done wrong so the engines were moved 1mm to port, but the bearings are still heating up. The ship is unable to sail until the problem is fixed. No current solution. The yard was responsible and the ship owners will not pay the costs.
- The replacement vessel is awaiting a funding decision by the politicians. There is a Cabinet Science Policy working group, the project is called New RV, and it is seeking support from neighboring countries for cooperation. There is no European Union flag a ship can sail under but in order to get cooperation for funding construction of a new ship the issue of trying to choose a single country for the flag must be worked out.
- The goal is to finalize the tender document by the end of 2016. $54M Euro is the projected construction cost. Annual operating cost of $4.5M Euro per year is the plan.

<u>French Fleet highlights and updates (Olivier Quedec)</u>:

- An update on the evolution of the French oceanographic fleet since 2015. Decision was made to decommission *Le Suriot* which is over 40 years old. A decision was made to update Thalassa for $16M Euro. The refit will install a new crane to deploy Victor 6000, Arianne, and future AUV6000m "Coral". A new propulsion system will be installed to get her under the ICES curve, and a new fairing for EM302.
- Contracts have been signed or being signed, the EM302 on *Le Suriot* will be updated and installed on *Thallassa. Le Suriot* is for sale.
- Ariane Hybrid ROV, back to trials. It can be operated from a non-DP capable light ship, 1.8 ton, 2500m depth, 4-10 hour- endurance, payload up to 250kg. And can be operated as a tethered ROV or as an untethered AUV.
- It has a depressor weight, a traction tether with a float, and an onboard winch for the tether. In Sep 2015 Ariane had a thermal runaway on the battery in the electronic pod during charging. Did not find the real reason for the fire. Have a new battery pack and trials have been underway for 1 month.
- IFREMER is supporting the Polar Pod Project. Goal is to have a platform based on the FLIP design i.e. a vertical ship. Could not get private funding so the project came to IFREMER.
- Designed for 20m waves, 18kts wind, 4 science berths and 3 crew berths onboard. 22m long, 80m draft, 800 tonne, 7 persons, 60m in air draft, 2-3 month legs are planned during a cruise of two years. 1.5 kts drift speeds, 3 or 4 wind farms for 2.5kw of power. Will likely need a support ship to meet the

polar code requirements. IFREMER will be the owner of the Polar Pod. A call for tender for construction will be issued. It will include integration of science equipment. The Polar Pod will be operated for a two-year period by an oceanographic institution.
- Sea trials are planned for mid-2019 so construction will need to be during 2017-2018.

Question: How will crew changes be conducted?
Answer: Will need to use a supply vessel with DP 1 or 2.

NOAA Fleet Update (David Score):

- 2015-2016 field season was in the U.S. EEZ. *Ron Brown* and *Okeanos Explorer* have been in the Pacific for about 2.5 years.
- *Ron Brown* serviced the Tropical Atmosphere Ocean Array and West Coast Ocean Acidification expeditions.
- NOAA was nimble in responding to an El Nino year with a rapid response field campaign. Data will support improved forecast models. The expeditions included Global Hawk and satellite coverage.
- *Okeanos Explorer* completed deep-water exploration in the Western Pacific Monuments, found new species and did seabed mapping.
- OE will stay in the Pacific for the 2017 field season, using telepresence.
- *Ruben Lasker* has the bugs worked out, now had a 97% execution rate focused work on HABs, and California Current Ecosystem Survey, along with other surveys.
- *Henry Bigelow* completed the Atlantic Marine Assessment Program for Protected Species and worked with Unmanned Aerial Systems. More NOAA ships will be using UAS in the future.
- The NOAA Hydrographic fleet surveyed over 1435 square nautical miles in 2016.
- Fleet safety summary: approximately 30% of reportable incidents across NOAA Office of Marine and Aviation Operations were caused by improper focus on attention; 40% occur on the ships; but the overall rate has been reduced from 2015 to 2016.
- Hurricane Matthew tracked along the East Coast and within 48 hours NOAA was able to provide new data on the web. Data showed breaches in the coastal barrier islands.
- Overall NOAA executed 85% of planned sea days. The three oldest ships caused 80% of the lost time. 50% of the lost time was due to unscheduled maintenance with extended repairs or growth work; old ships have different challenges than new ships with regulatory design environments causing more maintenance; need to break off operations and leave an area to pump and dump due to new environmental regulation. There will be growth in

unmanned systems, cyber security and IT, and communications requirements will increase.

- NOAA fleet of the future is undetermined with planning efforts and funding support efforts on-going. A number of NOAA fleet recapitalization plans have been submitted but none have been approved. NOAA convened an Independent Review Team which has submitted recommendations regarding NOAA fleet recapitalization efforts. NOAA is also developing a Fleet Force Architecture.

RV Investigator Update (Toni Moate):

- CSIRO Marine National Facility (MNF), is a blue water research capability funded by the Australian government. The government only funds for 180 days of work so CSIRO is looking for additional customers to get up to 300 days of work. The government is looking for greater coordination and collaboration.
- *RV Investigator* is 94m long, 40 science and 18-20 crew, 10km range, dedicated laboratories to study interaction between ocean and atmosphere, an acoustically quiet ship. Independent committees assess the science and the projects which are conducted from the ship.
- Achievements include multiple research projects and a very high satisfaction rate from the users. The ship is very stable.
- Challenges include equipment maintenance due to the high tempo of operations resulting in issues: HVAC issues in Antarctic waters; a major failure of the bow thruster and is currently non-operative.
- Despite the issues, have still been able to meet about 95% of the objectives. Successful management of a medical emergency on a remote voyage. Mental health and well-being strategy is being developed. Have completed 13 voyages.
- HVAC issues include an inability to meet server room heat load; poor temperature control in labs; insufficient heating issues; issue with insulation under bridge wings; issues with the CTD door which was rebuilt 3-4 times in the shipyard but still had issues. It did not have a lock back and the door was completely replaced.
- There is high demand of up to 800 days but the government only funds for 180 days. They contracted to oil and gas but it resulted in perception issues using a government vessel for commercial work.
- Antarctic Division signed a contract in 2016 for a new ice-breaker, 156 m long, vs *Aurora Australus* which is 95m long.

