SUBMARINE CABLES AND BBNJ

Side Event 29 August 2016

International Cable Protection Committee (ICPC)

INTERNATIONAL CHAMBER OF COMMERCE

EastWest INSTITUTE

Welcome!

- **Introduction** by Graham Evans, ICPC Chairman, EGS Survey Group
- **1. Environmental Aspects** by Nigel Irvine, ICPC Vice Chairman, Verizon, and Lionel Carter, ICPC Marine Environmental Advisor, Victoria University, New Zealand
- **2. Cable Owner's Perspective** by Robert Wargo, ICPC Executive Committee Member, AT&T
- **3. Cable Route Survey** by Graham Evans, ICPC Chairman, EGS Survey Group
- **4. Cable Ship Operations** by Jim Herron, Managing Director, Marine Operations, TE SubCom
- **5. Ocean Governance** by Douglas Burnett, ICPC International Law Advisor, Squire Patton Boggs (US) LLP
- **Q&A Session**

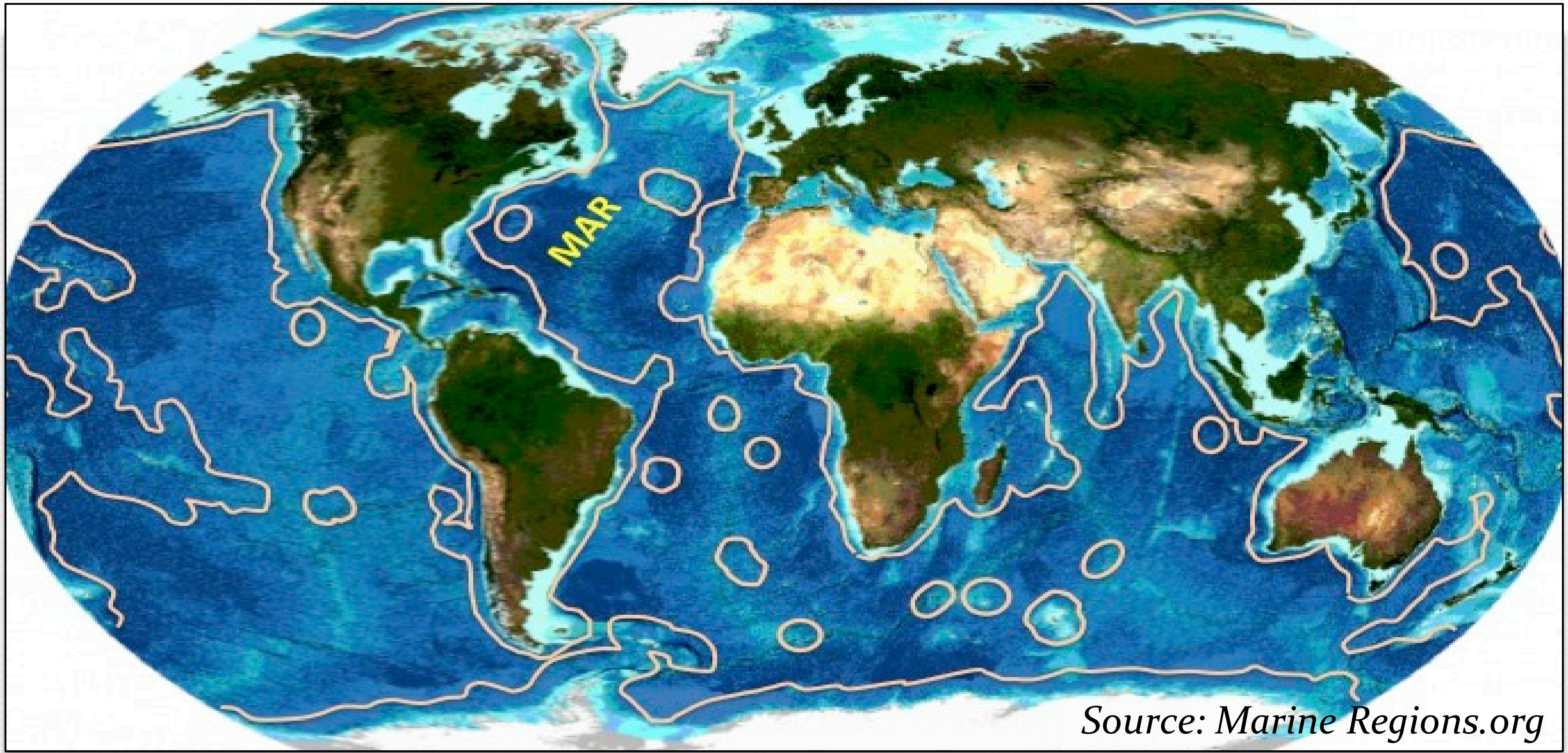
SUBMARINE CABLES AND BBNJ

1. ENVIRONMENTAL ASPECTS

Nigel Irvine, ICPC Vice Chairman, Verizon
on behalf of
Lionel Carter, ICPC Marine Environmental Advisor, Victoria University, New Zealand

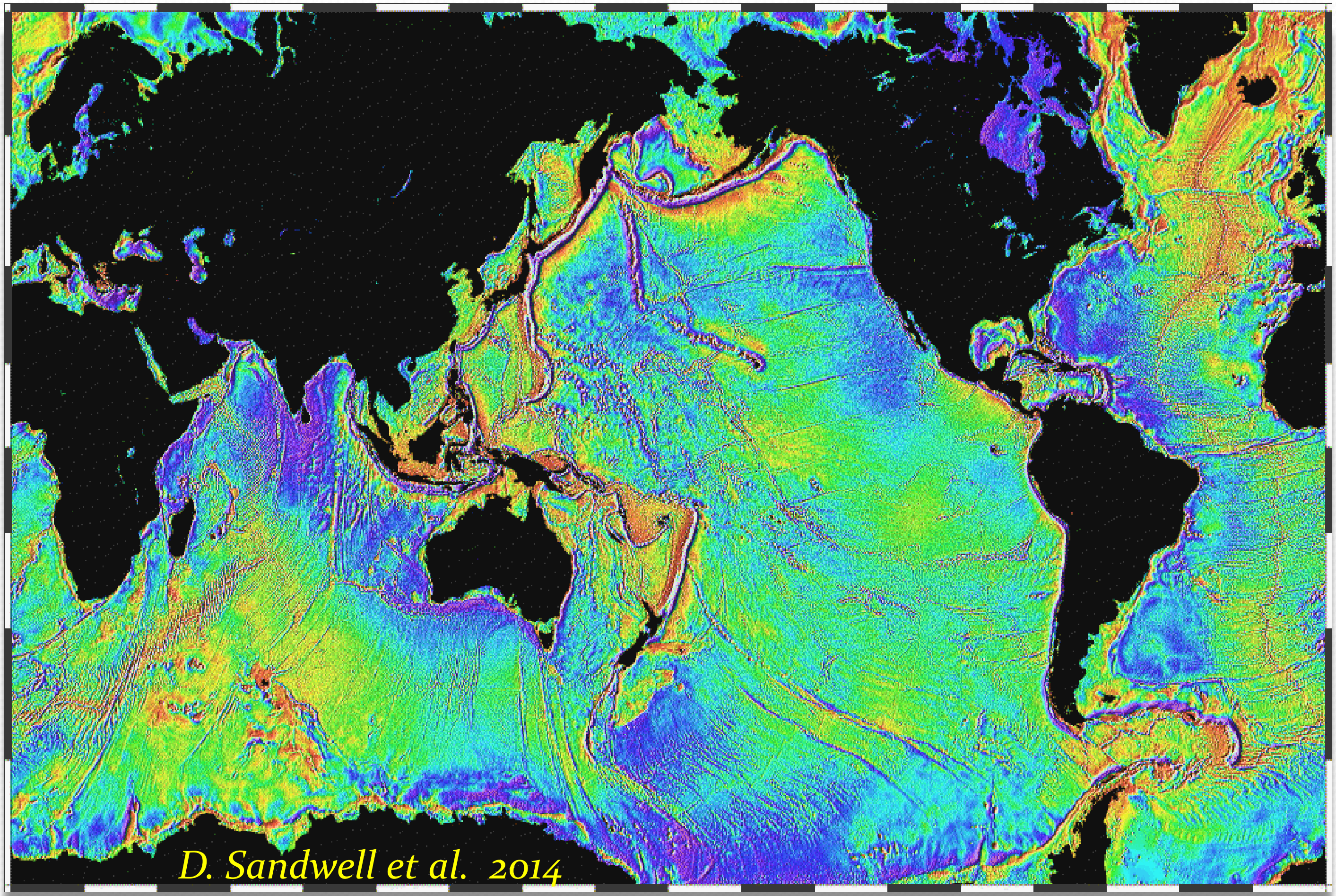
What is the BBNJ area?

