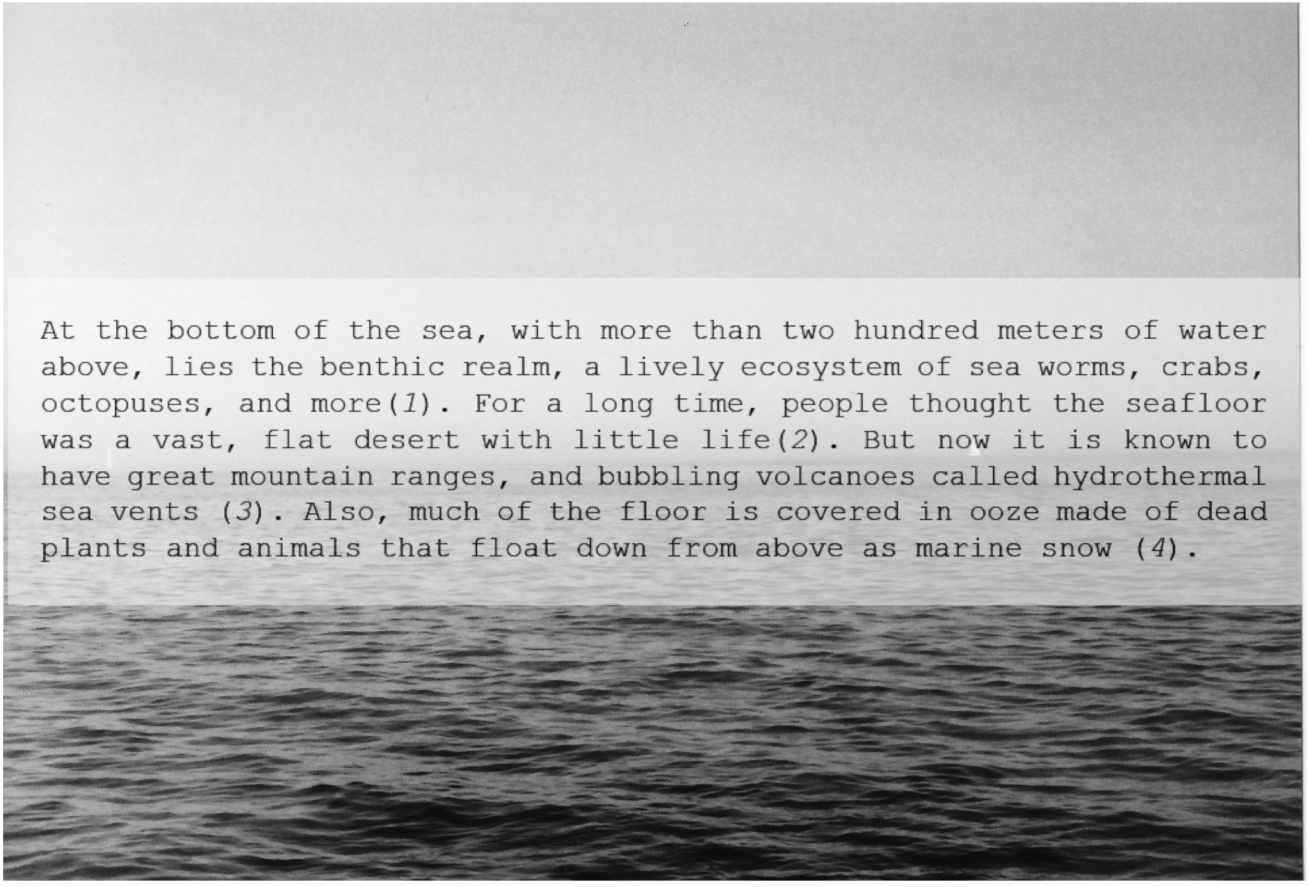
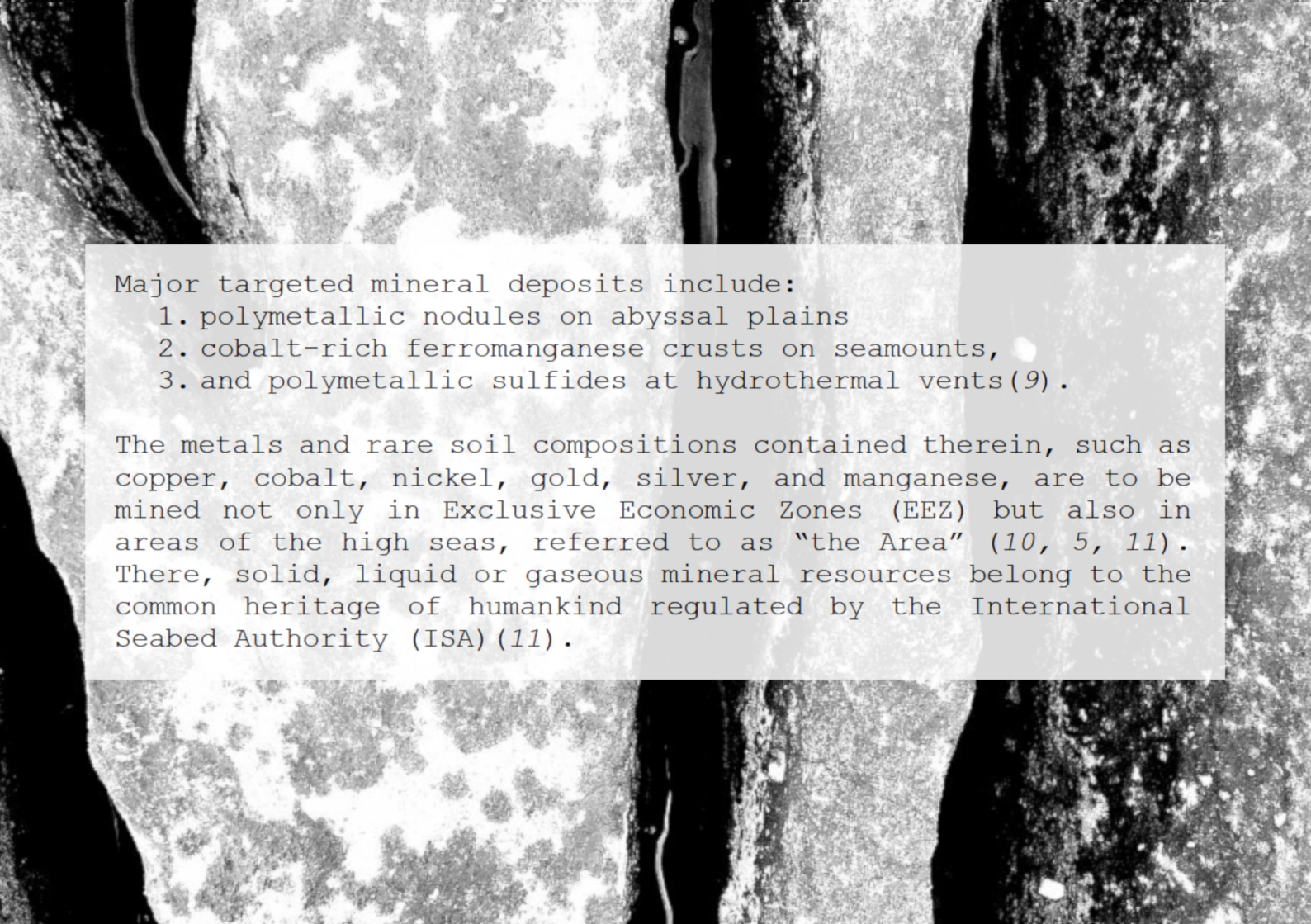

the
SEABED
MINING
activity
and
coloring book



At the bottom of the sea, with more than two hundred meters of water above, lies the benthic realm, a lively ecosystem of sea worms, crabs, octopuses, and more(*1*). For a long time, people thought the seafloor was a vast, flat desert with little life(*2*). But now it is known to have great mountain ranges, and bubbling volcanoes called hydrothermal sea vents (*3*). Also, much of the floor is covered in ooze made of dead plants and animals that float down from above as marine snow (*4*).