NSF Update (Bob Houtman):

- The NSF Regional Class Research Vessel (RCRV) Project continues to more ahead
    - Request for Information was released in May 2016

        - 14 respondents, including seven shipyards
    - Request for Proposals was released in August 2016
        - Up to three RCRVs are possible but the actual number to be built will be determined by the final budget language
    - Final Design Review is planned for November 2016
    - Potential construction starts in mid-2017 with delivery of the lead ship in 2020, depending on the budget
- NSF funded a $2.4M U.S. upgrade to the Jason ROV system in 2015 which includes new:
    - Cable tether with 70,000 lb. breaking strength
    - Active Heave Compensation Winch
    - Launch and Recovery System to support the increased payload capacity of 15,000 lb.
    - Vehicle frame capable of 4000 lb. loads
    - Swappable heavy lift tool skid
    - Larger science payload basket
    - Additional floatation
- The NSF-funded Ocean Observatories Initiative (OOI) became operational in 2016
    - 83 platforms carrying over 830 instruments providing over 100,000 science and engineering data products
    - Data is freely available via the cyber-infrastructure user interface
    - Website is www.oceanobservatories.org
    - Data Portal is www.ooinet.oceanobservatories.org
    - Ask the Experts is available at help@oceanobservatories.org

BAS Update New Vessel (Randolph Sliester):

- *RRS Sir David Attenborough*, new ship will have 60 berths, current ship has 30 berths; the two current vessels will be replaced by this one new vessel. Final design is 128m long, hull PC 4 and propulsion PC 5, 29 crew and officers and 60 science, helicopter hangar for two aircraft, aircraft will be contracted, 3m moon pool, 42m piston coring system, science days scenario is 154 days but this is only one of several scenarios, this is 154 days on site, cutting steel in the summer of 2016, delivery in the summer of 2018, the new ship enters the fleet in the summer of 2019.
- Two stage acquisition process: Stage 1: 28 organizations submitted Expressions of Interest, eight shipyards were shortlisted. Stage 2: Rolls Royce was selected. The cargo carrying capacity was increased because it will need to carry all the logistical support. Science hangars and scientific winch system and over the side handing will be Rolls Royce design/equipment. Cammell Laird shipyard is where the ship will be constructed.
- Rothera Research Station will get a new jetty and container handling system to try to reduce the port days and turn around time, reducing the base energy footprint.

- The *RRS James Clark Ross* will be retired in 2020.

Benchmarking and cost control measures (Ian Sage):

- Benchmarking is one of the key themes of the IRSO website but it is difficult and an emotive topic area for operators and institutions.
- What do you want to measure? Cost: day rate, total operating costs, cost per bunk, long term maintenance included? $3.5M to $4.5M Euros per year were being shown as an average projected cost of a Regional Class Vessel?
- Efficiency: actual days vs planned days, maintenance downtime, science completed vs planned?
- How do we provide that meaningful data? How can true comparisons be drawn: by size of ship or vessel classes; by age of the ships; by science complement; by science outfitting i.e. telepresence; by crew composition i.e. government vs institution?
- Many papers have been written with trends identified and which include graphical representations but there are very little details.
- Ian is willing to take the lead in trying to compile ship data in classes but not identifying individual ship costs.
- Having a sound defensible benchmark system is key to making a request for a new ship (s).

Comment: Recently the Ocean Facility Exchange Group (OFEG) went through a process of reassessing the points assigned for each ship. The OFEG quickly found that it is very complex because the shore support and science equipment vary significantly between individual ships. There are even sub-categories within each ship class which adds to the complexity.

Japanese Fleet Update- Outlook of New Polar Region Ship – Next Generation Deep Exploration Vehicle (Yuki Mori, Masanobu Yanagitani, Takao Oshima, Kazuhiro Maeda):

- There is a flow of Cruise Planning events. An open competition goes out to the science community, then there is an internal application for JAMSTEC researchers, and there are also externally funded cruises. Each goes through a Proposal Screening Committee and the results go to the Schedule Planning Committee.
- The budget for the government funded cruises has been decreasing steadily.
- The proposals then go to the Marine Resource Board.
- *RV Kaimei* review: 100m length, 27 crew and 38 researchers, seismic capabilities, azimuth thrusters, retractable bow thruster, three labs, mammal observer room above the bridge, coring system, 3D seismic system with 4 x 3000m streamer, or a single 12k streamer, or 20 x 300m streamers, power grab clamshell system down to 6000m, 40m long large diameter coring

system, 36 bottle CTD sampler, ROV to 3000m, and also has a boring machine system.
- Since April the ship has been doing training cruises but some equipment has not yet been delivered from shipyard.
- *RV Mirai* did Arctic cruise in 2016, they needed to meet U.S. code requirements, which includes a vessel response plan, and also had an extensive outreach plan.
- Challenge to JAMSTEC: Advanced Tech development for Arctic Region Observation and Development of Next Generation Deep Sea Exploration.
- Arctic Observation in Japan: The *RV Mirai* is part of this effort but they are looking at building a new ship for the Arctic Exploration.
- Tech for the Deep Sea is for a Full Depth Research System, to investigate the Japan Trench. Step 1: A Full Depth ROV with update KAIKO MK-IV and start research operations in 2019. Step 2: Depth extension for AUV, for URASIKA, etc., Step 3: The plan is for a full depth HOV. Shinkai 6500 is turning 20 years old so they are looking at a goal of a Shinkai 12000!