[1]Ocean Area = 71% High Seas = ~39%
Ocean Depth = 3688 m High Seas = >3688 m
[2]MPAs = 4% of Ocean

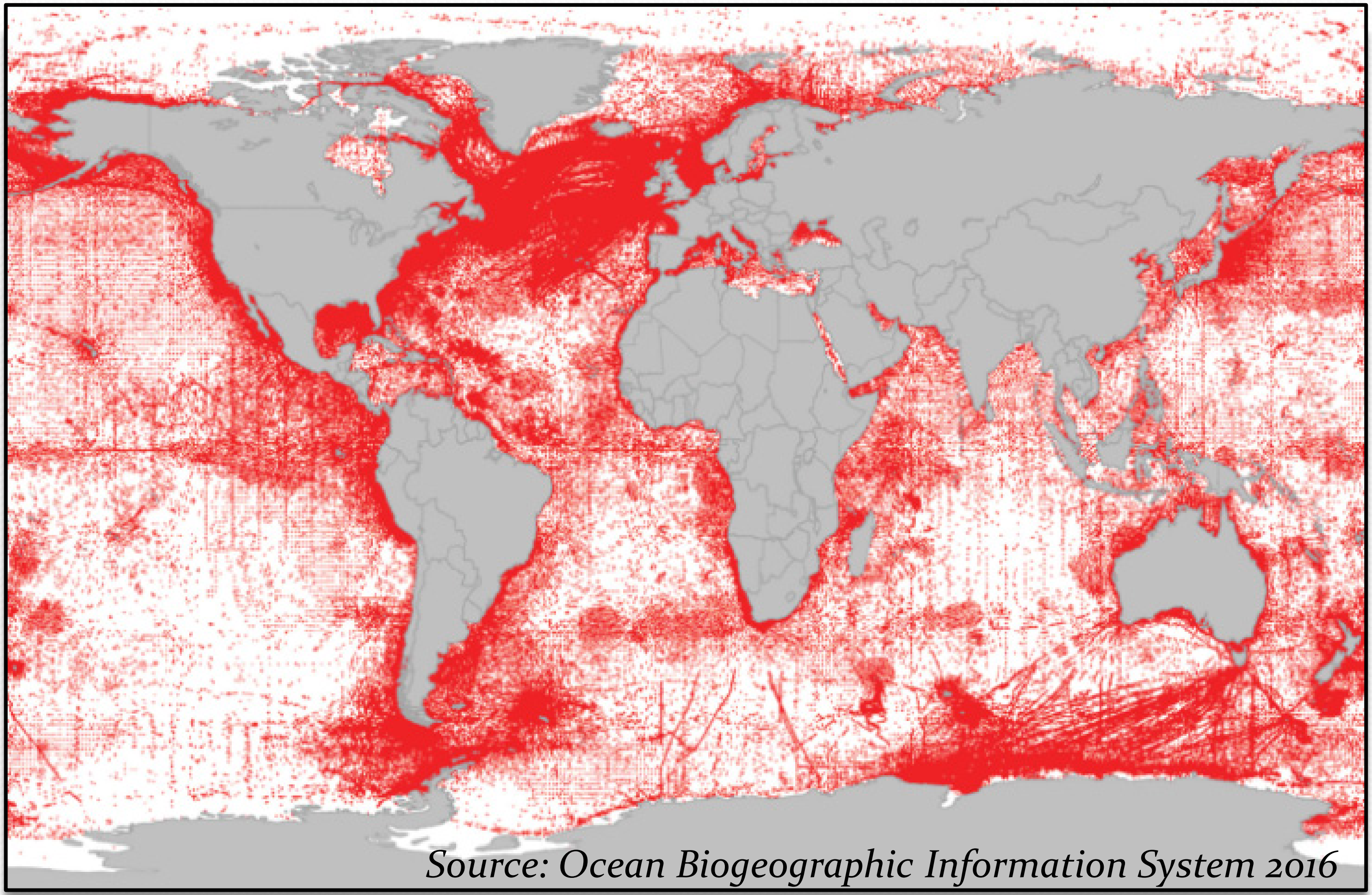


Source: Marine Regions.org

Physical Aspects – reasonable knowledge of seabed/ocean

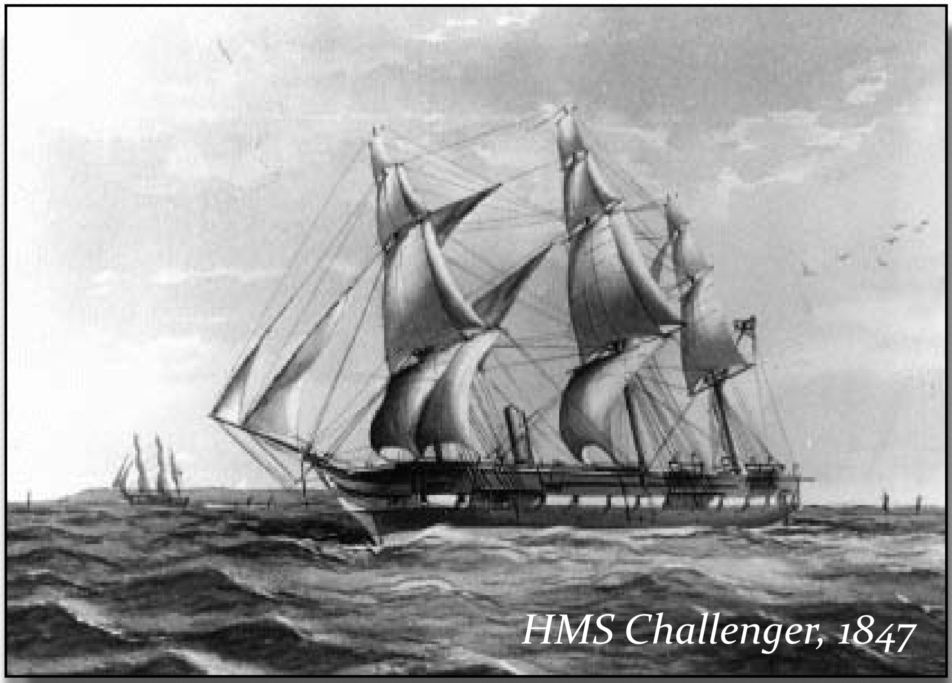


Biological Aspects - limited for S. Hemisphere/Arctic



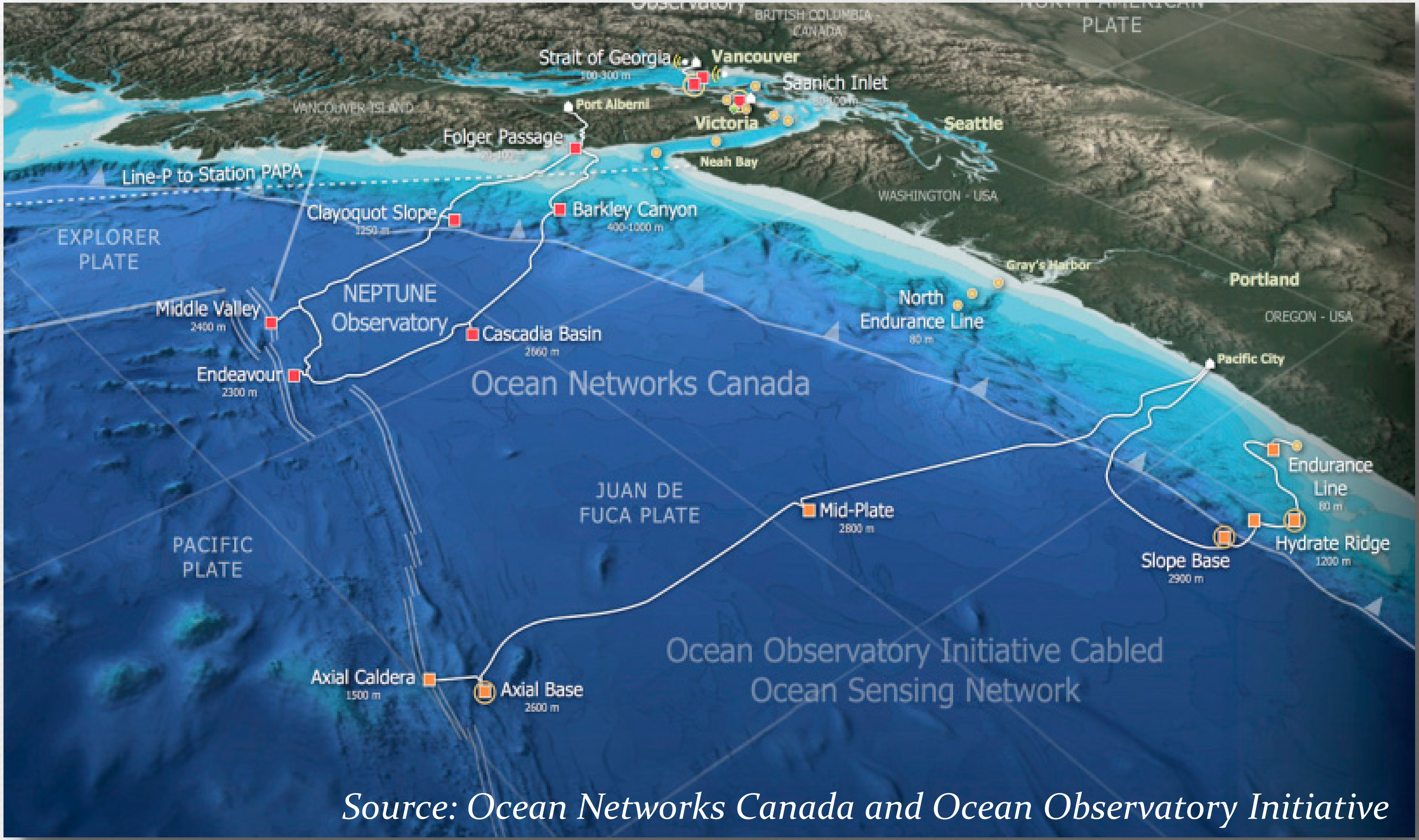
Source: Ocean Biogeographic Information System 2016

Cables and science – a long association of discovery



- Cables and marine science have an association that began with the first trans-oceanic cables in 1858-1866
- Cables recovered for repair, came back with organisms from depths (>500 fathoms) that some scientists thought were too inhospitable to support life.
- To settle this fundamental issue, *HMS Challenger* undertook the first global ocean survey 1872-1876.
- A major finding is that life occurred at most ocean depths.

