Submarine Cables as a Sustainable Use of the Deep Sea Environment

International Cable Protection Committee ("ICPC")
BBNJ IGC 1 Side Event

September 13, 2018

About ICPC

- Founded in 1958, ICPC is the world's preeminent global organization for:
  - Advancing freedoms to install and maintain submarine cables, and
  - Mitigating risks of damage to those cables.
- ICPC has more than 170 private-sector and government members from more than 60 countries and:
  - Works with governments, other marine industries, international organizations, and NGOs to promote cable awareness, cable protection legislation, and effective international agreements;
  - Commissions peer-reviewed research on the environmental characteristics of cables; and
  - Promulgates recommendations for cable operators.

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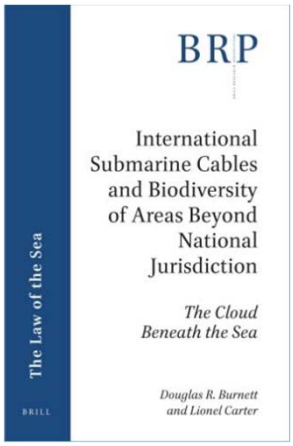
Agenda

- Economic, social, and security importance of submarine cables
- Cable characteristics; installation and repair methods
- Environmental characteristics and related research
- Status of submarine cables under UNCLOS



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1. Economic, social, and security importance of submarine cables

- Alice de Juvigny, Squire Patton Boggs (US) LLP, ICPC UN Observer Representative
- Kent Bressie, Harris, Wiltshire & Grannis LLP, ICPC International Law Adviser

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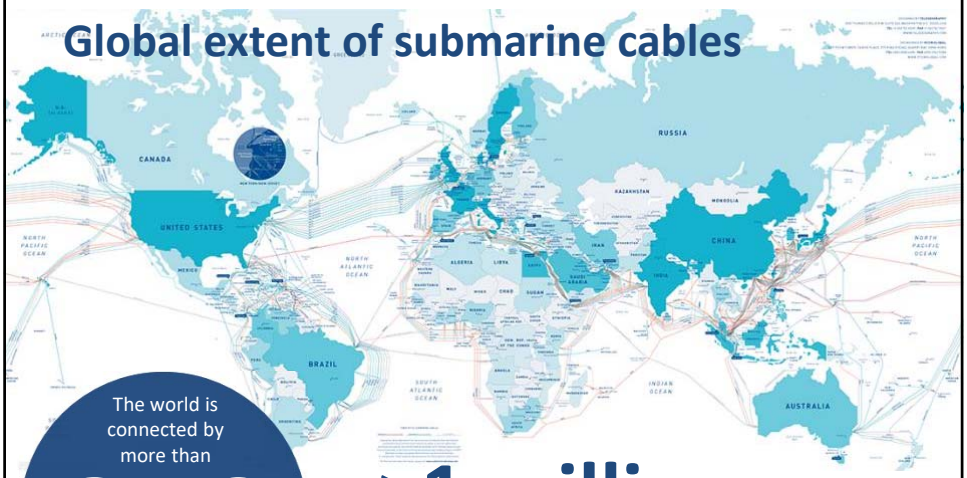
Global extent of submarine cables



The world is connected by more than **350** SUBMARINE CABLE SYSTEMS

>1 million *kilometers of cable installed*

enough cable to circle the Earth 25 times

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Global importance of submarine cables

99%

of international Internet, voice, and data traffic travels via submarine fiber optic cables—not satellites.

Submarine cables are the BACKBONE OF THE INTERNET, garden hose-sized cables carrying vast amounts of traffic over glass fibers slightly larger than human hair.

- Submarine cables ensure access to **Facebook**, **Instagram** photos, **YouTube** videos, **Google** search results, and **Office365** documents and email, whether from a laptop computer, tablet or mobile phone.
- Submarine cables backhaul most of the world's **mobile network traffic**.