The deep sea is believed to harbor the largest reserves of unknown species, ecosystems, and nonrenewable resources (*5*). Just like on land, the rocks and sands under the ocean are made of metals and minerals valuable for their uses in technology like your computer or cellphone (*6*, *7*). Seabed mining is an experimental industry that wants to remove these ores from the seafloor to sell (*2*). Accordingly, deep-sea mining is understandable as a geopolitical object that shapes the global discourse on future resource security, turning the "wilderness" of the deep sea into one of the "last planetary frontiers" (*6*, *8*).

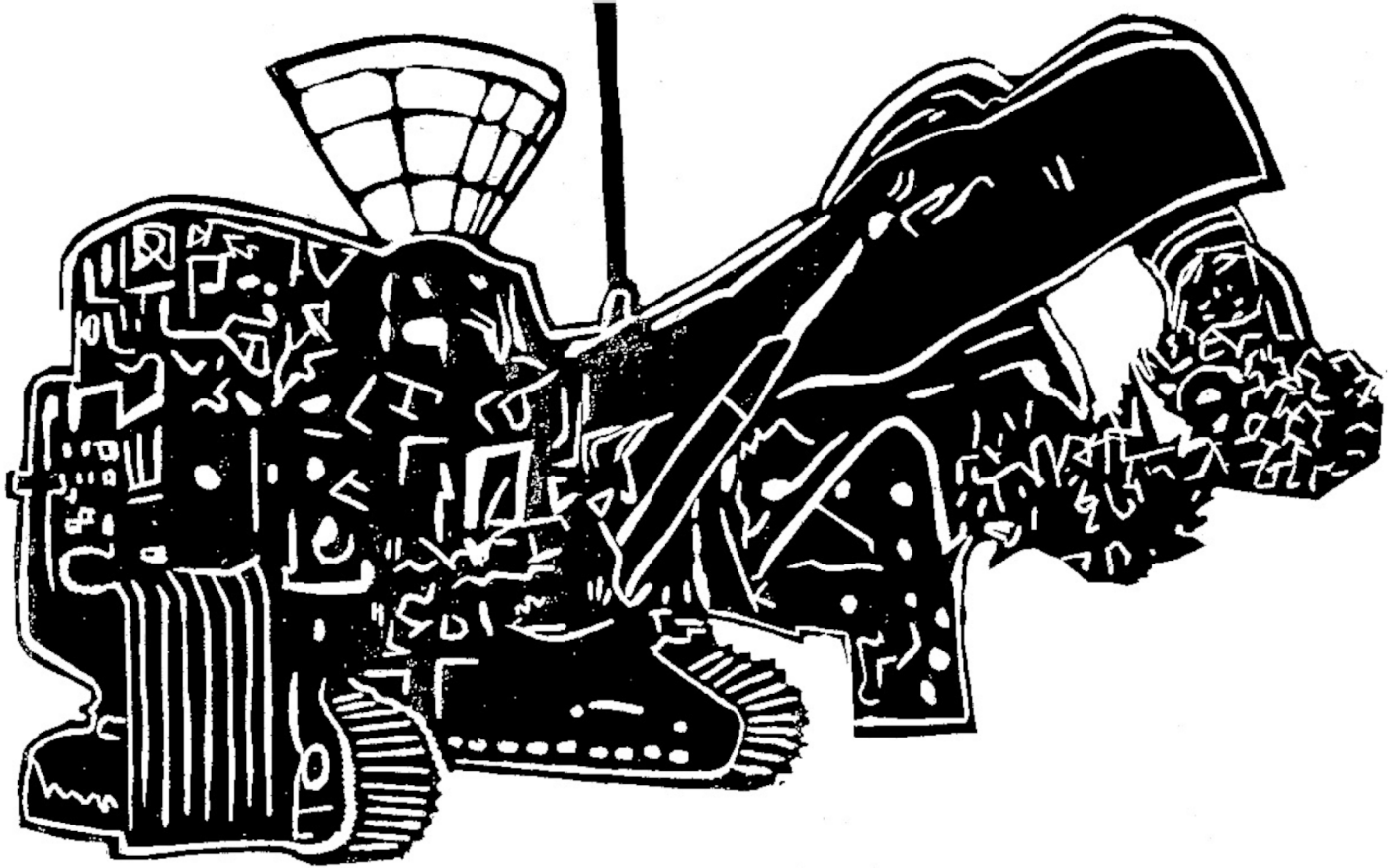


Major targeted mineral deposits include:

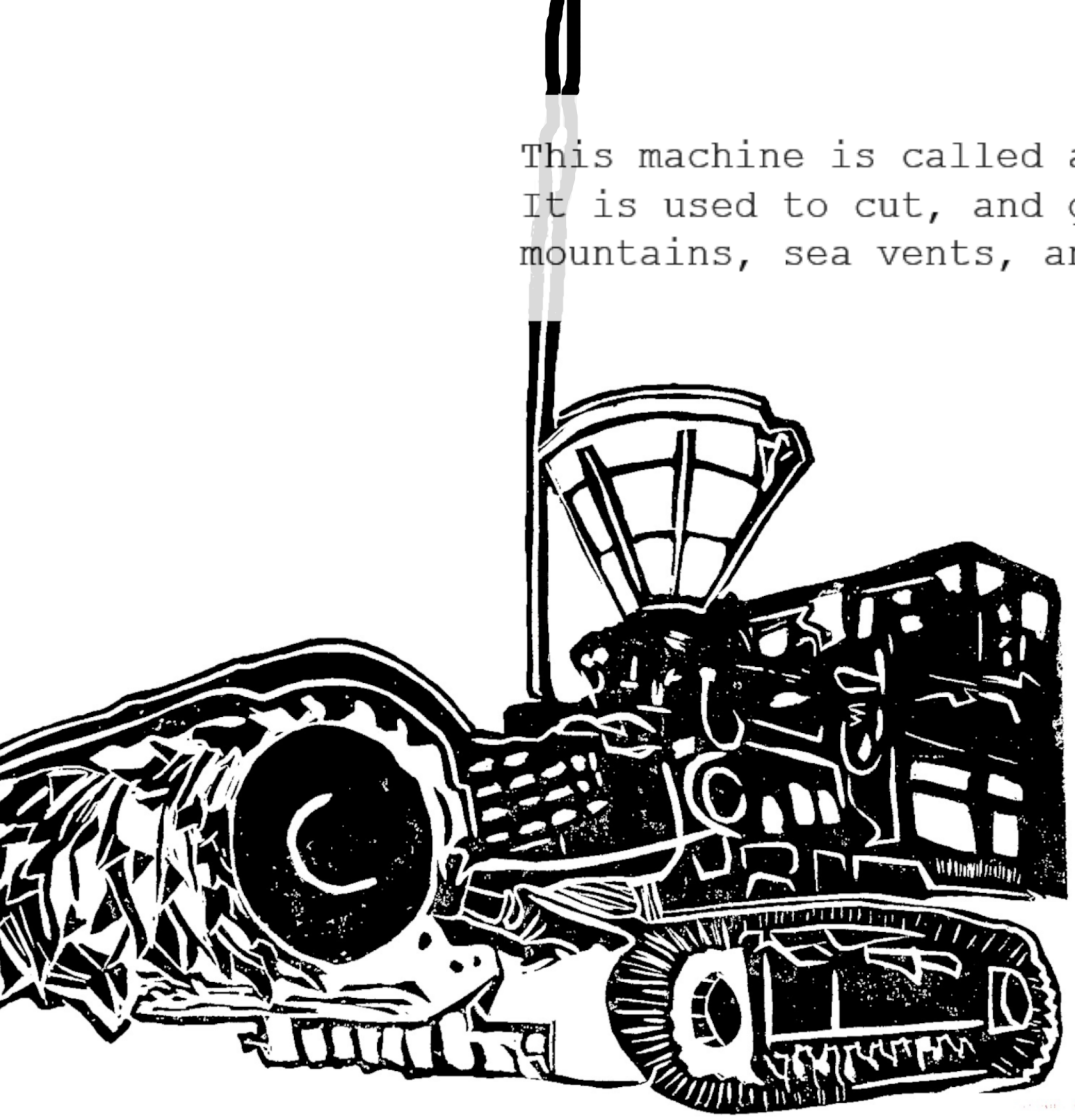
1. polymetallic nodules on abyssal plains
2. cobalt-rich ferromanganese crusts on seamounts,
3. and polymetallic sulfides at hydrothermal vents(*9*).

The metals and rare soil compositions contained therein, such as copper, cobalt, nickel, gold, silver, and manganese, are to be mined not only in Exclusive Economic Zones (EEZ) but also in areas of the high seas, referred to as "the Area" (*10*, *5*, *11*). There, solid, liquid or gaseous mineral resources belong to the common heritage of humankind regulated by the International Seabed Authority (ISA)(*11*).

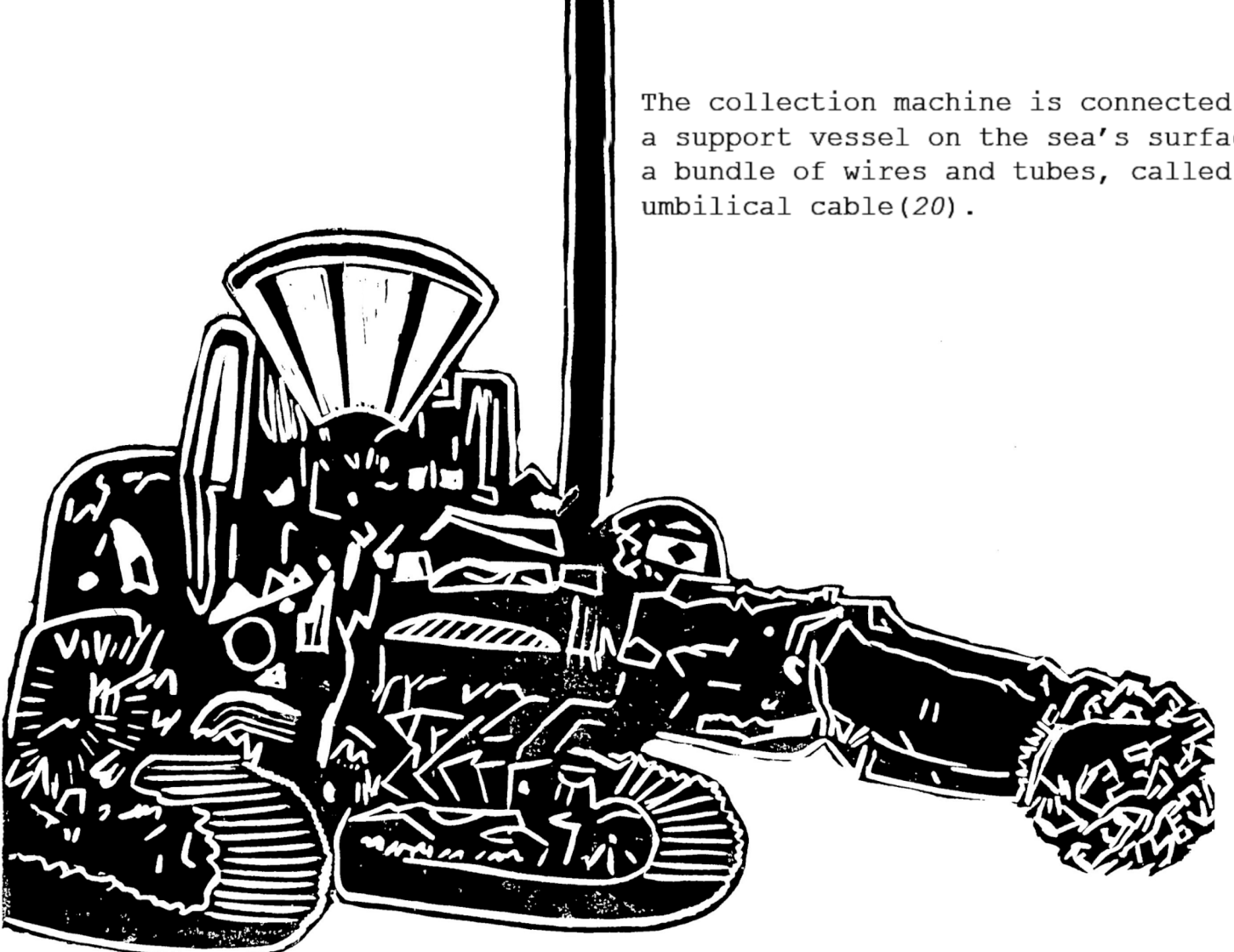
This machine, named "the auxiliary cutter" is the first machine in the process of creating a level working surface for the next two machines(*19*).



This machine is called a Bulk Cutter.
It is used to cut, and grind the undersea mountains, sea vents, and seafloor (*18*).