Cables and science – underpinning ocean observatories



Source: Ocean Networks Canada and Ocean Observatory Initiative

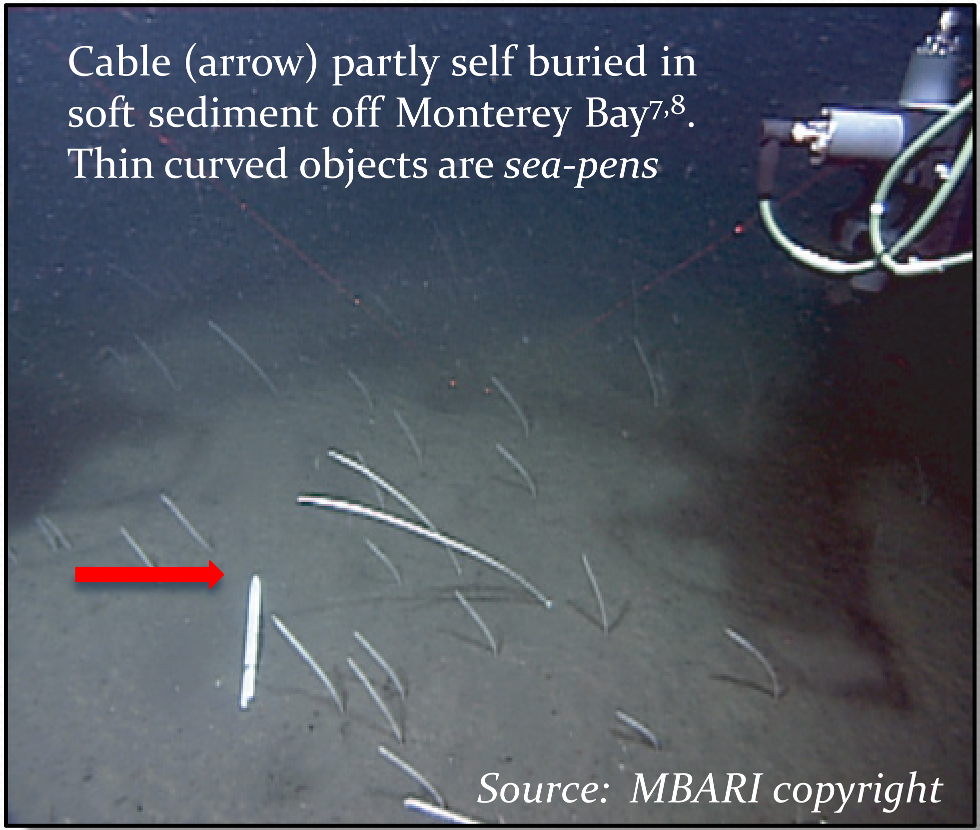
Cables and environment - based on peer-review research

Cables and environment

According to the UN World Ocean Assessment (2016)[20]

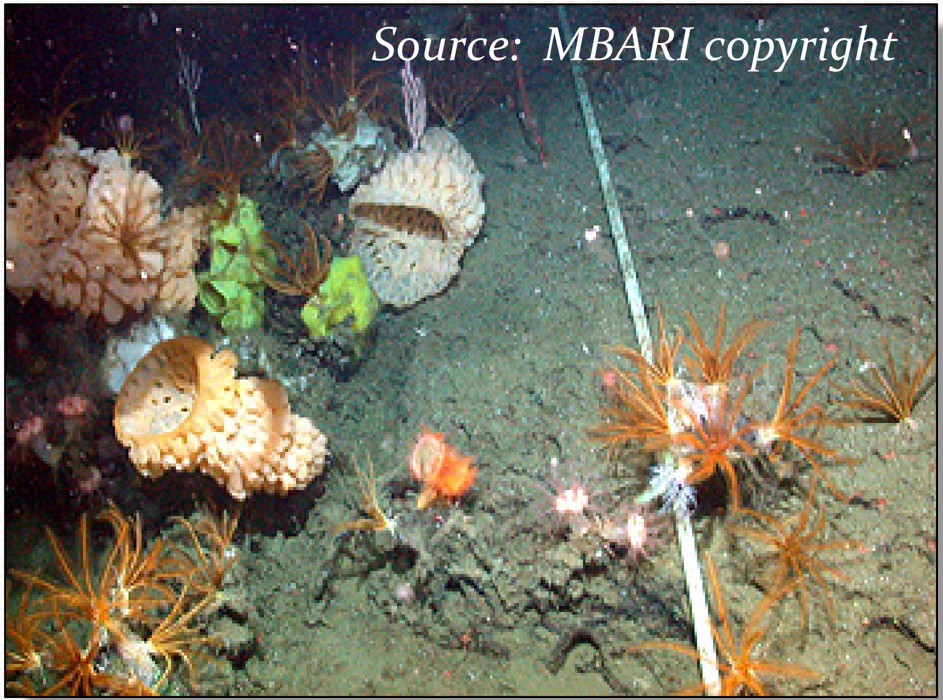
"A large body of knowledge already exists about the construction and operation of submarine communication cables, including how to survey environmentally acceptable routes and allow for the submarine geology."

Telecom cables in BBNJ area – physical presence



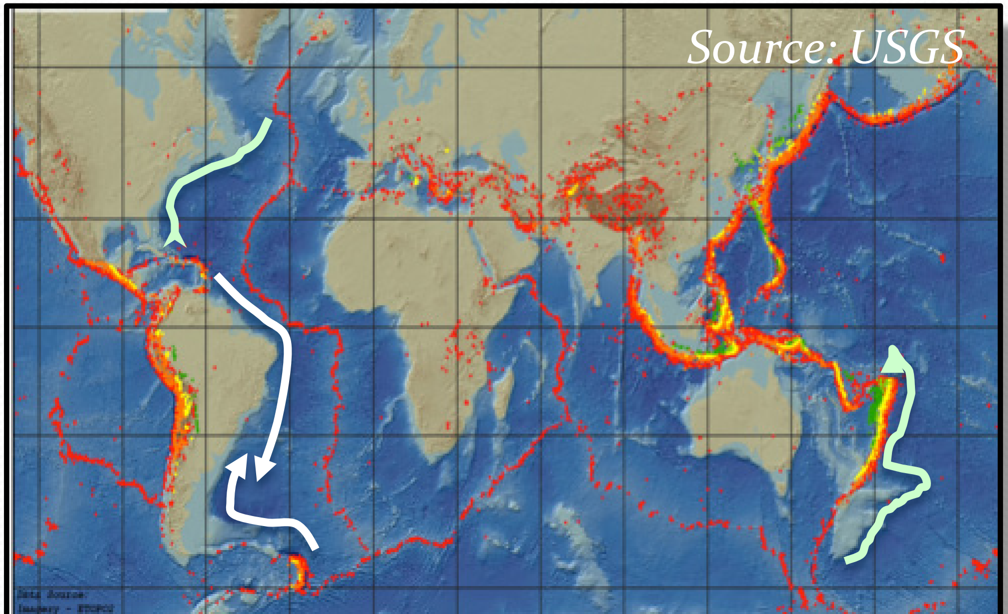
- Because of depth, BBNJ area cables are typically 17-21mm diameter
- Their high-grade polyethylene sheathing is chemically inert[3,4]
- Electro-Magnetic Field (EMF) is less than lap-top computer
- Cables are laid directly on the seabed thus minimising environmental disturbance[5,6]

Telecom cables in BBNJ area - biota



- Independent studies of continental shelf/slope settings show:
- No differences in faunal abundance and diversity near and distant from cables [7-10]
- Modern cables successfully designed and laid to prevent entangling whales, which has not happened over past 60 years[11]. ABNJ too deep for whales
- Fishes bite cables but caused <0.5% of all faults in 1959-2006, and no faults since[12].