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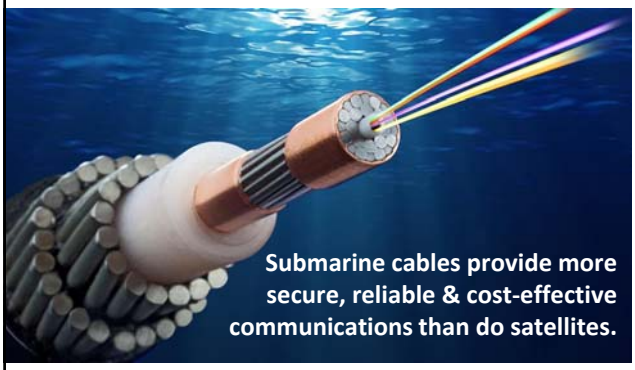
Submarine cables vs. satellites



Only submarine cables provide the **real-time** connections and huge carrying capacity necessary for **live video**, instant **financial transactions**, **remote health** and **education services**, and a host of other applications.

Submarine fiber optic cables transmit communications at the **speed of light**, by far the fastest transmission medium, with delays of mere milliseconds.

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Submarine cables are critical infrastructure

- Governments designate submarine cables as critical infrastructure.
- Governments use critical infrastructure designations to highlight asset criticality and identify and mitigate vulnerabilities and threats.
- Critical infrastructure is frequently defined as:

- Assets that are **essential for the functioning of society and the economy**, and
- Damage or destruction of which would harm national and economic security, public health, and public safety.

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Particular benefits for small island developing states ("SIDS") and G-77

- In the past 15 years, submarine cables have connected the majority of SIDS and G-77 members.
- New cables are planned or under construction for countries such as Niue, Kiribati, and Tokelau.
- With projects like the current **Caribbean Regional Communications Infrastructure Program ("CARCIP")** and **Pacific Connectivity Project**, and the earlier **East African Submarine System ("EASSy")**, the World Bank and regional development banks have funded significant new submarine cable infrastructure.
- Submarine cables foster economic development and more efficient delivery of remote education, health, and other services.

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Existing and planned cables landing in G-77 and SIDS (shown in orange)

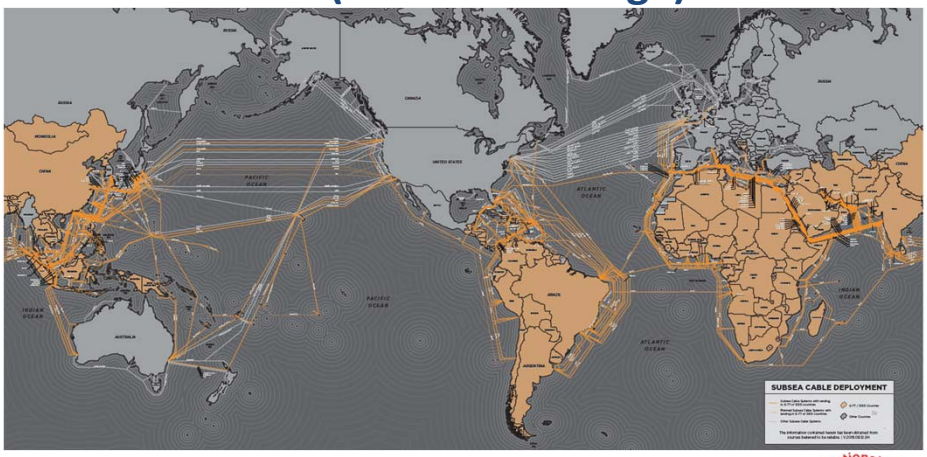

Image source: TE SubCom

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Tonga Connectivity Project

"A few months ago, the people of Tongatapu have started to enjoy the benefits of this high-speed internet, and Government have worked earnestly to ensure the equitable distribution of this development benefits is shared with the outer islands and communities."