New Build Progress Norway (Per Nieuwejaar):
- Update on building of two new vessels.
- *Dr. Fridtjof Nansen*, launched in 2015 is now outfitting and conducting dockside trials. Delivery is planned for December 2016 and is about 4 months behind schedule. This ship will be working off West Africa and Indian Ocean cruises in 2018.
- *Kronprins Haakon*, designed by Rolls Royce marine, being built by Fincantieri, launch planned for March 2017. 100m long and 20m wide. Z drives. PC 3.
- New coastal RV. The government proposed in the 2017 national budget to build the ship in 2017. 30-35m length, 9-10m wide, 15 berths, green propulsion, approximate cost $8M Euro.

Team Building activities and dinner at the Anacapri venue

Wednesday 12 October- Day Two

Administrative matters- logistics

Update on the Ocean Class Program (Tim Schnoor and Mike Prince):
- ONR Program overview and historical perspective.
- *RV Knorr* transferred to Mexico in May 2016
- *RV Melville* transferred to Philippines in May 2016
- *RV Neil Armstrong* delivered in September 2015
- *RV Sally Ride* delivered in July 2016
- *RV Kilo Moana* receiving a propulsion control system upgrade in 2016
- *RV Thomas G Thompson* receiving a mid-life refit 2016-2017. Plan is to be back in service July 2017.

- *RV Roger Revelle* – The mid-life refit is being planned for 2018-2019. One-year project timeline with a planned completion in 2019.
- *RV Atlantis*- The mid-life refit planned for 2019 and the five year Alvin overhaul is planned to be conducted at the same time.
- The Office of Naval Research (ONR) continues to own six ships.
- Science teams rotate to the ships for 18-25 day projects.
- ONR's ships average 280 days of science operations per year.
- The mid-life refits are expected to add 15 years of life to the ships for a total of 45 years.
- The mid-life refits will address new fuel efficient engines and regulatory requirement changes
- *RV Neil Armstrong* transited to the East Coast after delivery, went in the shipyard for installation of science equipment and sonars, conducted trials in the Bahamas. The ship meets the ICES 209 at 8 knots, the air borne noise is very low so the unintended consequence is that other noises usually masked by white noise are easily heard i.e. in the staterooms. The ship came in 100 tonnes light resulting in a more livelier ride than expected because of the shallow draft. Modifications being looked at include building a special hangar to do CTD work, and installing some permanent ballast. The one-year warranty period just ended.
- *RV Sally Ride* is in the middle of its science verification cruise, which will be followed by a UNOLS inspection and also a piston coring science verification cruise. The ship has a hands-free CTD handling system; has one large main crane on the main deck; 30,000 A-frame with a fold-to-the deck maintenance position; and consideration is being given to adding another smaller portable crane.

Hybrid propulsion system to be installed on *Johan Hjort* (Per Nieuwejaar):

- Several years ago the ship had a spectacular failure of the main propulsion gears; $6.5M Euro project was funded to convert the traditional propulsion system to a hybrid system; goals are to get increased efficiency and reduce underwater radiated noise.
- The project will include replacing the main engine, generator system, and installing a large battery bank; will also replace the shaft and propeller. The battery bank is used for shaving peak power requirements and adding power when needed instead of firing up another engine; the battery packs are modular and more packs can be added as needed if the space is available.
- The hybrid system also provides "back-up get-home" power if there is a main engine casualty. The challenge will be for the crew to learn to operate all the various modes, it also has a heat recovery system for energy efficiency, and a Selective Catalytic Reduction system. It will have a new Ballast Water Management System. The plan is for the ship to be in the yard November 2016 – February 2017. The crew will cross-deck to other ships while the

Johan Hjort is in the yard. 60% of the costs for operating the ships are in the personnel costs.

- The expectation is for reduced fuel consumption with the variable RPM and prop. The ship operates in DP mode with the diesel electric mode which will allow the main engine to be shut down. The heat recovery system reduces the need to heat boilers. There will be more flexible shore power capabilities by having a new connection in conjunction with the battery bank so the bank can provide a more constant power flow into the ship system with reduced power spikes. The upgrades will include resilient mounts for the engines and reduced propeller noise.

Question: Are you finding the crews and captains receptive of the new technology?
Answer: There is a wide variety of acceptance level but in general it is well received. With a fleet of several ships there is flexibility for those crew that prefer a certain level of technology to move between ships.

Question: Do you have any insight into the value of hybrid applicability into the different classes of ships i.e. coastal vs regional vs ocean class which all have differing mission profiles?
Answer: This was considered a low risk project because the government provided the money without the need for in-depth justification of the requirement or applicability to this specific ship. There was a very short time line to spend the money, so the project came together quickly based on inputs from the yards. The actual success of the hybrid system will be monitored and assessed based on the performance of the ship after the upgrades.

Comment: Stern azimuth thrusters are presenting new challenges to the crews and new experience is being gained for research ships.

Question: Is there any safety issue with such a large battery bank being onboard?
Answer: No new safety requirements have been identified.