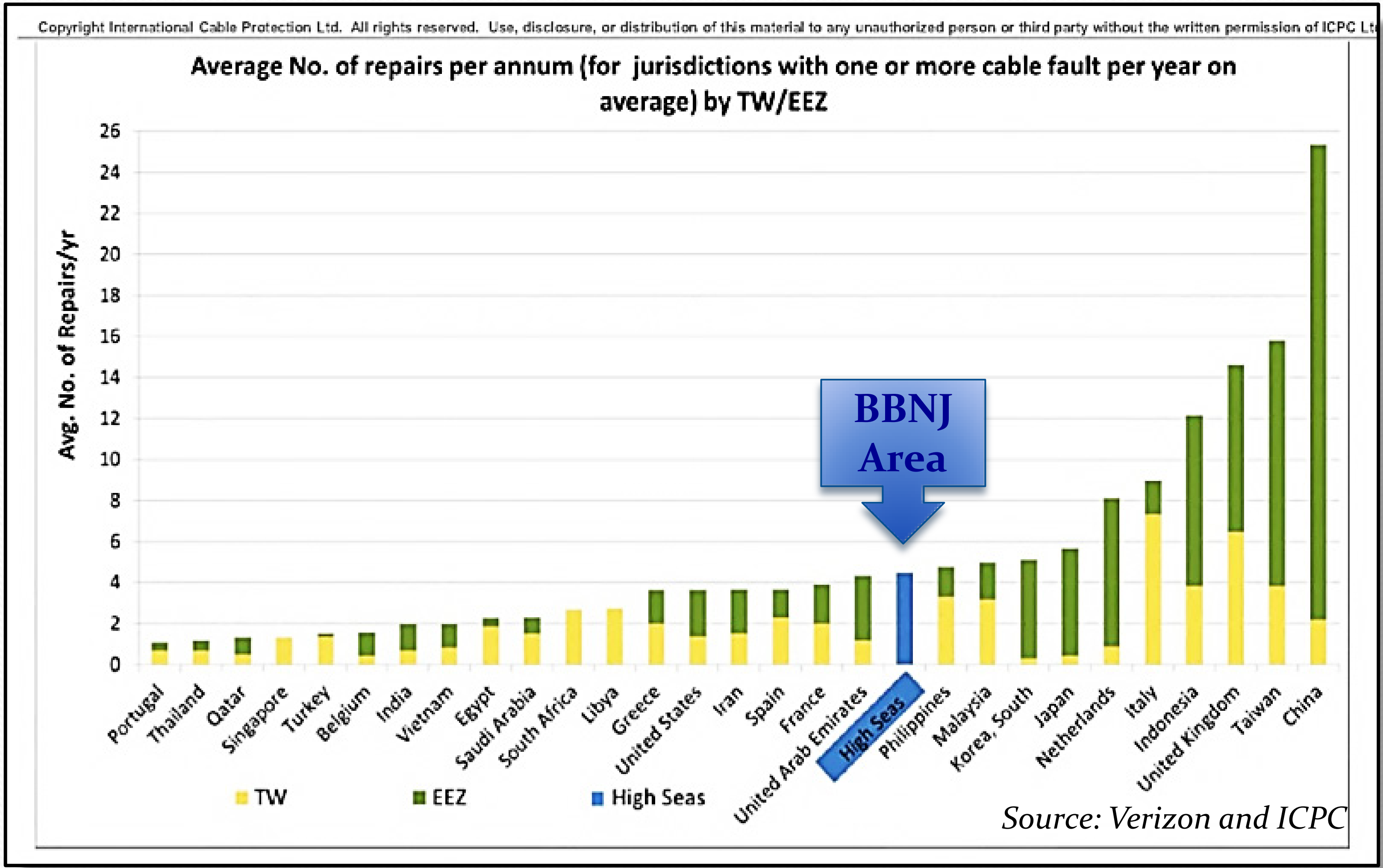
Telecommunications Cables - faults



Global earthquake epicentres 2000-2008 and examples of 3 areas of abyssal currents (white arrows).

- Deep ocean faults are mainly from landslides, turbidity currents and current abrasion
- As such they occur in regions of [i] strong currents as along ocean margins and seamounts and [ii] colliding tectonic plates where earthquakes, tsunami, storms and sediment-laden floods are common e.g. Pacific rim[14,15], Mediterranean Sea[16]
- This localised damage means that most of the BBNJ-area has few cable faults.

Telecommunications Cables - faults



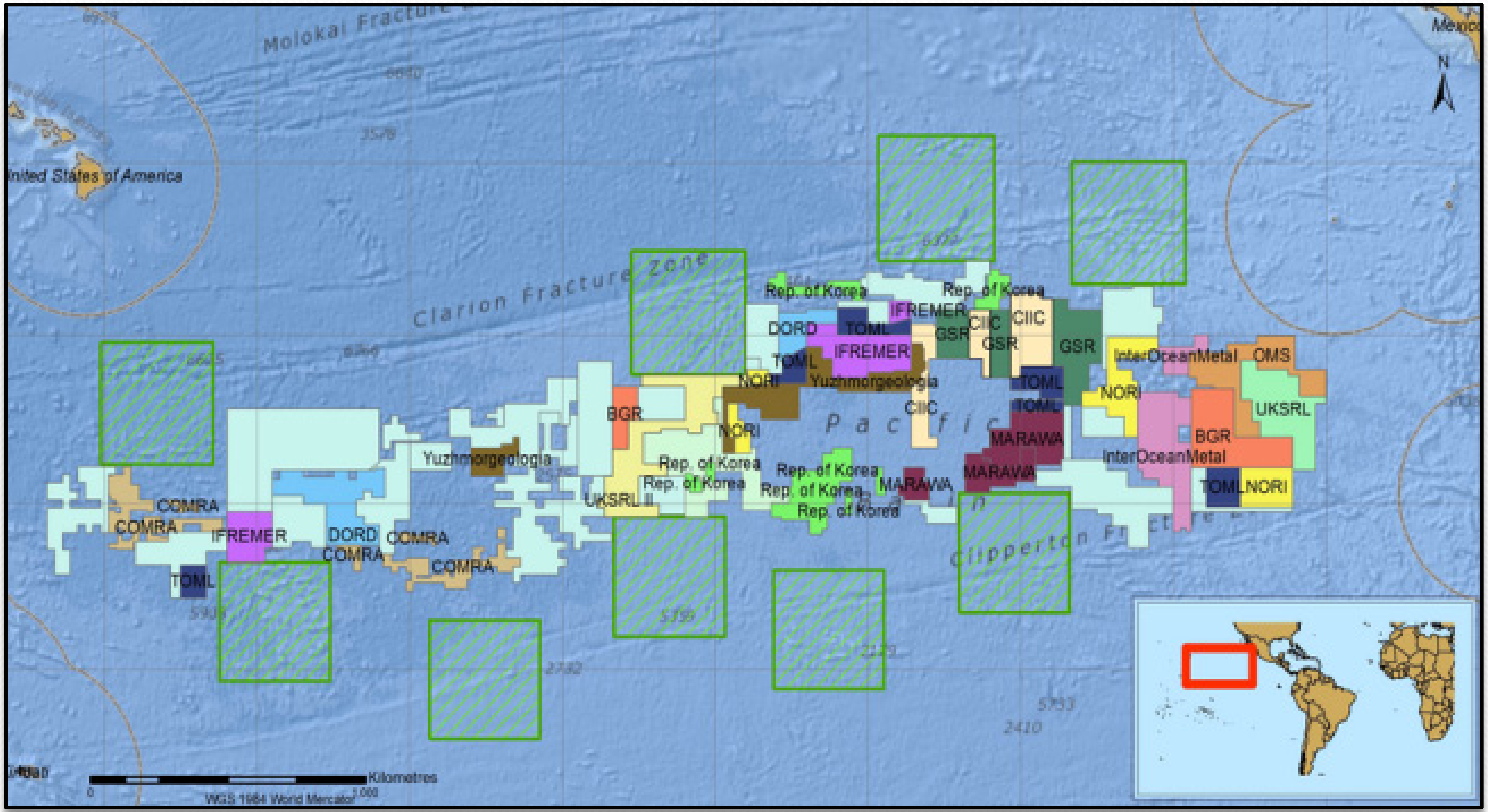
Source: Verizon and ICPC

Application and other ocean stakeholders

Sargasso Sea Alliance[18]

The 2015 workshop on *Submarine Cables in the Sargasso Sea* involving the cable industry, Sargasso Sea Alliance and other ocean stake holders, made by consensus a series of findings that are essentially those presented in the previous 4 slides[18].

Application and other ocean stakeholders
International Seabed Authority[19]



Since 2010, ISA and ICPC have collaborated under a MOU to professionally resolve any conflicts between mining and cable operations under present UNCLOS provisions. Also, ISA agree that the "environmental impact (of cables) is minor if not negligible." [19]

Synopsis

- Telecommunication cables in BBNJ area occur in deep water beyond the continental shelf (not less than 200m depth, where anchoring and fishing – the main causes of cable damage – are most common).

- Thus protective measures such as cable burial or armour are not required. Therefore, BBNJ area cables are small, chemically inert objects laid directly on the seabed with minimal disturbance.

- Apart from local areas where the seabed is disturbed by submarine landslides and strong currents, cable faults resulting from natural hazards are rare.

- Cables have statistically no effect on the abundance and diversity of seabed organisms [7-9, 17]

On the basis of present knowledge, telecommunications cables have little effect on the deep ocean environment – a conclusion shared by other studies[4,8,20-21]

Synopsis – conclusions of UN organisations

UNEP/WCMC- ICPC Cable Report 2009[5]

"as outlined in this report, the weight of evidence shows the environmental impact of fibre-optic cables is neutral to minor."

UNCLOS Report of UN Secretary General 2015

"Submarine cables themselves are considered to have a low-carbon footprint and a small relative impact on the environment…"

UN World Ocean Assessment 2016[21]

reviewed submarine telecommunications cables and concluded that they "*have very limited environmental impacts*".

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SUBMARINE CABLES AND BBNJ

2. CABLE OWNER’S PERSPECTIVE

Robert Wargo
ICPC Executive Committee
Member, AT&T

The Cable Owner's Perspective

- The Planning, Permitting and Installation of an undersea cable is typically a multi-year effort during which the cable owner or owners will work closely with the cable supplier, surveyor, and installer to refine the cable route and get the cable installed as expeditiously as possible.
  - Generally the endpoints are known, existing cable stations and the route typically chosen between the two endpoints is a great circle route to minimize the expense of the cable.
  - The cost of the cable can be in excess of $500M (US).
- The objective is to install the cable in a route that does not require future repair. To help meet this objective:
  - Cables tend to follow earlier "tried and true" routes because experience has generally shown them to be predictably safe and reliable
  - The routes generally avoid topographic features, like seamounts or canyons, to help protect the cable.

The Cable Owner's Perspective

- Undersea cable owners have consistently supported UNCLOS
  - At the time of drafting many telecommunications companies were sectors of government affiliated with the Post Office and were instrumental in advising governments on the importance of undersea cables.
  - Additionally private telecommunication companies advised governments as well.
  - It is custom and practice for a telecommunications company to indemnify and reimburse a vessel for fishing gear or anchors sacrificed to avoid damage to a cable.
  - Cable owners rely on the current provision in UNCLOS in their day to day operations and undermining these provisions by new regulations is not helpful.
  - Numerous governments, with input from ICPC member companies, have recently updated national legislation to be more in line with UNCLOS provisions.

The Cable Owner's Perspective
The need for additional Environmental Review

- In some jurisdictions cable owners may spend upwards of $2M for environmental reviews and mitigation measures within the Territorial Sea of a coastal State.
- Additional environmental review is often unnecessary in the ABNJ due to the small area affected by a rare, one time event, and the minimal amount of damage that could possibly occur.
- While we understand the sea bed is not a flat featureless plain, cables tend to avoid topography that may increase the risk to the cable.