Lord Tu'ivakano, Tonga
Prime Minister, 14 May 2014

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2. Cable characteristics, planning, survey, installation and repair

- Bob Wargo, AT&T, ICPC Executive Committee Member
- Graham Evans, EGS Survey Group, ICPC Chairman
- Ron Rapp, TE SubCom, ICPC Executive Committee Member
- Nigel Irvine, Digicel, ICPC Member

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Submarine cables

- Materials: glass, copper, polyethylene, fiberglass, steel wire
- Weight: from 0.7 kg/meter (unarmored deep-water) to 4.8 kg/m (double-armored)
- Diameter: 17mm to 50 mm (with armor)

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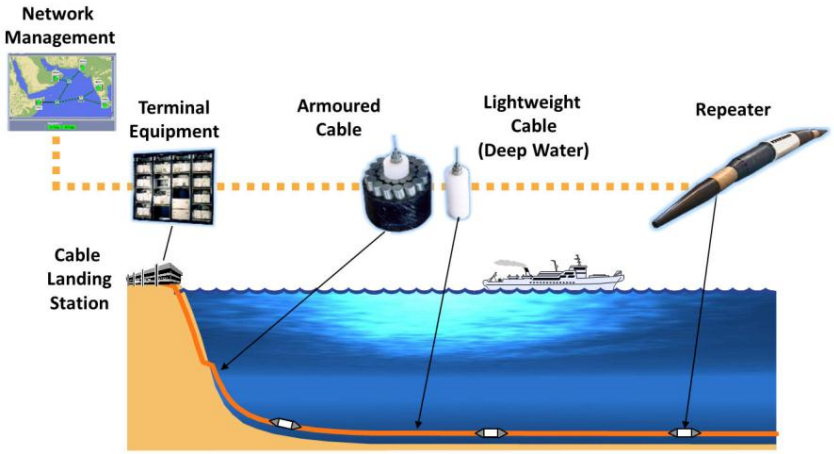
Typical submarine cable system



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Phases of submarine cable installation

Planning	**Desk top study** **Route survey and selection** **Burial feasibility (not in ABNJ)** **Installation Modeling**	**Focus on risk avoidance and risk mitigation**
Installation	**Shore ends (where cable lands on shore)** **Cable burial (only in shallow water)** **Surface lay (in ABNJ)** **Branching unit/nodes**	**Use of best practices, tools and equipment**
Post Installation Support	**Marine liaison** **Cable maintenance** **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 ABNJ.

Source: TE SubCom

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Submarine cable route planning

- Cable owners design routes to follow the **shortest 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.
- Route planners seek **flat and uninteresting seabed** that avoids geographic features with steep gradients, seamounts, vents, or fracture zones.
- Route planners evaluate potential risks posed by other seabed and marine actors and consider route adjustments.

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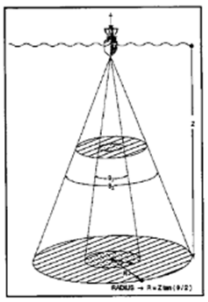
Submarine cable route survey

- Deep water cable routes within ABNJ are 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^o x 1^o 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 is owned by the cable system owner.



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Typical cable route survey vessel

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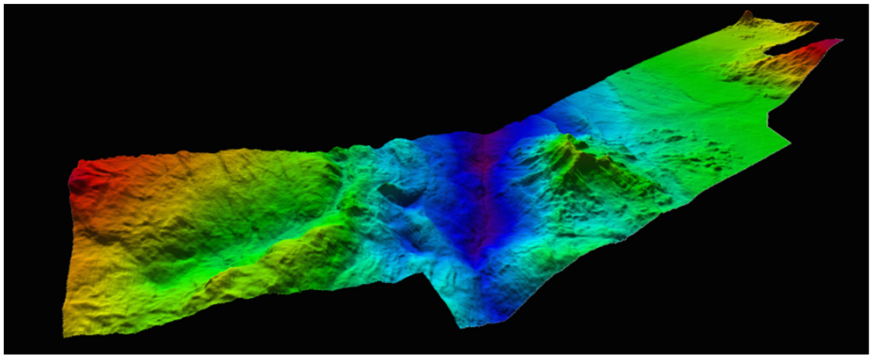
Rendered deep water multi-beam echo sounder data