Question: Did this project get coordinated with European programs because that work plan also has a focus area on hybrid propulsion?
Answer: This was a very quick Norwegian project and it was not coordinated with the EU programs.

Question: Has there been any investigation into new hull coatings like silicon to reduce fuel consumption?
Answer: No special coatings have been planned for the *Johan Hjort* but a comment was made that the *Joides Resolution* drillship has been recoated with a special material and the ship owner and ship operator have seen a 3-4% reduction in fuel costs.

Construction of two new Fisheries Research Vessels for Argentina (Martin Ehrlich, Laura Machinandiarena, and Adrian Madirolas):

- New 52m regional fisheries research vessel, they received a $40M Euro loan from International Development Bank. Budget is $33M Euro for two ships. 52m and 25m lengths. Coastal vessel contract award was made to Armon shipyard in Vigo Spain in 2016.
- Armon has a contract for a cost of $28M Euros to build the 52m vessel. It will have a drop keel, DP, 2 - 20ft containers, destroyer bow with no bulb, increased flat bottom for installation of sonar arrays and a flare, reduced stern freeboard, constant tension of towing cables. It will have a large suite of scientific equipment.

Question: How large is the trawl deck?
Answer: The exact size is on the drawing.

Question: What depth can you trawl to?
Answer: 100-200m depth.

Question: Is there a mid ships crane?
Answer: Yes, a small folding crane.

Marion Dufresne (MD) Refit (Helene Leau):

- The refit is expected to extend life of the vessel by 15 years. *Marion Dufresne* has 10 persons in the oceanography department. 120m ship, 110 passengers, 217 days for science, 120 days for logistic support, 48 crew, one of the longest ships in the European fleet, conducts multidisciplinary cruises, fit for work in the Southern Ocean as well as worldwide. The project was $10M Euros for the non-science upgrade and additional funding for the science equipment upgrade. The ship's home port is Reunion Island and it was a very tight schedule because the ship is needed to be available to conduct resupply of Sub Antarctic Islands and Antarctic Stations.
- The upgrade included gondola mounted echo sounders EM122 and EM170, sediment profiler, Kongsberg SBP 120, EK 80, ADCP 38, 75 and 150 kHz. 12m long gondola. Upgraded the coring system. New winches. A new coring A-frame to 45 tons. New handling booms. Also improved the long core so can now do 75m cores. The upgrades have solved the previous problems of the old system with core stretching.

Question: How many berths are available?
Answer: 110 berths available for passengers because it is also used to resupply the island. When doing science have generally 75 scientists onboard.

Question: Will the Polar Code impact *Marion Dufresne*?

Answer: *Marion Dufresne* does not go too far South so do not need to look closely at Polar Code.

Poster Session during the coffee break-

Theme 3: Manning, Safety and Training

RV Falkor crew-developed & crew-led safety and shipboard familiarization presentation (Eric King):

- Schmidt Ocean Institute has instituted a number of new procedures to familiarize themselves with safety procedures. The program covers all the aspects of personal protective equipment (PPE), fire safety, and immersion suits. Everyone gets issued a personal radio and EEBD. Training includes watertight door safety procedures, emergency evacuation slides, medical kits and procedures, work safety, lab and IT procedures and information, watch schedules and scientific computing systems.

Question: How about if you wanted to work with isotopes?
Answer: You would coordinate ahead of time with the ship and they will rent an isotope van.

Question: How does the emergency escape system work in bad weather?
Answer: Simulations were done and safety consultants were used to assess how it works in various weather conditions and it appears to be a valuable asset.

Psych Health and Wellbeing, eLearning for voyage participants (Ron Plaschke):

- Ron is retiring from CSIRO at the end of the month. IRSO is an amazing forum that transcends politics and cultural differences. Ron has been at CSIRO for 33 years.
- There are 3 million people in Australia living with depression and anxiety. The estimate is 45% of people will experience some form if it during their lifetime.
- Being at sea in a remote environment with international participants can contribute to anxiety.
- The CSIRO Psych Health and Wellbeing strategy is summarized in an eLearning module which must be completed by all cruise participants pre-voyage.
- There are several videos to watch and use to assess your readiness to participate on a voyage.
- There has been a positive response from the participants and no major incidents have been reported from remote locations.

NIWA Ship Security Breach – Lessons Learned (Greg Foothead):

- Sharing a new experience is also an important part of the IRSO forum.
- Greenpeace decided to use the *RV Tangaroa* as an example of the NZ government supporting the oil and gas industry. It was a protest event during the climate change world conference.
- NIWA is 100% NZ government owned. The mission is to enhance environmental resources so Greenpeace tried use the fact that *Tangaroa* was being used to support oil and gas which is not a green industry.
- Most of the NIWA ship work is in the Western Australia ocean area.
- NIWA added a 10k length winch and cable system to reach the deep ocean Kermadec Trench area.
- Oil and gas already is over 50% of NZ exports from primary industries. NZ put out a petroleum block offer in 2016, working with oil industry companies, most work has been to support environmental impact assessments and piston coring, etc. as pre-drilling events.
- The protestors climbed over the fence onto the pier, then up onto the top of the A-frame.
- There was a lax security situation on the pier during a critical period of time that allowed the protesters to climb onboard without being challenged. The 24-hour security requirement by the ship also broke down. Additional security training for the crew was done on how to manage protestors. An important lesson learned was the need to establish a media protocol and procedures.
- What went well: the police were professional and worked with NIWA to manage the situation, NIWA took a non-confrontational approach, NIWA media personnel stayed in touch with the client.
- Needed Improvements: Always provide 24/7 guard presence on the pier, etc.
- Challenges: The position of the research organizations should be to provide the scientific data without being perceived as advocating, government needs to better inform the public on the benefits and risks of oil and mineral exploration, ship activity and location is easily accessible to the by various means, there is increasing visibility on where the ship operates.
- Do better: do not solely rely on the port security company.