The Cable Owner's Perspective
Repair considerations

- ABNJ repairs are generally limited in number (~4/year worldwide), duration and area affected.
  - Most cable repairs occur in nearshore areas due to fishing and anchoring - not in ABNJ.
  - Once on site a cable ship can affect a deep water repair in less than a week.
  - On bottom disturbance is generally limited to 3 grapnel runs perpendicular to the cable.
  - Absent a rare repair, cables typically lay undisturbed.

End of Life/Out of Service Cable Considerations

- ICPC Recommendation No. 1 reflects the custom and practice in the industry with respect to out of service cables and provides cable owners with a decision matrix for cost-benefit and environmental analysis of what to do with a cable that is out of service.
- Most undersea cables are left in place when out of service, available for re-use or recycling if the opportunity arises.
- Recovered cables have been placed on artificial reefs in both NJ and MD – typically near shore armored cable.
- Limited lengths of deep water cable have been recovered and recycled limited by crossings and close parallels.
- Out of service cables have been recovered and reused (e.g. Gemini Bermuda, CB-1) or donated to scientific institutions (IRIS, University of Hawaii); the first undersea "observatory" was a retired submarine cable.
- Currently three companies are engaged in recovery and recycling of near shore and deep water cables around the world.

SUBMARINE CABLES AND BBNJ

3. CABLE ROUTE SURVEY

Graham Evans
ICPC Chairman, EGS Survey Group

Cable Route Planning Criteria

- Cable routes are typically designed to follow the shortest technically and economically viable route between landing points exhibiting the lowest risk to the installed cable
- Technical and economic viability can be compromised in the interests of lower latency (time taken for data to pass from point A to point B) by great circle routing
- In deep water (ABNJ) cables are surface laid ***therefore:***
- Route planners are seeking flat and uninteresting seabed which avoid geographic features with steep gradients, seamounts, vents, or fracture zones
- Underscoring the route selection process is considering the interests of existing known seabed user stakeholders where potential conflicts could exist

Route Planning Objectives & Activities

- System security – plan the most secure route that is
  - Technically viable
  - Economically viable
  - Understand and mitigate all identified risks
- Planning objectives achieved at differing activity levels of commercial commitment, including:
  - Initial feasibility studies
  - Desktop (Cable Route) Studies
  - Route survey
  - Cable engineering
  - Cable protection

Pre Survey Desktop Study (DTS)

- Output from planning activities will be input to a pre survey DTS
- Risk and hazards for each route section will be assessed and summarized in a risk matrix
- In addition to archival research, the desk study will document information gathered from visits to the system landing sites
- The DTS will recommend appropriate route survey procedures designed to prove viability of the pre survey planning effort

Cable Route Surveys

- The fundamental objective of the cable route survey is to:
  - Prove and document the preliminary route developed during initial project planning stages
  - Identify and where practical, develop the pre survey route to avoid obstructions and hazards found during the survey
  - Determine final cable engineering and cable quantities
  - Confirm or amend preliminary cable protection strategies
  - Provide all data and documentation necessary to support cable installation
  - Provide the database framework for system maintenance

Route Survey Data Sets

- Shallow water where cables require burial (≤1,500m); usually within Areas of National Jurisdiction
  - Bathymetric data – seabed topography (typical corridor 500m to 1,000m)
  - Sonar imagery data – seabed surface features
  - Sub-bottom profiling data – sub surface soil profile
  - Burial assessment data – mechanical properties of the seabed soils
- Deep water (within ABNJ) where cables are surface laid (≥1,500m) by definition are outside Areas of National Jurisdiction
  - Bathymetric data – seabed topography (typical corridor 3 x water depth up to 10km)

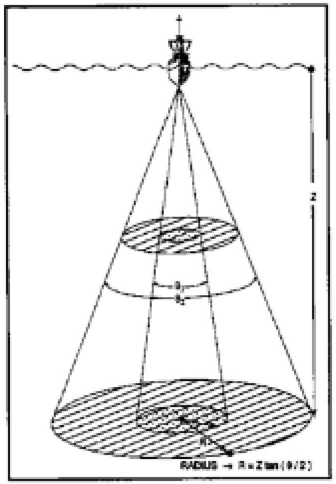
Multibeam Bathymetry

Within the context of BBNJ, cable route surveys within ABNJ will be confined to the collection of multi-beam echo-sounder (MBES) data

- Bathymetry and co-located back-scatter data
- Digital data output can be rapidly processed and analysed
- Data used to develop seabed terrain model
- Resolution of multibeam systems altitude and beam width dependant

Deep Water Cable Route Survey

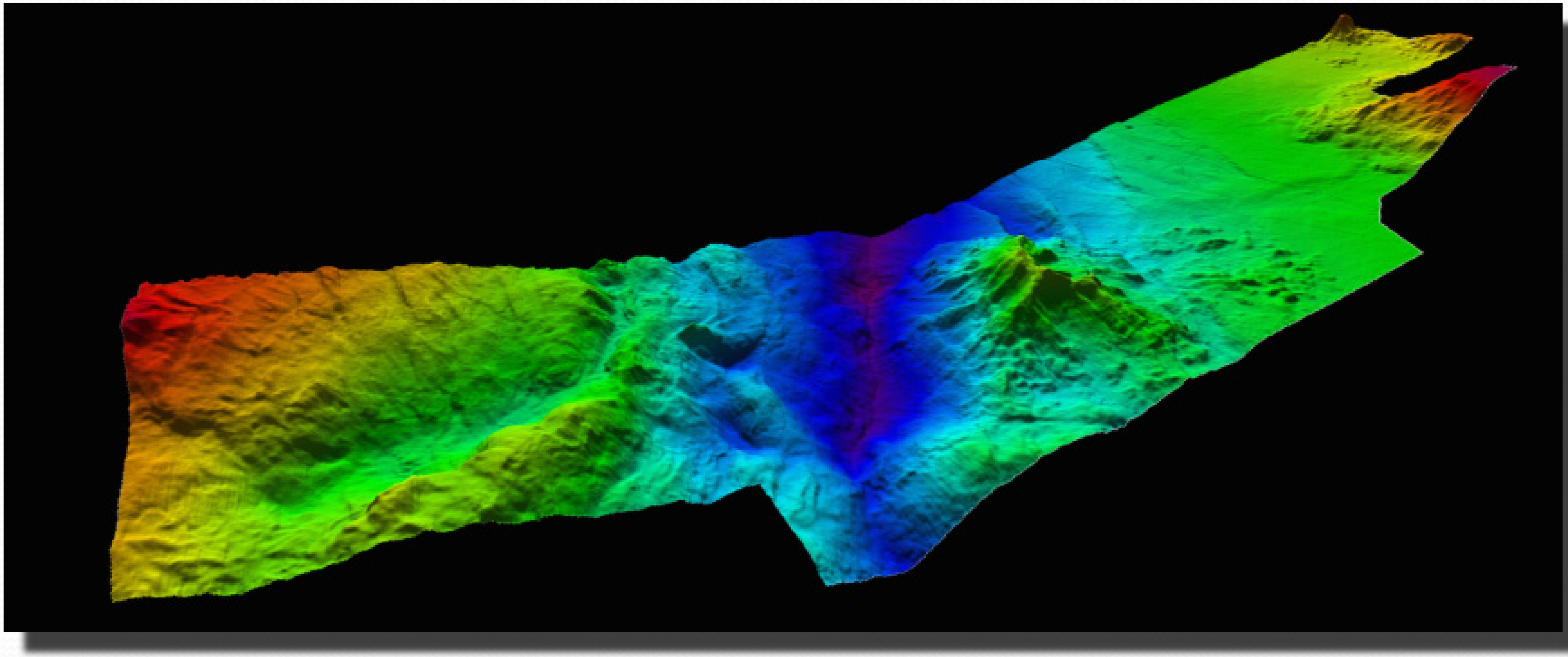
- Deep water cable routes (within ABNJ) will be surveyed as a single line swath of multibeam data typically equal to 3 x water depth once pre installation for the 25 year design life of the cable
- The multibeam footprint of each beam at the seabed is both depth and beam width dependent for example:
  - Typical 12kHz $1^0 \times 1^0$ MBES system footprint
    - Beam footprint at 500m = 9m
    - Beam footprint at 1,000m = 18m
    - Beam footprint at 3,000m = 50m
  - Cable route survey data typically unable to detect or map features such as volcanic vents or fumaroles



- Survey data ownership is vested with the cable system owners but collected on their behalf by qualified survey contractors