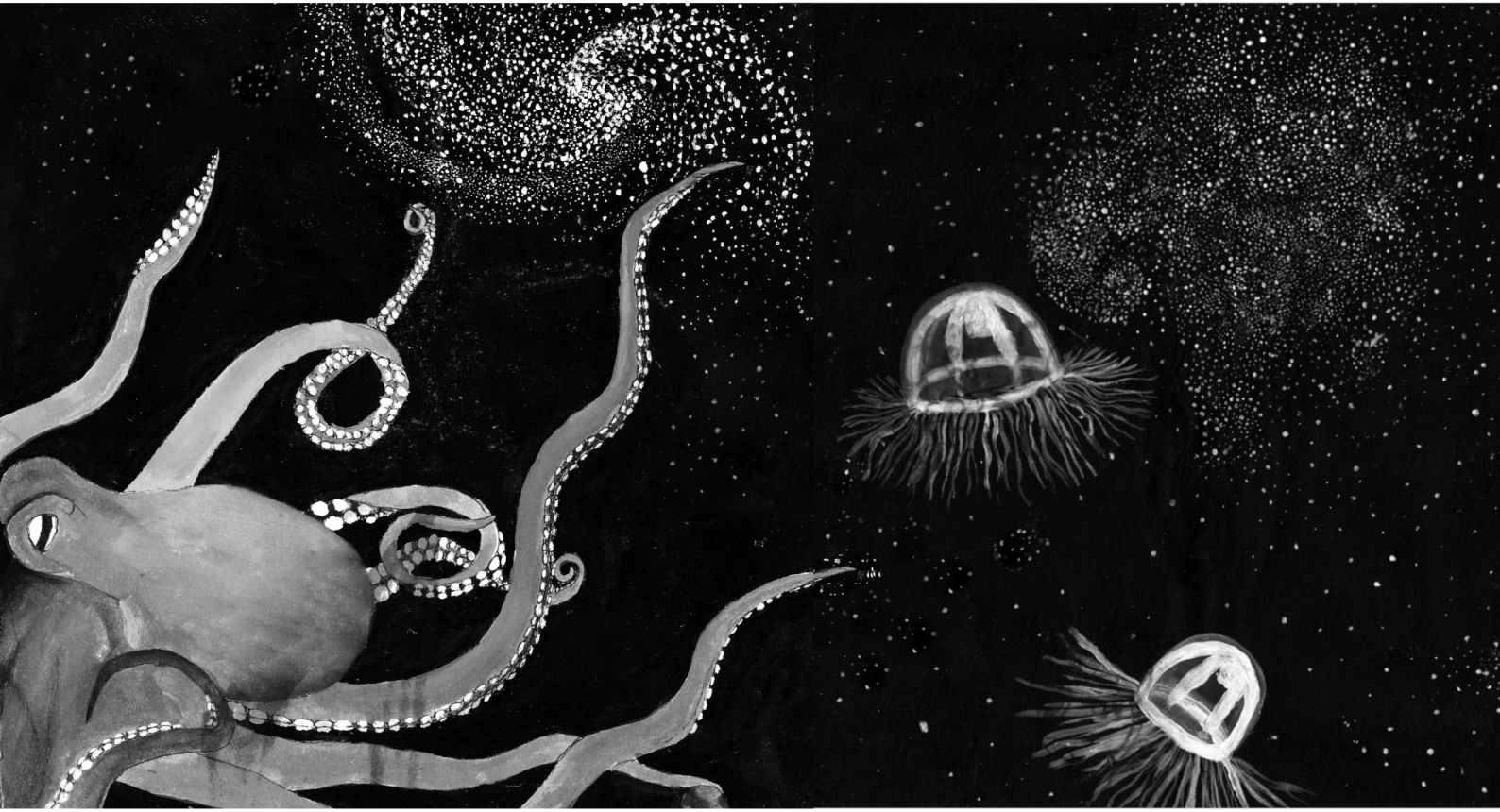


The collection machine is connected to a support vessel on the sea's surface via a bundle of wires and tubes, called an umbilical cable(*20*).



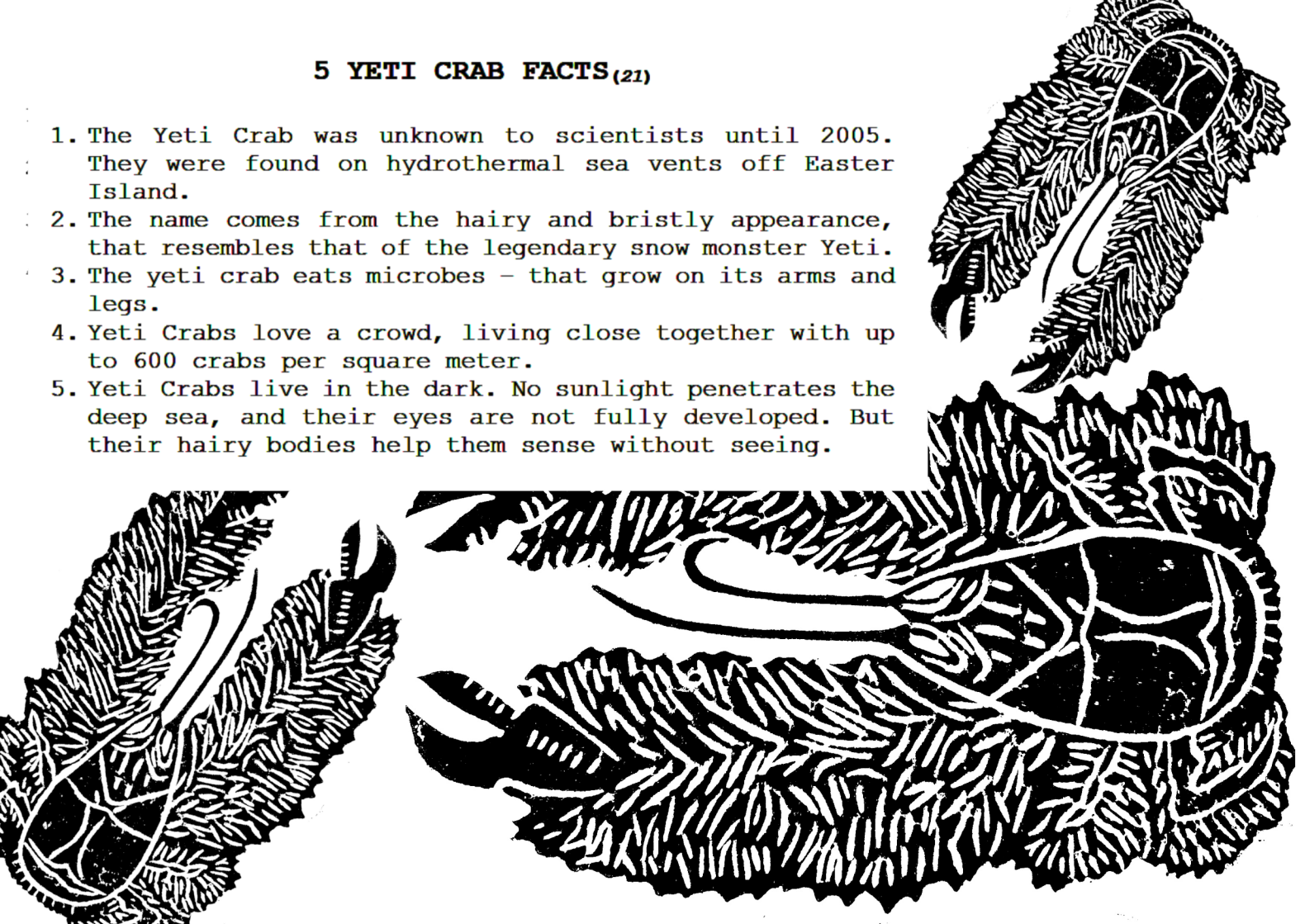
For the past 27 years, the ISA has been the only authority to ensure sufficient monitoring of mining activities and to decide on exploration licenses based on the Law of the Sea Convention (*6*). The certificates are only granted to private mining companies if a certified sponsor state guarantees the venture and provides due diligence(*12*, *13*). So far, 31 of these licenses have been issued worldwide(*9*). Most of them cover sections of the Clarion Clipperton Zone (CCZ) - an area between Hawaii and Mexico with high species richness and biodiversity (*8*, *6*).