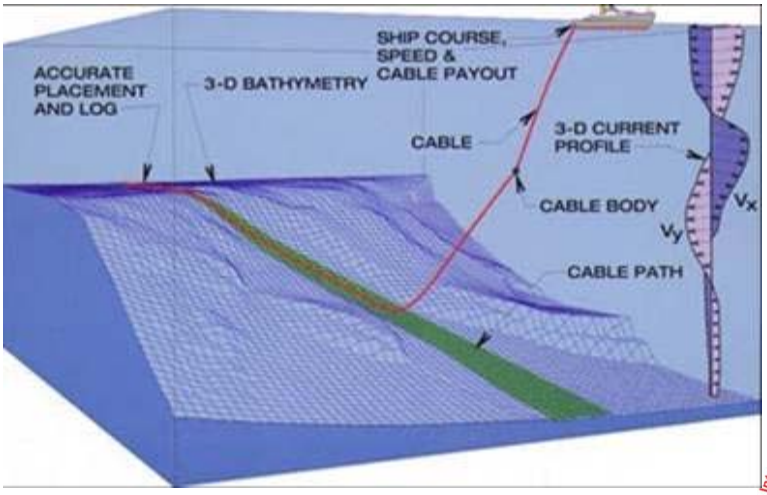
Marianas Trench Pacific Ocean – Courtesy EGS Survey

Submarine cable installation methods

- In ABNJ (greater than 1000-1500m water depth), cables are laid from a ship on ocean surface onto the surface of the seabed according to an engineering plan.
- The cable ship uses shipboard slack management software, linear cable engine, and cable drums to lay cable under tension.
- Tension ensures that cable lies flat on the seabed, avoiding loops or suspensions that could increase the chance of damage.

Linear Cable Engine
Image source: TE SubCom

View of submarine cable installation



Computerized cable lay plan

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Typical cable ship used for installation and repair

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.

Image source: TE SubCom

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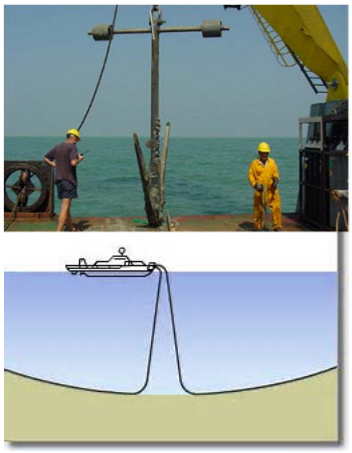
Submarine cable maintenance

- Owners contract in advance or spot contracting for maintenance, with a focus on speedy repair
- During a repair operation, the owner and maintenance provider:
  - Identify the fault location
  - Use a grapnel or ROV to retrieve and cut cable
  - Bring cable ends to surface and buoy them
  - Repair or replace repeater
  - Splice in and test additional cable
  - Return “bight” to seafloor, perpendicular to cable route



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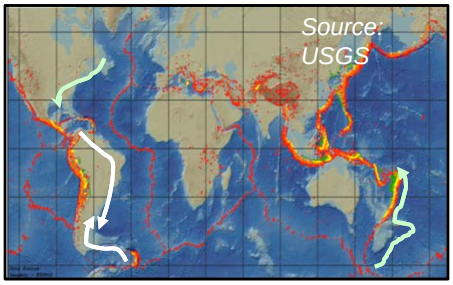
Faults and the need for repair

- A “fault” is an event requiring maintenance or repair activity to ensure continued useful service of the cable and may be caused by natural or man-made factors.
- Deep ocean faults are caused mainly by subsea landslides, turbidity currents, and current abrasion.
- Faults occur in regions of (i) strong currents as along ocean margins and (ii) active tectonic plates where earthquakes, tsunami, storms and mud laden floods are common.