Typical Cable Route Survey Vessel

Rendered Deep Water MBES Data



Marianas Trench Pacific Ocean – Courtesy EGS Survey

SUBMARINE CABLES AND BBNJ

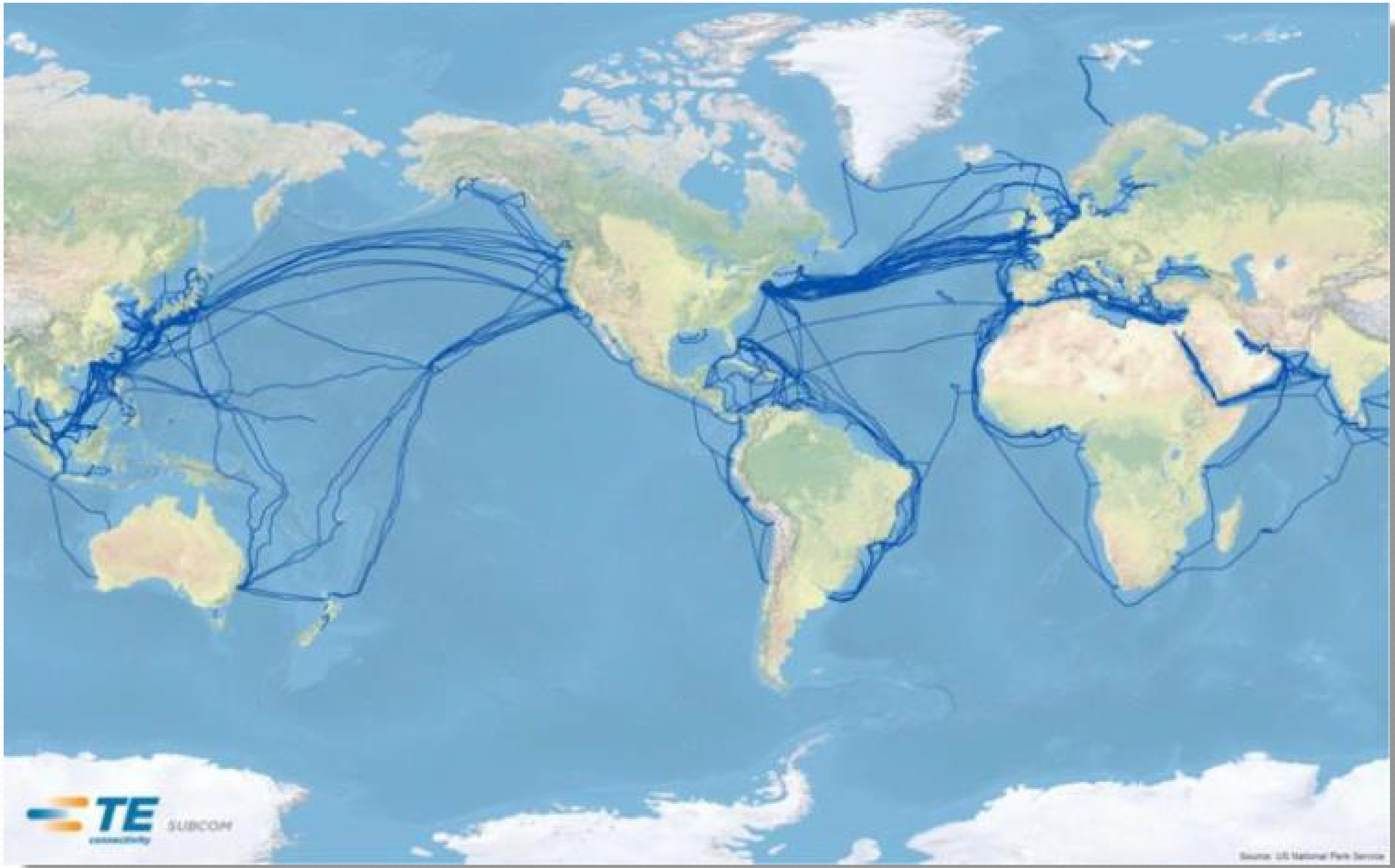
4. CABLE SHIP OPERATIONS

Jim Herron – Managing Director
Marine Operations, TE SubCom

TE connectivity
SUBCOM

International Cable Protection Committee

Global Undersea Cable Routes – Active Cables



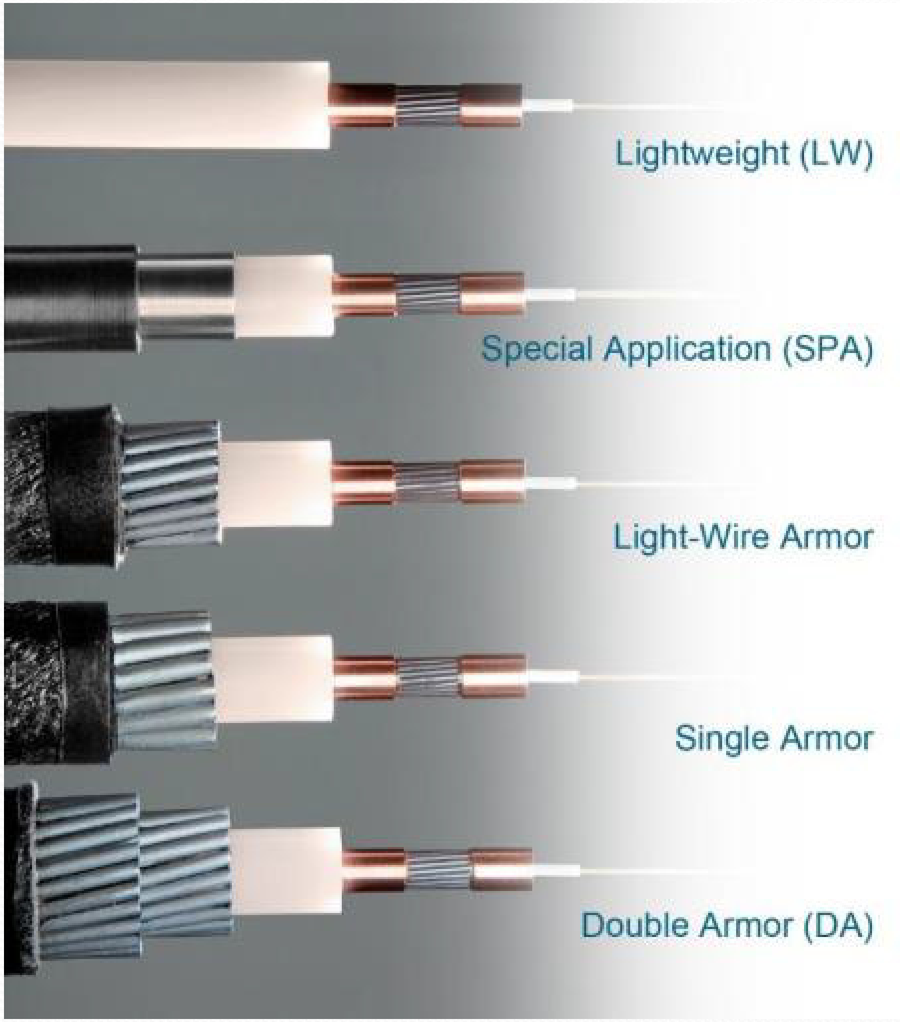
Carry more than 98% of international internet, data, and telephone traffic.
Comprise extremely high reliability components with redundant paths.

Undersea Telecom – Principle Marine Activities

Planning	Desk Top Study Route Survey and Selection Burial Feasibility [Does not Apply in ABNJ] Installation Modeling	Focus on risk avoidance and risk mitigation
Installation	Shore Ends [Does not Apply in ABNJ] Cable Burial [Does not Apply in ABNJ] **Surface Lay** Branching Unit/Nodes	Utilization of best practices, tools and equipment
Post Installation Support	Marine Liaison **Cable Maintenance** GTSC – Global Technical Support Center	Education, network monitoring and cable repair services

Of the many activities involved in planning, installing, and maintaining a cable system, only a few pertain to operations in the BBNJ.

Undersea Fiber Optic Cable



Undersea Cables…

- Protect optical fibers and electrical conductor
- Withstand harsh environmental conditions for 25 years
- Durable, yet flexible to support system deployment, recovery, repair & re-deployment
- Non-threatening to the undersea environment
- Survive a variety of stresses: Temperature, tension, torsion, pressure, chemical exposure, bending/flexing

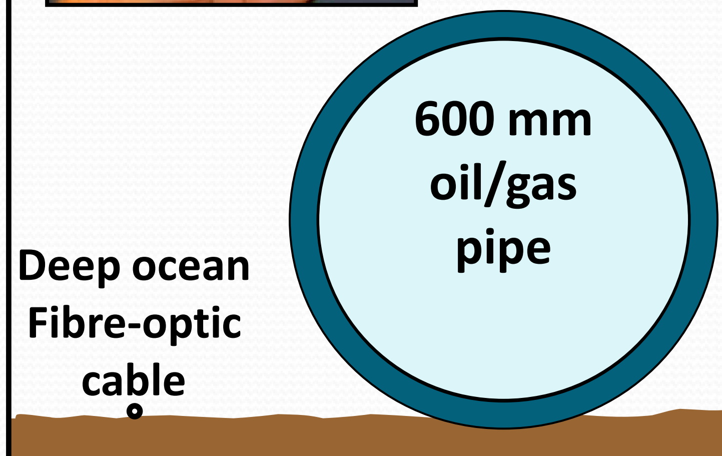
SL Lightweight (LW) Cable…

- For depths > 2500 meters (largest percentage of deployment)
- Serves as the core for all armored cables