Many regions targeted for future seabed mining are also considered sensitive marine ecosystems(*1*). These distinctive and unique species communities show that resources cannot be considered in isolation from associated structures in the same habitats(*1*). However, existing knowledge gaps regarding deep-sea ecosystems and their interconnectedness with the oceans also mean that the impacts of mining can only be poorly understood(*6*).



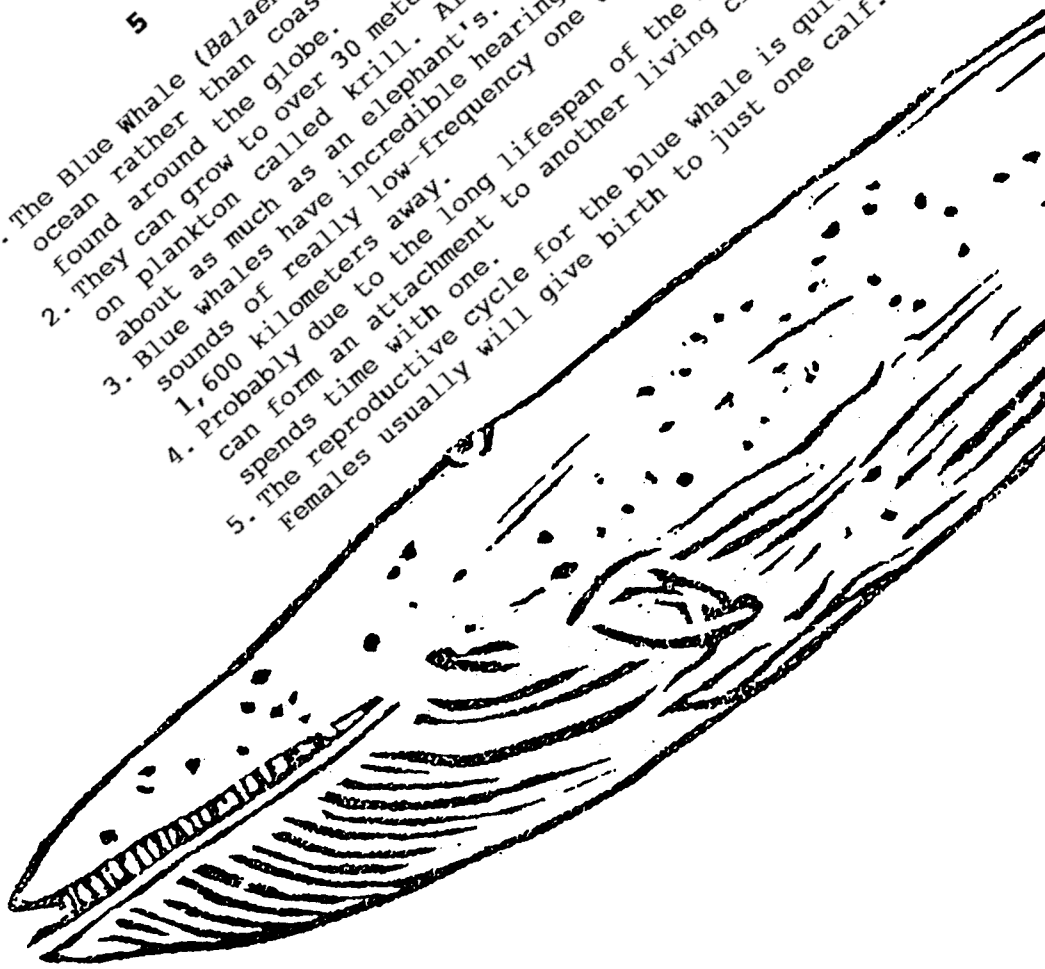
5 YETI CRAB FACTS(21)

1. The Yeti Crab was unknown to scientists until 2005. They were found on hydrothermal sea vents off Easter Island.
2. The name comes from the hairy and bristly appearance, that resembles that of the legendary snow monster Yeti.
3. The yeti crab eats microbes – that grow on its arms and legs.
4. Yeti Crabs love a crowd, living close together with up to 600 crabs per square meter.
5. Yeti Crabs live in the dark. No sunlight penetrates the deep sea, and their eyes are not fully developed. But their hairy bodies help them sense without seeing.