Global earthquake epicenters 2000-2008 and examples of 3 of abyssal currents (white arrows)

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Fault frequencies—few in ABNJ

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Management of out-of-service cables

- Cable owners engage in a **cost-benefit** and **environmental analyses** and assess proximity to and crossings with other cables when deciding whether to remove or leave in place an out-of-service ("OOS") submarine cable.
- Most OOS submarine cables are left in place when out of service, available for re-use or recycling if the opportunity arises.
- Significant lengths of deep water cable have been recovered and recycled.
- OOS cables have been **recovered and reused** or **donated to scientific institutions** (*e.g.*, IRIS, University of Hawaii). The first undersea "observatory" was a retired submarine cable.
- Currently three companies engage in recovery and recycling of near shore and deep water cables around the world.

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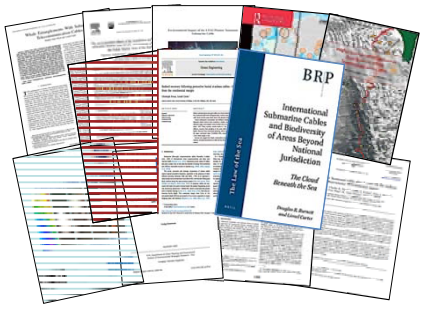
3. Environmental characteristics and related research

- Nigel Irvine, Digicel, on behalf of Lionel Carter, Victoria University of New Zealand, ICPC Marine Environmental Advisor
- Graham Evans, EGS Survey Group, ICPC Chairman



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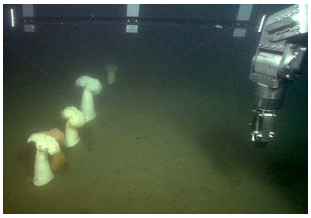
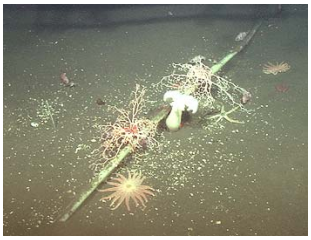
Submarine cable are neutral to benign in the marine environment





Source: MBARI copyright

- Peer-reviewed scientific research conducted by leading academic and government scientists confirms that submarine cables are neutral to benign in the marine environment.
- Submarine cable industry and ICPC continue to encourage additional research.
- Research papers and materials are available from ICPC and on the memory stick distributed at the IGC side event.

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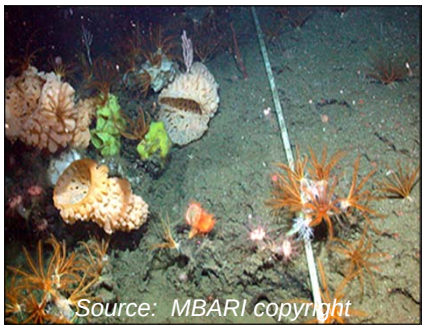
Submarine cables in ABNJ: biota

- Scientific studies focused on continental shelf/slope show:
  - No differences in faunal abundance and diversity near and distant from cables.
  - Modern cables and installation techniques prevent whale entanglement.
  - Fish bites caused less than 0.5% of all faults in 1959-2006, with no such faults since then.



- Deep ocean has less benthic abundance and diversity of macro fauna than shelf/slope areas, but the above findings are equally relevant in ABNJ.

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Submarine cables in ABNJ: physical presence

- Cables' high-grade polyethylene sheathing is chemically inert. Studies show that cable materials do not leach into seawater.
- Electrical fields are shielded, with an electro-magnetic field less than lap-top computer, and do not disturb marine life.
- There is no plowing or burial of submarine cables in the deep ocean.

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Underwater sounds from marine surveys

- Compared with other offshore activities, the frequency of acoustic instruments used during submarine cable route survey are directional and/or low energy.
- The frequency and acoustic output of instruments used for surveying in deep water is above the hearing range of most animals are all directional and sounds naturally attenuate over modest distances.
- Animals that can hear these sounds (particularly *Odontoceti*) have highly directional hearing
- Deep water surveys progress at ~200 km/day across oceans
- Usually, the area inside the acoustic footprint of deep water multibeam echo sounders will not be re-surveyed for decades, when another cable route is surveyed.