Cable Size

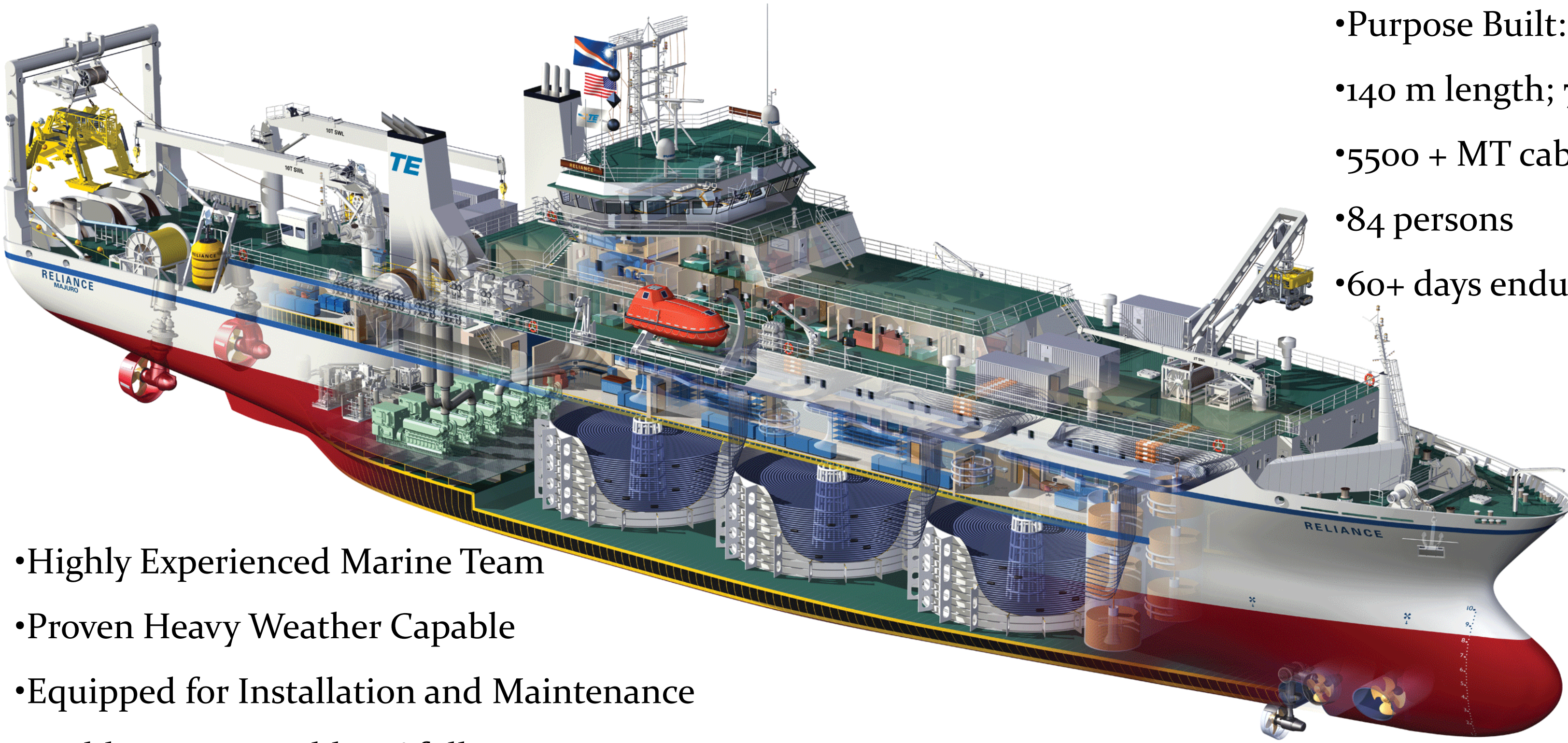
- Cables are small: deep-ocean types, without protective armour, are typically 17-20 mm diameter – the size of a garden hose or beer bottle cap
- Armoured fibre-optic cables may reach 50 mm diameter
- In contrast, submarine oil/gas pipes can reach 900 mm diameter, and fishing trawls typically range over 5,000 – 50,000 mm wide
- One of the longest cable systems is the South East Asia - Middle East - West Europe 3 system (SE-ME-WE-3), with a total installed length (including branches) of almost 40,000 km

Deep-sea cable, (black) sectioned to show internal construction; fine strands at top are optical fibres used to transmit data



Modern fibre-optic cable in hand (for scale) and relative to 600 mm diameter subsea pipe

SubCom Reliance Class Cable Ships



- Purpose Built:
- 140 m length; 7.8m Design Draft
- 5500 + MT cable capacity
- 84 persons
- 60+ days endurance

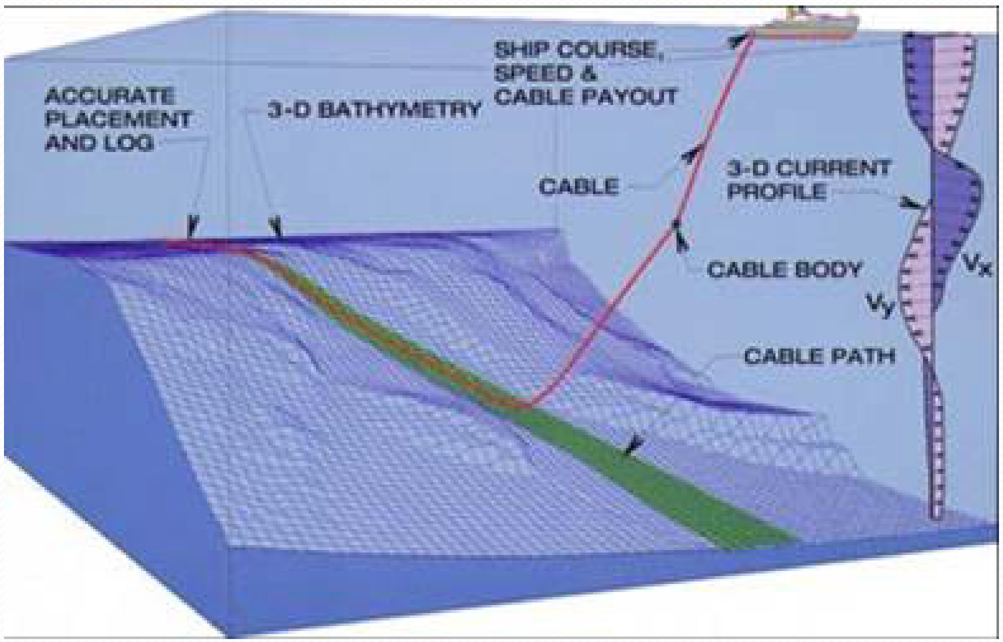
- Highly Experienced Marine Team
- Proven Heavy Weather Capable
- Equipped for Installation and Maintenance
- Highly maneuverable w/ full Dynamic Positioning
- 60 MT A Frame
- Plow and ROV equipped
- Full Cable Jointing & Testing facilities

Cable ships are operated by highly trained and experienced crews and specialist with concern for safety, fuel economy, environment and quality of installation and repair

Surface Laid Cable

Typical for deep sea (>1000-1500m water depth)

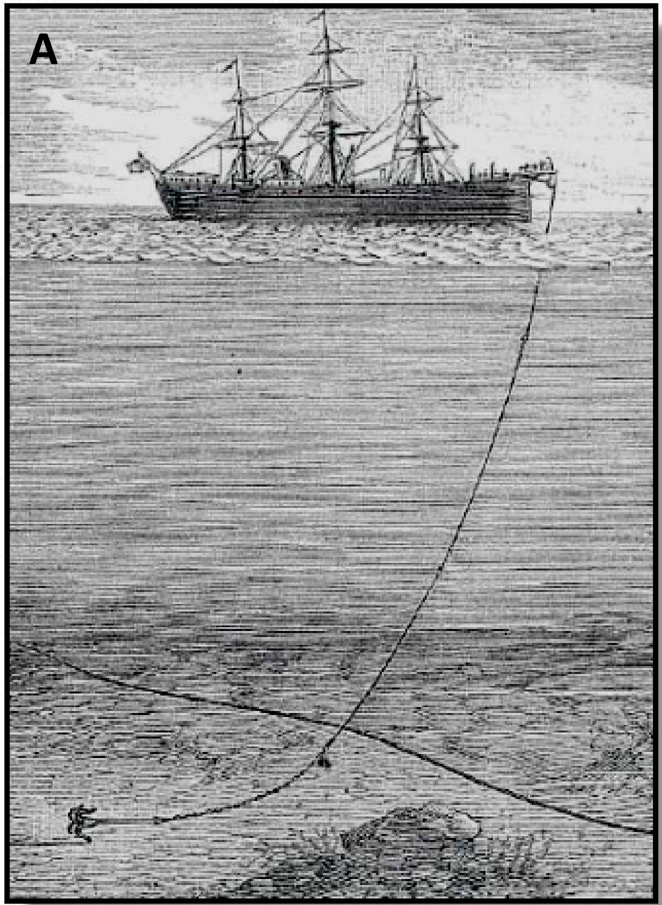
Lay according to pre-engineered method of procedure using shipboard slack management software so cable lays flat on the seabed and in the engineered and surveyed location.

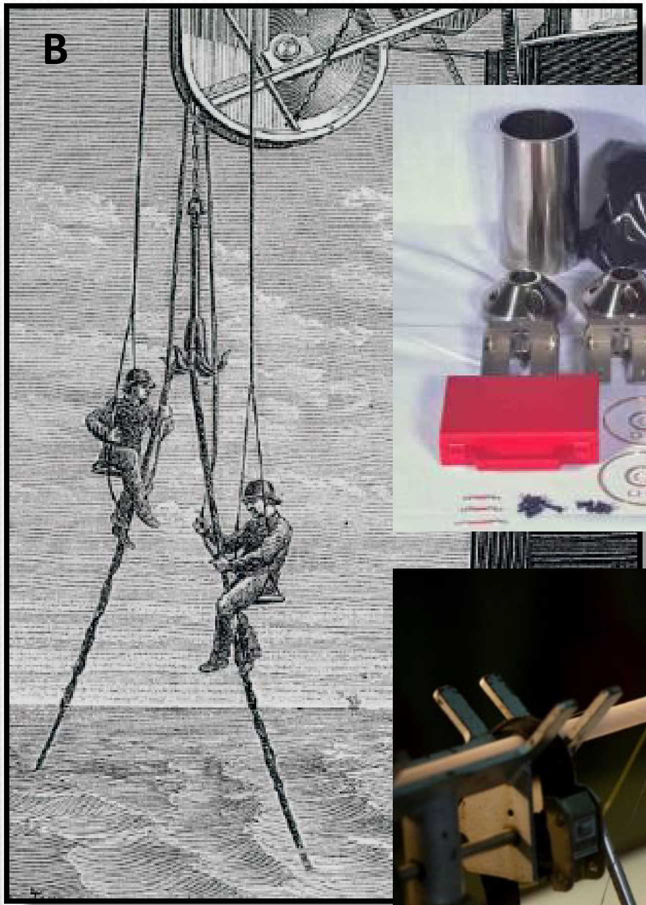


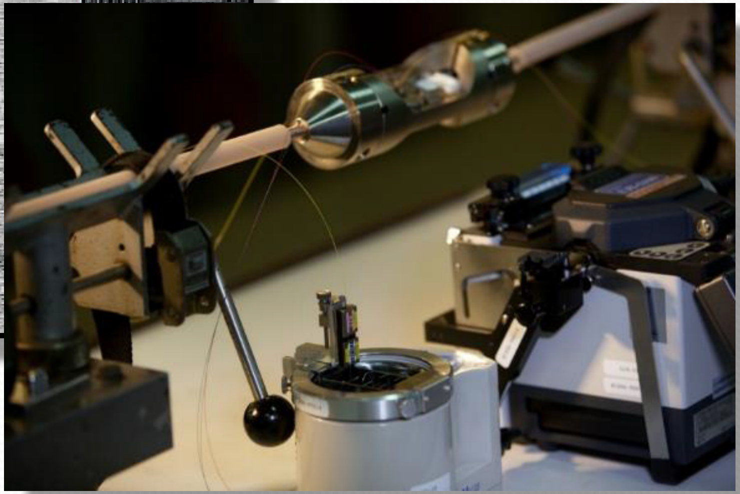
Computerized Cable Lay Plan

Linear Cable Engine (LCE) and cable drums used to control cable slack and provide hold back tension