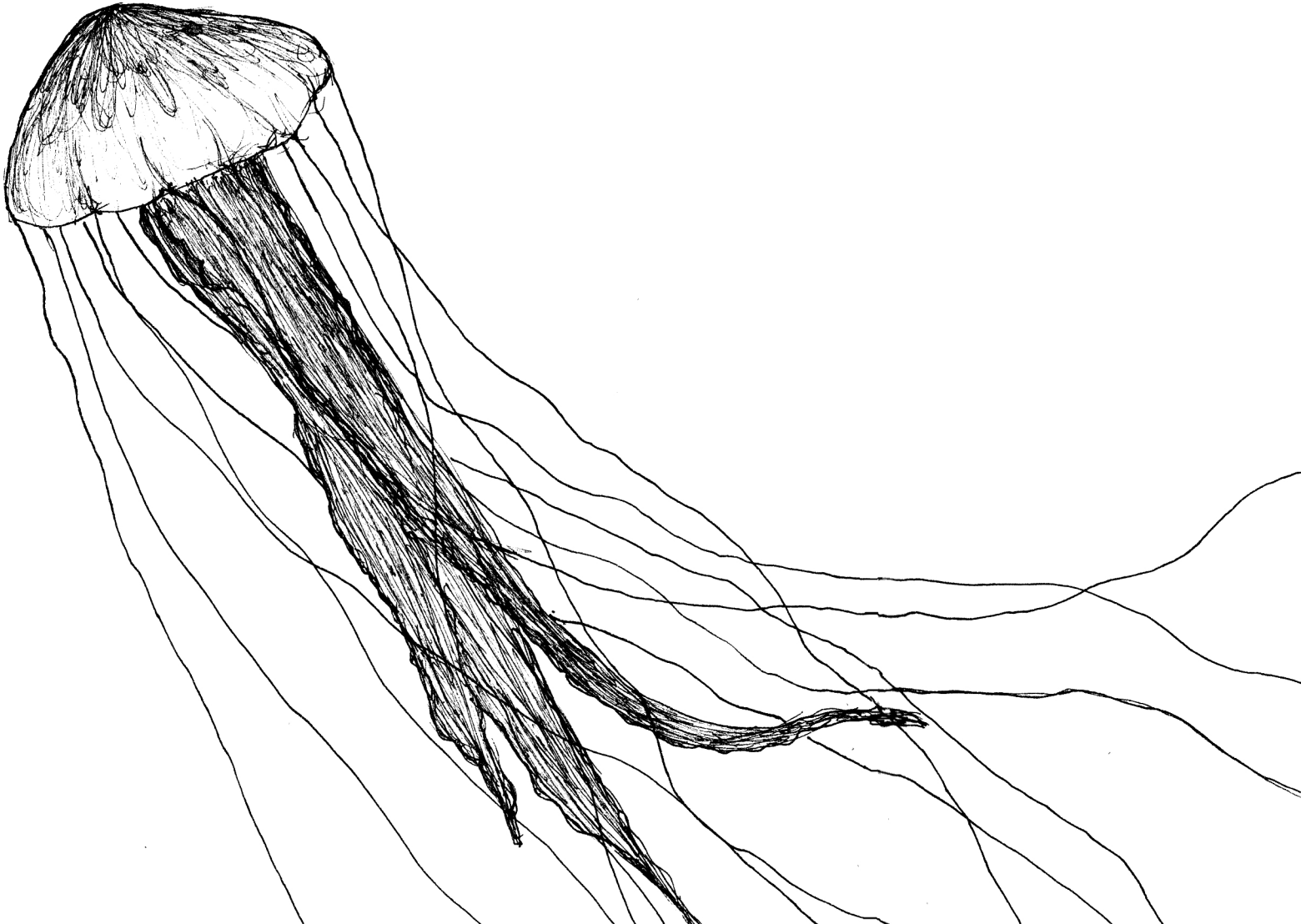
5 BLUE WHALE FACTS (23)

1. The Blue Whale (*Balaenoptera musculus*) prefers the deep ocean rather than coastal waters or bays and can be found around the globe.
2. They can grow to over 30 meters in length while feasting on plankton called krill. Also, their tongue weighs about as much as an elephant's.
3. Blue whales have incredible hearing, communicating with sounds of really low-frequency one can hear as far as 1,600 kilometers away.
4. Probably due to the long lifespan of the blue whale, it can form an attachment to another living creature that spends time with one.
5. The reproductive cycle for the blue whale is quite slow. Females usually will give birth to just one calf.



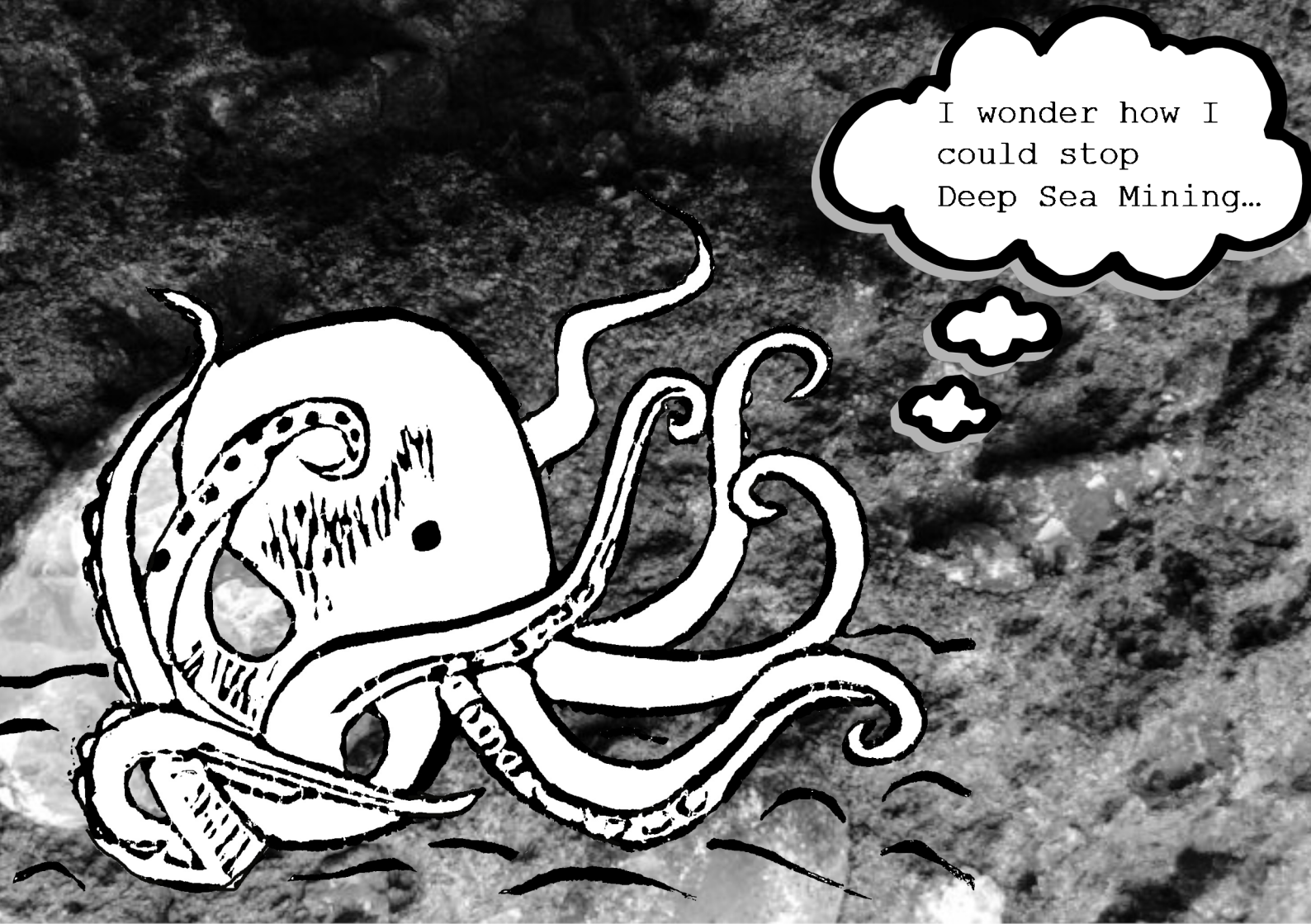
5 GIANT TUBE WORM FACTS (22)

1. *Riftia pachyptila*, known as "giant tube worm", lives on the floor of the Pacific Ocean near hydrothermal vents with high amounts of particularly toxic hydrogen sulfide present.
2. The worms form a ring around the opening of the vent, stopping at an invisible boundary where the water temperature is intolerable.
3. They contain a particular kind of bacteria that thrives on the high sulfide content of the water spewing out of the vents, and this in turn provides every for the worm to live.
4. These worms are extremely fast-growing and can reach a length of 3m.
5. While these animals don't eat, they do have to breathe. They do so by sending out a long red plume of gill structures that reach out into oxygenated water.