Polar Code (PC) development/implementation amongst IRSO members (Per Nieuwejaar):

- The Polar Code Enters into force on January 1, 2017 for new ships; January 1, 2018 for existing ships and ships now in construction.
- There not been much IRSO collaboration on this topic yet. Per would like to start sharing information between the IRSO members. Norway has 3 vessels that are in Category C and work in open waters. *GO SARS*, *Johan Jhort* and *Kristine Bonnevie*. For the Polar Service Temperature (PST) they are using 25C for Category C vessels.

- Per checked on ice accumulations limits and the three ships all meet PC Cat C requirements.
- The ships will need new search lights; extra gyros; covers for the fire hydrants, pilot ladders and other deck equipment; the potential need to provide heating of antennas and foundations is being evaluated; will need VHF radios with aeronautical frequencies; new STCW 95 regulations are expected next year which will include new Polar Code requirements.
- For *Kronprins Haakon* (KH) as a Category A vessel, PC requires five days of provisions in the lifeboats but there are no commercially available lifeboats that can do it. Efforts are in progress to develop the contents of the Group survival container; also developing plans to train and certify crew and science party on handling rifles for polar bear defense; developing a Polar Water Operations manual for KH is well underway will be used as a starting point.
- Looking at holding a Polar Code workshop in Muggiano, IT in April 2017 which will include a visit to the KH.

Group photo- The photo can be found on the IRSO web page.

Italian Navy survey vessels and updates (CDR Maurizio Demarte):

- The Italian Hydrographic Service has a Policy Branch, a Technical Service Branch and an Operational Branch. They have the mission of atmosphere, water column, and the seabed. In Very Shallow Water they use RIBS with hydrographic payloads, and two REMUS 100 vehicles. In Shallow Water they use 50m small survey vessels. Out to the Deep Water the ships include *ITS Ammiraglio Magnaghi*, which is undergoing continuous refits, but she is getting old so they try to keep the science equipment up-to-date. *ITS Ninfe* Class (*Aretusa* and *Galatea*) are fiberglass ships. Have one AUV for deep-water missions. Payloads on the ships include two frequency multi-beam systems. Dual-use activities means one ship can do many parallel activities. If the ship is planned to go in a certain location, they ask if any other agency has requirements or activities that can be also completed.
- Development: They have not been successful in getting a new ship so they are focused on refitting the existing ships. They are trying to develop key performance parameters for a new hydro vessel.

The National Research Council contribution to Marine Research and the Blue Economy in the Mediterranean Sea (Rosalina for Enrico Brugnoli):

- The presentation outlined the importance of the Bluemed Initiative and covered aspects of the sustainable use of marine resources, the Italian coasts and societal impact, marine research at CNR and their capabilities.

Marine study sites, marine protected areas and the importance of the blue economy to the Mediterranean region was highlighted.

Lunch

Theme 4: Scientific Technology

Schmidt Ocean Institute's new ROV Subastian – a new free-to-use 4500m ROV for the scientific community (Eric King):

- The vehicle was designed in-house with a new docking head and a new winch. The command and control system is the heart and brains of the vehicle.
- Sea Trials were successful in the vicinity of Guam in the summer of 2016

Knowledge, Innovation and Technology – new tools for shallow water surveys at CNR (Ennio Marsella):

- There are 1M people living around Naples so in some areas this is just as high a population density than it is in Bangladesh.
- The connection between the city and port is an important inter-relationship in studying the dynamics of populations living in the coastal regions.
- The geographic setting is critical and the correct tools for surveying in the shallow water are needed.
- A possibility is to use a scientific platform as a home base for conducting important science data collection. They also use mobile shelters. They use a 28m Fast Cargo Vessel which can carry one 20 foot container and has a small moon pool.
- The Acqua Alta Oceanographic tower is a valuable infrastructure facility.
- They are planning to propose The Smart Bay Concept which is a multipurpose platform.

The role of ship based measurements in the satellite calibration and validation activities – CNR experience (Rosalina Santoleri):

- Satellites play an important role in Ocean monitoring and the CNR mission, Copernicus Marine Environmental Service (CMEMS)
- They have an architecture for the European Ocean Color component which is now in operation. The data calibration and validation is important because the sensors are affected by instrument degradation, errors and assumptions.

Theme 5: Legal and Insurance

Marine Science Research (MSR) authorization related issues (Alison Reed):

- There is a requirement for some MSRs to get diplomatic clearances. Science has no boundaries. Science also has many different faces.
- Challenges and trends include:

- Timeliness
- Differing coastal state internal processes
- Maritime boundaries
- Optics of the planned work
- Changes to the request once it is granted
- Categories of the work i.e. some things like routine ocean observation may not be MSR considered by the U.S. but the coastal state may not agree including Citizen science and marine mammals fitted with oceanographic sensors.
- In US waters, they look at the nationality of the chief scientist to determine if a clearance is needed. For example, a Canadian chief scientist working aboard a US flagged vessel in US waters would require a US clearance.