Cable Repair in 1888 and Today



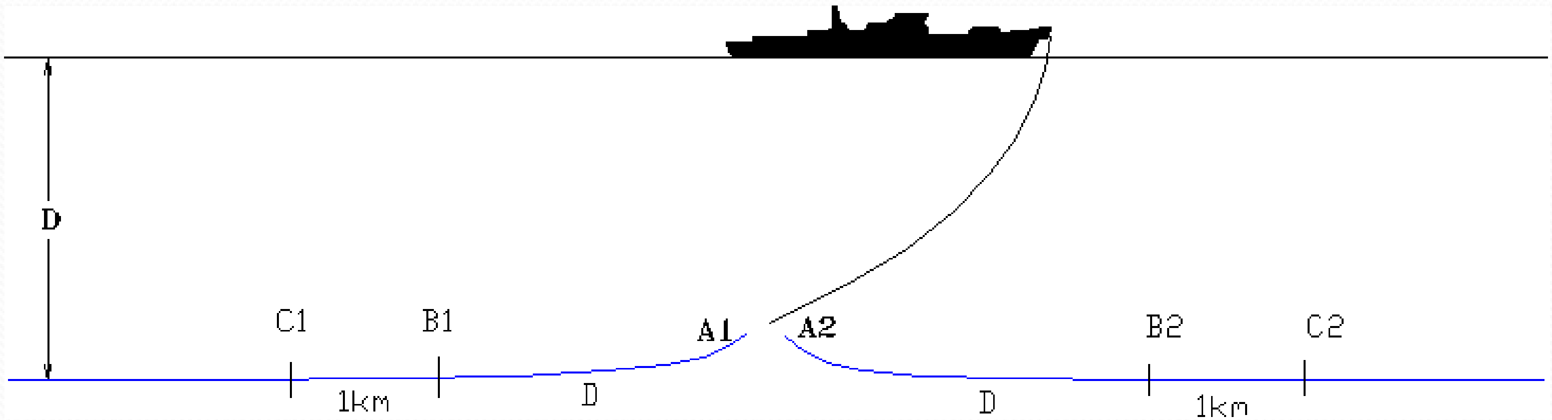




[A] Cable ship trailing grapnel to retrieve cable followed by
[B] securing of the cable ready for repair
Source: Traité de Télégraphie Sous-Marine by E. Wüschendorff, 1888

Cable Repair Cutting Drive

- Different repair methods are used in different depths and conditions
- One common method starts with the ship dragging a cutting grapnel to cut the cable



- For an animation of a cable repair operation, click here: https://www.youtube.com/watch?v=m6qTk5WNq9E

Atlantic Maintenance Agreements

Maintenance ships are rapid response

Load spare cable and repeaters, joints kits

Can be underway within 24 hours -- 7x24x365

Strategically located vessels to cover member cables in the Atlantic and Eastern Pacific Ocean.

Summary – Marine Operations

- Cable burial is not an element of cable laying in the BBNJ area. Cables are laid at a typical ship speed of 6 knots. Transit speeds are typically 10 to 12 knots. Slow enough to avoid whale collisions.
- Weed matts are typically avoided during transits if seen during daylight hours. During cable laying events, vessels must follow a precise route. Cable slack is automatically controlled so cable lays flat on the seabed; cable routes avoid seamounts.
- The cable deployment is modeled and controlled so cable is laid on the prescribed route; sensors are in calibration. Vessel positioning uses precise GPS.
- The deep-sea cable is very small diameter and inert with polyethylene covering.
- There have been very few cable faults, therefore very few repairs in the BBNJ area.

Summary – Marine Operations (Contd.)

- We issue Notice to Mariners for operations, so others mariners are aware of operations.
- Vessel operations are done with concern for safety, fuel economy and environment.
- Cable ships are operated by highly trained and experienced crews and specialist.
- Quality systems are in place to report incidents and make corrective action and continual improvement.
- As-laid routes are documented and provided to Hydrographic Offices. Cable locations are precisely known with modern navigation.

Cables, cable laying operations and transits are of minor impact to the BBNJ eco-system.

SUBMARINE CABLES AND BBNJ

5. OCEAN GOVERNANCE

Douglas R. Burnett
ICPC International Law Advisor

The Factual Context for Submarine Cables and BBNJ

- Cables have a neutral environmental footprint on the seabed. In the BBNJ area, submarine cables are surface laid on the flat seabed, not buried; to avoid damage to potential biological "hot spots" they are not laid on the tops or flanks of seamounts and avoid areas of active volcanism.
- There is no single global submarine cable network any more than there is a single world airline network. (There are about 236 active separate and decentralized international cable systems totalling 997,336 km.)
- Cable systems are either owned by consortia of 4-30 private companies or in some cases by a single company. About 99% of international telecommunication cables are non-government owned. Cable systems are not "flagged" to any one State.
- Cable repair arrangements are organized regionally by private contract-not by government mandate. Contracts require repair ships to sail within 24 hours notice of a cable fault; GOAL = FAST RESPONSE AND REPAIR.
- There are about 59 cable ships in the world; about half are on stand-by to carry out emergency repairs pursuant to cable ship pooling contracts with various cable owners and cable ship operators, and the other half is laying new cables or performing other tasks (training, vessel maintenance, out of service cable recovery).
- Cable ships are expensive, custom built, conspicuous, require specialized crews, and fly diverse flags (UK, France, Marshall Islands, Singapore, Japan, China, Korea, UAE, Panama, Denmark, Norway, Spain, Italy, Philippines, Mauritius, Barbados, Belize, Indonesia) = COMPETITIVE RATES + EFFICIENCY.
- Cable repairs are urgent not only to restore service, but because each cable acts as the backup for other cables that are damaged and awaiting repair= RESILIENCY.

The Existing UNCLOS Provisions for Submarine Cables are time tested and proven
IF ITS NOT BROKE DON'T FIX IT.

- The 10 articles addressing submarine cables are successful (articles 21, 51, 58, 79, 112-115, and 297).
- The 10 articles as currently applied with articles 192 and 206 provide a fair balance between critical international infrastructure and a neutral environmental impact.
- The 10 articles allow for sharing and conflict free practical cable solutions with other uses like deep sea bed mining, shipping, oil and gas, and fishing.
- The 166 year history of international submarine cables is well documented by scores of modern peer reviewed scientific and academic articles, research projects and, international workshops.
- Cable repairs in the ABNJ are rare , non-repetitive-averaging no more than 4 per year in all of the world's oceans with zero risk of marine pollution from a cable break.
- In the BBNJ area, the only cables are fibre optic telecommunication and science cables. Power cables, because of their physical weight and length limitations have not been laid, and none are forecast. Attempts to regulate power cables would be a solution looking for a problem.

Environmental Impact Assessments (EIA)

- Based on scientific review and history, EIAs are not normally required for laying fibre optic submarine cables in international waters.
- Flag States for cable ships and coastal States where international cables land or where cable owners reside already provide adequate safeguards to balance cables and protection of the marine environment.
- Article 206 already provides for EIAs if needed for submarine cables.

Submarine cables in MPAs

Analysis of International Submarine Cables in ABNJ MPAs
(Based on comparison of MPA data base* http://www.mpatlas.org/explore/ and commercial data base of Global Marine Systems Ltd (GMSL))**

Data Description	ABNJ
Total number of cable systems in data base in ABNJ	150
Total cable systems in MPAs	22
Percent of cables that cross MPAs	15%
Total km of cables in ABNJ in data base	314,350 km
Total fibre-optic km in ABNJ MPAs	5,362 km
Percent of total km in MPAs	1.7%

*Marine Conservation Institute. (2016). MPAtlas. Seattle, WA. www.mpatlas.org [Accessed 27/06/2016]. The ICPC gratefully acknowledges the assistance by MP Atlas and the Marine Conservation Institute
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Final Thoughts

- There is a wealth of peer reviewed scientific and legal literature on international cables that underscore their neutral impact.
- In view of the 166 year lawful use history of submarine cables in the ocean environment, there is no need for a precautionary approach for international cables.
- Undermining well tested UNCLOS provisions by creating an "enhanced freedom of the seas", centralized reporting and control by new or existing entities, and unnecessary high seas permitting bureaucracies carries risks of unintended consequences (i.e. stifling innovation, reducing the ability to allow cables to reach small islands and to increase redundancy to reduce disruption risks, increased cybersecurity risk tied to centralization, etc).

The UN World Ocean Assessment (2016) reviewed submarine telecommunications cables and concluded that they "have very limited environmental impacts"

Any questions?

Feel free to ask us, now or later:

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