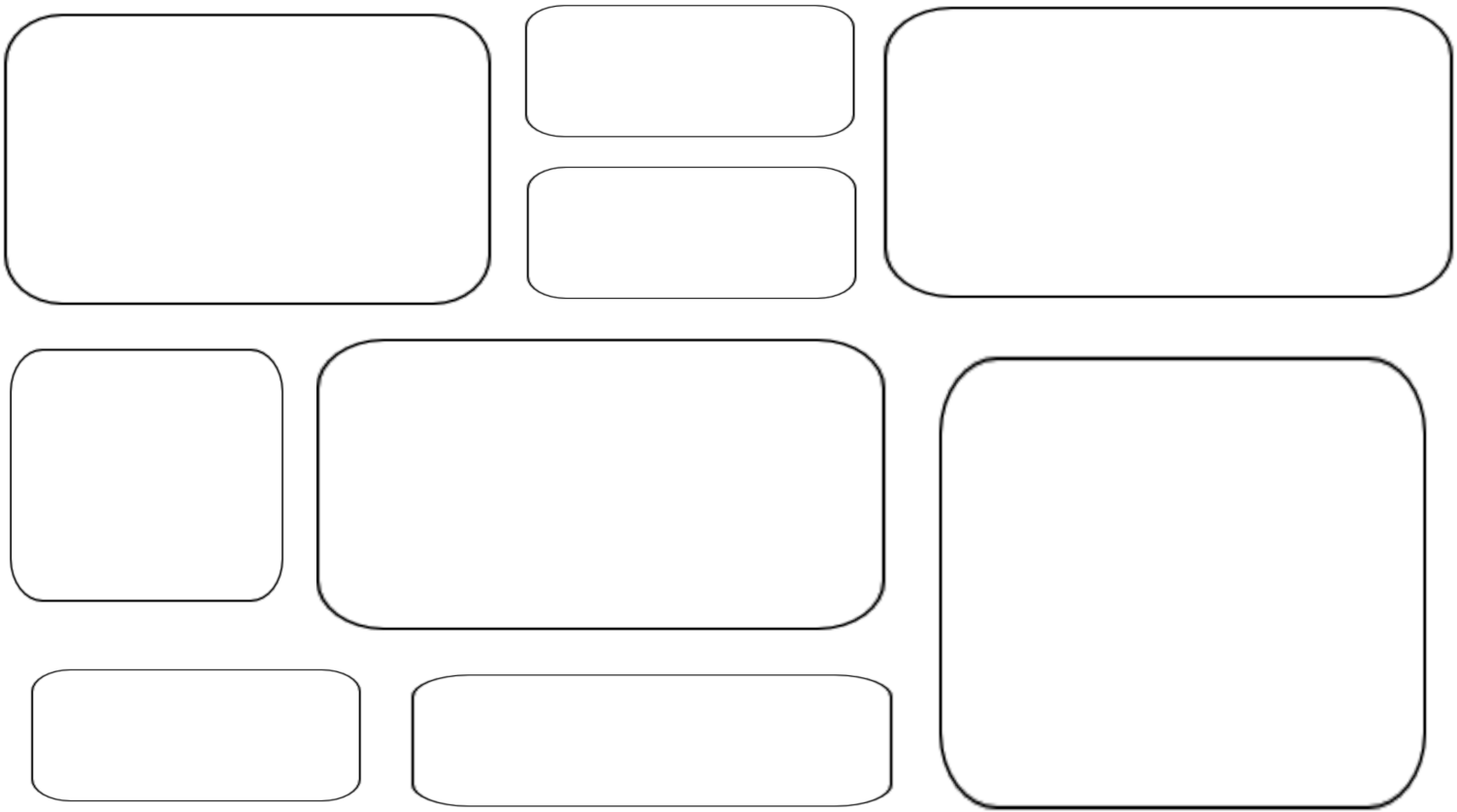


Environmental damages might include:

- the destruction of benthic ecosystems and the extinction of species throughout the deep sea(*9*),
- contamination of the water column and pelagic animals by heavy metals and other toxins (*9*),
- sediment or wastewater discharge plumes that can cause severe turbidity even in higher water layers(*9*),
- disturbance of existing fauna by artificial light and underwater noise(*9*),
- possible oil spills and other accidents(*14*, *9*),
- increasing ocean acidification and increased climate risk posed by an additional release of "blue carbon" stored in the seabed over millennia (*9*, *14*, *13*).


I wonder how I could stop Deep Sea Mining…

Hi! I'm Casper, the ghostly octopus.
Here you can draw a small comic on
how I could save my home.



Although the mining sites seem distant, they are not separate from what happens on land or intangible from spiritual connections (*15*). For many oceanic societies, the ocean is a core element of their identity (*5, 16*). Many island nations of Oceania are on the front lines of the climate debate and are already experiencing significant disturbances without added threats through deep-sea mining. Within Pacific movements, women and youth, often excluded from economic or political debates, have often been the backbone of grassroots organizations (*17*). Therefore, it is likely, that the far-reaching environmental impacts of deep-sea mining will be felt disproportionately in pacific communities (*13, 6*).