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Typical sound source characteristics

- Given seawater conditions, it is possible to calculate the sound level at different distances from a sound source.
- Studies have defined the sound level of 180 dB re 1µPa as "harassment"; and 160 dB re 1µPa as the level likely to cause "behavioral response" (*e.g.*, avoidance).

Instrument	Operating Frequency (kHz)	Sound Source Level (dB re 1 µPa-m)	Distance (km) to 180 dB re 1 µPa-m	Distance (km) to 160 dB re 1 µPa-m
Multibeam Echo Sounder	400	221	0.06	0.17
	70	228	0.08	0.42
	12	242	0.8	4.8

- The assumptions are a simplification, intended to give an idea of scale; a starting point for assessing the *acoustic footprint* of anthropogenic sounds.

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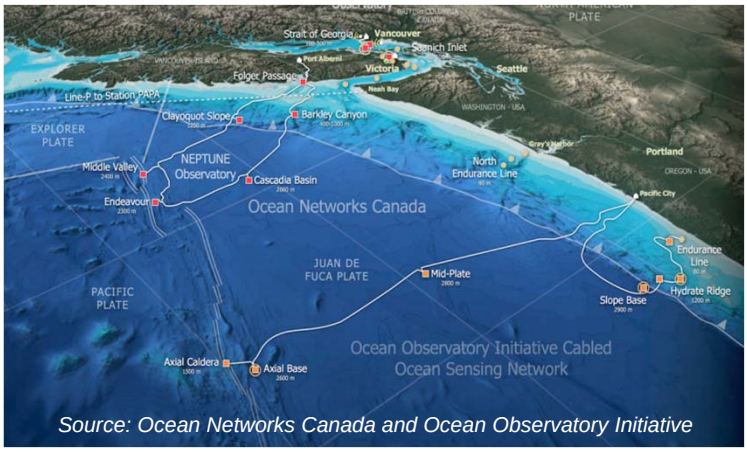
Submarine cables underpin ocean observatories



Source: Ocean Networks Canada and Ocean Observatory Initiative

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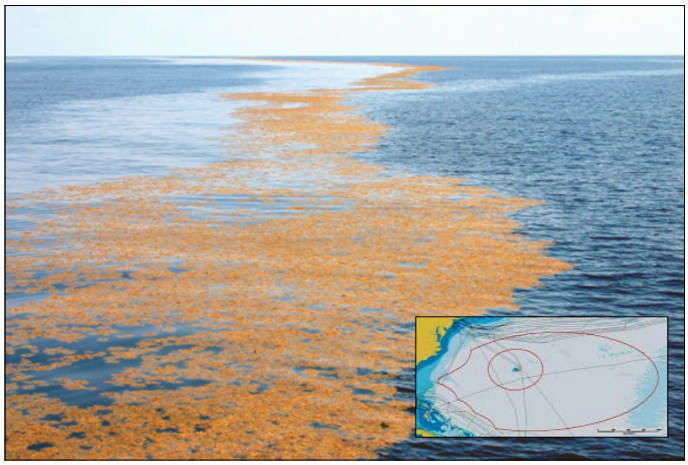
Workshop with Sargasso Sea Alliance



A 2015 workshop on *Submarine Cables in the Sargasso Sea* adopted consensus findings indicating that submarine cables had a benign impact in the Sargasso Sea.

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Summary

Peer-reviewed scientific research shows that:

- Submarine cables are **small, chemically inert** objects that do not leach into seawater.
- Submarine cables are surface laid in ABNJ with no burial or ploughing, with **minimal disturbance of the seabed**.
- Submarine cables are intentionally routed **away from seamounts and hydrothermal vents**.
- Activities associated with the survey of cable route and installation and maintenance of cables produce **minimal underwater noise**.
- Apart from local areas where the seabed is disturbed by submarine landslides and strong currents, the further disturbance resulting from cable fault and repairs is rare.