Theme 5: Legal and Insurance

Recent Developments in Marine Law and Insurance relevant to Research Vessels (Jon Alberts for Dennis Nixon):

- There have been a number of interesting Maritime Law incidents in the past year which apply to research vessel operations.
- The inflow of high vessel value continues which increases risk exposure in the event of a vessel loss.
- A review of accidents, court rulings, and legal decisions all serve to remind the vessel operators the importance of vigilant operations.

Theme 6: Cooperation and Outreach

Search and recovery methods for aircraft and vessels. Have research vessels a role? (Aodhan Fitzgerald):

- There have been a number of high profile aircraft losses over the ocean and there are needs to do underwater searches for the black boxes and the acoustic pingers.
- The RVs may have a role to play so there are ways to do some preparations and training.
- The acoustic pinger frequency is not a good frequency for long-range propagation because the ocean is noisy and the batteries do not last very long. 2500m range is the maximum to hear a pinger. The pinger could be heard better on the multi-beam system compared to using other shipboard systems.

INMARTECH 2018 Host Venue (Per Nieuwejaar):

- INMARTECH 2016 was successfully held in Bergen, Norway the week of October 12, 2016. 200 people from 16 nations attended to hear the 55 presentations.
- Action item is to work with Per to set up an IRSO website place for INMARTECH technical exchanges.

Ocean Facilities Exchange Group (OFEG) update (Colin Day):

- The goal is a bottom up approach to research vessel planning.
- Research vessel planning efforts started in 1996 and OFEG began in 2006. There is now an OFEG and OFEG Tech- they realized the effective and efficient exchange of equipment and integration of portable equipment is essential for effective science delivery.
- Benefits are providing national scientists with a much greater access to ships, equipment and locations; OFEG includes 20 highly specialized Global/Ocean ships and associated equipment; OFEG has shown it greatly increases efficiency.
- A good example of the efficiency is supporting the OSNAP arrays. Another example is a joint *John Clark Ross* and *Sonne* geophysics cruise off of South America.
- A wide variety of ships are available through the OFEG barter system.
- Equipment availability is also increased through OFEG.
- The coordination and collaboration includes training opportunity exchanges.
- There is a continuous information exchange on the short notice ship or equipment support needs.
- An estimate of the cost savings is in the range of $2.5m Euros
- OFEG meets twice per year to exchange details on forthcoming ship programs. They actively seek to fill program gaps and members make themselves available throughout the year via telephone and email.
- An initiative is an integrated web based Voyage Planning System= a scalable modular approach. They are now able to more easily look at integrating program requirements for ships and equipment. The marine facilities planning tool is currently used by NIOZ and NERC. Program, Inventory Management, Personnel Planning, Program Construction, Project Management and Scientist Portal. Natalie Clark replaced Beth Woodward.
- The software is open source but is not free. NERC is interested in getting more users and is willing to discuss costs.

Bus to Marina Grande- All IRSO attendees were invited for an open house, hosted by CNR aboard the vessel, berthed in the Capri Harbour. The event was a highpoint of the meeting as it provided an opportunity to tour three research vessels, speak to the crews, and enjoy a relaxed social event.

Oceanographic Ship Visit
In the port of Capri, we visited the *CNR RV Minerva Uno; CNR RV G.Dallaporta;* and the *NATO RV Leonardo*

Conference Dinner at Da Paolino Restaurant-
The annual IRSO dinner was held in a local restaurant which provided an excellent opportunity for team building, a sharing of international perspectives, and good will.

Thursday 13 October

Administrative matters- logistics

Theme 6: Cooperation and Outreach continued

JCOMMOPS cruise notification tools (Martin Kramp):

- A monitoring and coordination center has been established for ocean data collection and distribution. Conceived in the 60's, the task was moved away from the IOC and to IODE in 1995. NOAA David Legler has tasked the JCOMMOPS to take the task back under the IOC. It operated through sustained funding for Ship Coordination and IT development. It is the coordination center for core in-situ ocean observing networks i.e. ARGO, DBCP, Go-ship, OceanSites. They can coordinate synergies. There is now an adequate IT environment up and running with tools to degrade and hide cruise details for unauthorized users; there is also the possibility of customizing reporting and statistics and they have an API connection.
- They are acting as the ARGO deployment manager, which includes Bio ARGO.
- They have detailed cruise information but they need other connections from agency representatives. The Team is ready to centralize, process, publish and promote cruise plans as appropriate by the operators.
- National Focal Points are needed.
- This could be an IRSO inter-sessional task project.
- All marine platforms are registered at JCOMMOPS, why not all cruises?

Question: Have you coordinated with UNOLS and R2R?
Answer: Yes, R2R is already connected via machine to machine. They need cruise tracks at least 3 months in advance to coordinate ARGO float deployment.

Schmidt Ocean Institute's (SOI) Evolving Outreach Program – a new approach to connecting at-sea science and with the shore-side world (Eric King):

- SOI has set up a new and improved website and media presence. It includes blogs, a media gallery, ROV Subastian video series and a 3D walk through tour.
- A Twitter account is now established; dedicated releases are conducted for post cruises, scientific data sharing, R2R. *Falkor* is the only ship from a non-profit organization that is participating in R2R.

Expanding the Reach of Ocean Exploration: Global Foundation for Ocean Exploration (Melissa Ryan):

- Mission is to identify and develop engineering innovations in underwater robotic technology.
- To train, nurture, and employ the engineers that deploy robotic technology
- They have the same people that make the technology then actually operate it.
- They assess the future technology needs that will allow exploration of the deep ocean.
- They have a formal partnership with NOAA OMAO. GFOE manages all the deep submergence operations for *Okeanos Explorer* (OE) which is the only U.S. federal ship specifically mission-funded for exploration work.
- *Okeanos Explorer* deploys a two-body ROV system rated to 6km. It is called Deep Discoverer (D2). D2 has extensive lighting and cameras.
- D2 is the "in-water" basis for the OE telepresence system.
- There are only 2 scientists at sea on the ship but have an unlimited number of people ashore participating in the cruise via telepresence.
- The GFOE Team includes a talented group for film production.
- YOGI is a 1500m rated ROV and GFOE also has a new 12m RV called Annie which has DP. Annie was custom designed and built for ROV work, can be airlifted by heavy lift helicopter, deployable from larger vessels and allows simultaneous ops. Cost on the order of $650K U.S.

IHO Presentation on the fundamental requirement for bathymetric data collection on all voyages (Robert Ward- Secretary- General, IHO):

- Intergovernmental Consultative and Technical Organization; 85 member countries; mission to ensure that all the world's oceans seas and navigable waters are surveyed and charted.
- Goal is to maintain a global reference dataset of bathymetry in Boulder, CO
- IHO-IOC General Bathy Chart of the Oceans –GEBCO
- Only about 15% of the ocean depths are directly measured, the rest is inferred data.
- 50% of the world's coastal waters are still un-surveyed.

- The Malaysia Airlines flight MH370 search area was based on only two 1960's principal lines and they expected a relatively flat area. In fact it was 1500 meters deeper with multiple seamounts.
- The need is to increase bathymetric data collection. Need to encourage holistic government survey and data gathering programs i.e. collect once and use many times. And then share the resources. The data needs to be made discoverable, all data is important, including old data, even if you think it will not meet IHO charting standards. For many purposes even knowing the depths to within a few meters is better than having no data all in the area.
- Crowd sourcing by mariners and scientists can collect data on all voyages, whenever possible.
- Every ship already has the equipment required to measure depths.
- The IHO Data Center for Digital Bathymetry (DCDB) is located in NGDC (NOAA) in Boulder, CO.
- It is a global data and discovery portal with upload and or meta-data and will be able to download data in early 2017
- The GEBCO project is also a global bathy dataset with gridded reference data.
- A solution to crowd sourcing data collection is a data logger that you can plug in directly into your system. It collects x,y,z,t and costs about $150 U.S.. It can be just the same as has been done for years with meteorological data for weather forecasting. The data loggers are from companies including Sea-ID, Teamsurv, Olex, Rose Point navigation Systems, etc. IHO also has a crowd sourcing working group.
- The IHO has made available some guidance for bathy data gathers: IHO Pub B-11 – IHO-IOC GEBCO Cookbook. www.iho.int
- The requirement for bathy data collection on all voyages supports the United Nations Sustainable Development Goal 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development
- The objective is to encourage ship operators to run ship echo sounders whenever possible and to make the data discoverable

Question: Many governmental national hydrographic offices are saying the same message of sending in all data regardless of quality.
Answer: The IHO center perspective is all data has value and they are trying to direct encourage data be sent to the Boulder data center.

Comment: Martin was invited to make this same presentation at the International Meeting of the Ship Observation Team.

Coffee Break and Poster Session

AORA Co-operative Atlantic mapping Project Update (Margaret Rae and Aurelien Caronniere):

- Atlantic Ocean Research Alliance
- A partnership between Canada, the EU and the U.S.
- The Galway Statement has several overarching objectives. The U.S. Co-chair is Craig McLean from NOAA who is the Assistant Administrator in the Office Oceanic and Atmospheric Research (OAR)
- There are Tri-lateral Co-chairs. The goal is to organize cooperation to work together to advance results in identified areas of research cooperation and to seek efficiencies and increased effectiveness.
- This will be done by AORA through organizing and leveraging activities and data sharing.
- Focus areas include: Ocean Health and Stressors, Ocean Observation and Prediction, Atlantic Seabed Mapping and Characterization, Aquaculture, Marine Microbial Ecology
- The implementation working groups have priority areas of cooperation: Formal Tri-lateral Working Groups have been established for Aquaculture, Ocean Literacy, Atlantic Seabed Mapping and Characterization, and an Ecosystem Approach to Ocean Health and Stressors. Establishment of the remaining areas of research cooperation are still evolving.
- In the U.S., NOAA is the lead agency. A collaborative International Research Program on the Coupled Atlantic-Arctic System has been established and a Science plan was finalized in May 2014.
- A Dear Colleague Letter (DCL) number NSF 10-006 was issued in October 2015
- Another upcoming collaborative opportunity will be the U.S. NASA EXPORTS Program
- In Canada there is significant receptor capacity to further advance work in Ocean Health and Stressors
- Next speaker will talk about the mapping of the seabed project in Work Package WP9. Atlantic Seabed Mapping International Working Group.
- It is an enormous task to map the Atlantic Seabed. 20 million km2, mean depth 3900m, general depth is 8380m. Example is MAREANO. In terms of cost it would be $6.5B Euro or $130M Euro/year for 50 years to do the entire Atlantic. This is not realistic, so new approaches must be taken such as more efficient use of existing ships, AUVs, etc.
- The Seabed Mapping Working Group was established in December 2014, chaired by Alan Stevensen. They have five themes: Leverage existing ocean exploration knowledge, integrating mapping initiatives, Communicating and sharing best practices for survey planning, Mapping the seabed specifically the North Atlantic with target areas and minimum data needed for reconnaissance, Raising awareness of the for mapping the Atlantic Ocean.
- The group has made recommendations such as “All data that currently exists should be identified and made accessible through the establishment of a North Atlantic Data Portal”