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Conclusions of UN organizations

UNEP/WCMC- ICPC Cable Report 2009

"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

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

UN World Ocean Assessment 2016

"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."

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4. Status of submarine cables under UNCLOS

- Kent Bressie, Harris, Wiltshire & Grannis LLP, ICPC International Law Adviser

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UNCLOS preamble

- The State Parties recognized the desirability of:
  - "establishing through this Convention, with due regard for the sovereignty of all States, ***a legal order for the seas and oceans which will facilitate international communication***, and will promote the peaceful uses of the seas and oceans, the equitable and efficient utilization of their resources, ***the conservation of their living resources***, and ***the study, protection and preservation of the marine environment***."

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High seas generally

- UNCLOS article 87(1): installation of submarine cables is a high-seas freedom.
- Article 112(1): "All States are entitled to lay submarine cables and pipelines on the bed of the high seas beyond the continental shelf."
  - Freedom to repair submarine cables and pipelines may be inferred from article 114 (which refers to "laying and repairing").
  - Freedom to conduct marine surveys in connection with installation and repair is inherent in freedom to install and maintain.

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High seas: due regard

- UNCLOS article 87(2): "These freedoms shall be exercised by all States with **due regard** for the interests of other States in their exercise of the freedom of the high seas."
- Article 112(2): "When laying submarine cables and pipelines, States shall have **due regard** to cables and pipelines already in position. In particular, possibilities of repairing existing cables or pipelines shall not be prejudiced."
- ***Chagos Marine Protected Area Arbitration (Mauritius v. United Kingdom)***: due regard required by UNCLOS depends on the nature of the rights held, their importance, the extent of the anticipated impairment, the nature and importance of the activities contemplated, and the availability of alternative approaches.

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DOALOS statement re submarine cables

"Beyond the outer limits of the 12 nm territorial sea, the coastal State may not (and should not) impede the laying or maintenance of cables, even though the delineation of the course for the laying of such pipelines [but not submarine cables] on the continental shelf is subject to its consent. The coastal State has jurisdiction only over cables constructed or used in connection with the exploration of its continental shelf or exploitation of its resources or the operations of artificial islands, installations and structures under its jurisdiction."

http://www.un.org/depts/los/LEGISLATIONANDTREATIES/frequently_asked_questions.htm

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Protection of submarine cables

- UNCLOS article 113: "Every State shall adopt the laws and regulations necessary to provide that the **breaking or injury by a ship flying its flag** or by a **person subject to its jurisdiction** of a submarine cable beneath the high seas done willfully or through culpable negligence, in such a manner as to be liable to interrupt or obstruct telegraphic or telephonic communications, and similarly the breaking or injury of a submarine pipeline or high-voltage power cable, shall be a punishable offence."

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Submarine cable activities fall far below environmental thresholds in UNCLOS

- Article 194, including provision on protection of fragile ecosystems, pertains to measures to reduce and control pollution.
- Article 197 provides that global and regional cooperation on rules, standards, and practices and procedures be consistent with UNCLOS.
- Article 206 permits environmental assessments of activities within the coastal state's jurisdiction or control that threaten substantial pollution or significant and harmful changes to the marine environment.

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ICPC recommendations for BBNJ Instrument (1)

- IGC participants and the zero draft should:
  - Recognize that the best available peer-reviewed scientific research confirms submarine cables are benign to neutral in the marine environment and do not threaten BBNJ conservation;
  - Recognize that submarine cables constitute a sustainable use of the deep sea environment and should be encouraged, particularly as they benefit developing and small island states;
  - Recognize that UNCLOS expressly provides for fostering of international communications and the development and protection of submarine cables;

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ICPC recommendations for BBNJ Instrument (2)

- Ensure that EIAs and ABMTs are not applied to delay or deter submarine cable installation or repair; and
- Engage submarine cable industry throughout the processes for implementing a BBNJ instrument.

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