- A research vessel coordinator is appointed and has resources to liaise with the research institutions that operate surveying and research vessels. A pilot project will be scoped to look at incorporating targeted sites, and identify ways that high resolution elevation data can be made available.
- Progress and activity includes 2015 meetings, 2016 meetings, Atlantic transects such as 2015 Celtic Explorer cruise to Tromso.
- There has been a prototype of the data viewer in place by NOAA.
- Connectivity has been established by the Ocean Literacy Working Group

NOAA Co-operation and Outreach (LCDR Megan Raymond):

- Climate Program Office is located in NOAA. NOAA ships conduct approximately 240 Days at Sea in international waters.
- The PIRATA mooring line is maintained by NOAA
- The RAMA mooring (Research Moored Array for African-Asian-Australian Monsoon Analysis and Prediction Array) has open locations that need to be filled and NOAA is looking for international partners.
- Challenges to sharing future cruise plans include technical infrastructure and security issues.
- Proposed solution is the JCOMMOPS system to centralize future cruise information. This approach has the technical infrastructure and ship operators can submit future plans with minimum metadata being required.
- Suggestions include identifying and sharing basic information that can be shared broadly, including vessel name and location. A Login is required for more detailed information. The organizations submitting the information can decide what is privileged information. Post cruise plans can also be shared on the POGO site.

Question: Is the POGO site not able to handle the future cruise plans?
Answer: The latest cruise plan posted is 2012. The new JCOMMOPS system is now capable of handling new cruise plans. The POGO website is not detailed enough.

European Research Vessel Operators- ERVO (Olivier Quebec):

- ERVO is an informal PAN-EUROPEAN long-standing network with no legal status and financial resources
- Objective is to create and maintain a forum for European RV operators. Focus is Enabling the Co-ordination of Coastal and Regional Class ships in Europe.
- ERVO established a "The Way Ahead Working Group" with seven focus topics
- ERVO- Legal framework/structure
- EUROFLEETS 1 + 2 Legacy
- ERVO/IRSO Relationship
- ERVO Collaboration with EUROCEAN
- ERVO and EOOS (The European Ocean Observing System)

- ERVO - New Organization. It could evolve into a somewhat more formal and structured group without losing its identity and flexibility. An ERVO Executive Committee, A General Assembly, TOR have been updated.
- www.ervo-group.eu/

The preservation of the deep seafloor as a key factor in a blue growth perspective (Fabio Trincardi):

- There is a high concentration of garbage in the Venice lagoon
- Bottom trawling as a geological agent is causing seascape alterations
- A scientific objective is Quantifying the Impact of Dense Slope Water on the Slope
- Bottom currents can be traced in detail
- The reason this is important is because this is an area with the highest level of ammunition dumping sites in the Mediterranean. These currents can uncover the bombs.
- A second example is the density (hperpycnal) flow through fiumare.
- These flow events take illegally dumped garbage down to bottom of the sea when there are flash floods.

Medium to Long-term needs for Research Vessels supporting Ocean Observing System Infrastructures (Juan Jose Danobeitia):

- PLOCAN – The Oceanic Platform of the Canary Islands
- ENVRIPLUS includes all the Environment Research Infrastructure (RI) supported by the European Commission.
- Long term needs and commitments can be expected from ERIC funded by the member countries for one or two decades. What are the wishes of the Marine RIs towards oceanographic RVs?
- What EU level of cooperation and coordination is needed?
- The Spanish level proposes to establish a Spanish EMSO Consortium.
- The Framework European Seas. Some research infrastructures already have plans or preliminary views, EuroARGO ERCiC, IRCO, JERICO/JERICO/JERICONEXT
- SIOS –Svalbard Integrated Ocean Observing System
- Looking at how to get Cooperation access to Research Vessels
- EMSO-ERIC regional nodes: 11 nodes and 4 test sites

RVOC (Jon Alberts):

- Briefing was skipped due to time constraints and the information is available on the IRSO website for download.

Introduction to venue for IRSO 2017 (Japanese reps):

- The IRSO delegates confirmed October 17-20, 2017 in Japan as the time period and location for the 30th IRSO meeting.
- The meeting will be held primarily at the JAMSTEC facility in Yokohama and will include an excursion to JAMSTEC Headquarters in Yokosuka where the RV Kaia will be open for tours.
- A central hotel for all delegates with bus transportation to and from the meeting site will be arranged with a reasonable conference fee.
- Details on the IRSO 2017 will be posted on the IRSO website.

Election of new IRSO Vice Chair:

- Erica Koning from NIOZ was nominated, seconded and elected as the new Vice Chair

Thanks to the Hosts

- Aodhan Fitzgerald thanked CNR, Giuseppe Magnifico and his entire staff for the superb logistical support provided in preparing for and executing the meeting.
- Jon Alberts presented Giuseppe with a token of appreciation.

Transfer of Leadership

- Aodhan Fitzgerald stepped down as IRSO Chair and Bob Houtman assumed the role of IRSO Chair
- Bob Houtman presented Aodhan with a token of appreciation for his inspirational leadership.

Official Closing of the 29th Meeting of IRSO

- Action item: Work with Per Nieuwejaar to set up an IRSO website place for INMARTECH technical exchanges.

- Action item: Look at how to connect the UNOLS Scheduling and ship track info into the JCOMMOPS database.

- Action item: Look more closely at possibly opportunities for collaboration through the Go-Ship program.

- Admin note: There was too much presentation material to be on loaded to the stick so it will be made available via a website to download later.

- Admin note: Limit the number of slides allowed for each presentation to assist in time management