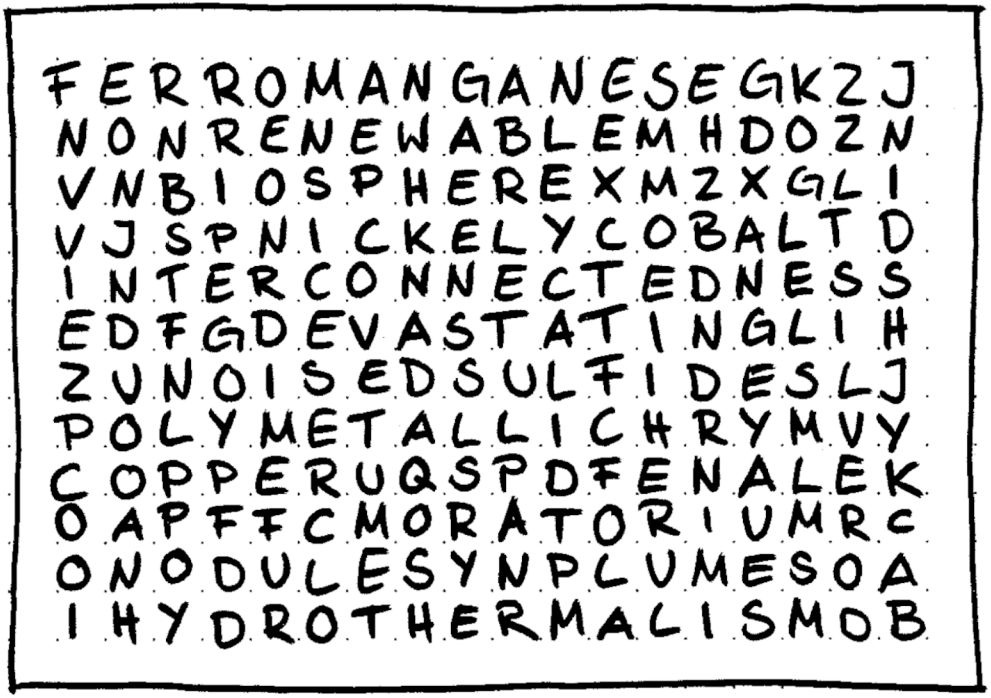
DEEP SEA SOUP

OF LETTERS

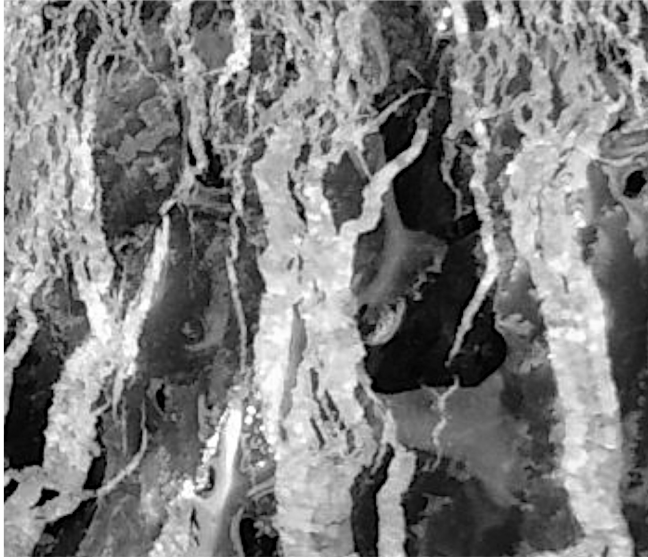
WORDS ARE HIDDEN

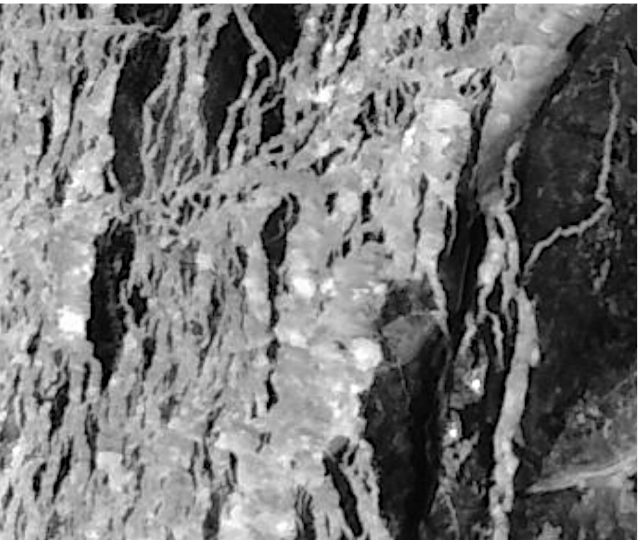
→ ↓ ↘

BIOSPHERE
COBALT
COPPER
DEVASTATING
FERROMANGANESE
GOLD
HYDROTHERMALISM
INTERCONNECTEDNESS
MORATORIUM
NICKEL
NODULES
NOISE
NONRENEWABLE
PLUMES
POLYMETALLIC
SILVER
SULFIDES

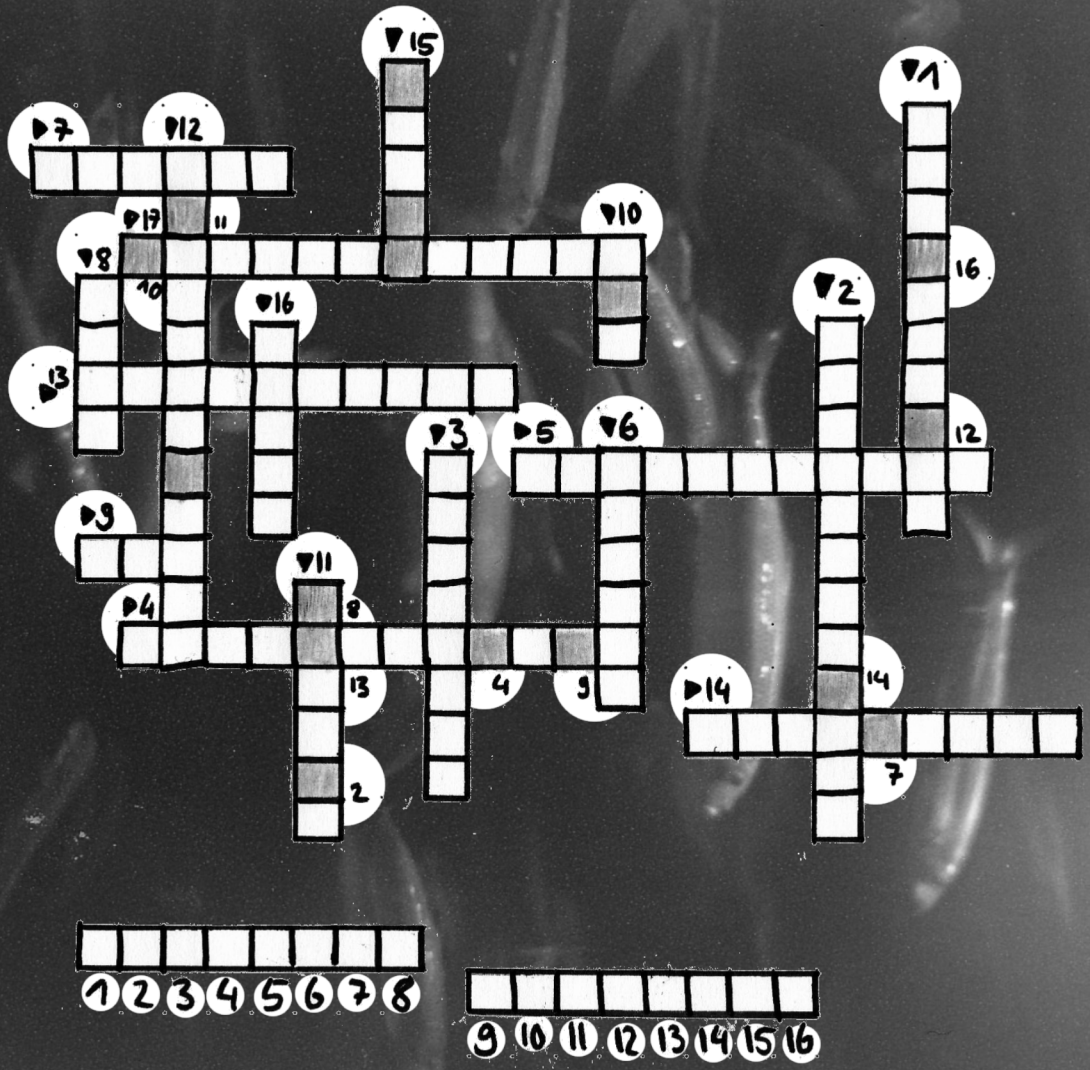


1. How deep do ecosystems have to be located below sea level to be part of the deep sea?
2. What characterizes the mineral resource that the deep sea harbors?
3. What is the "wilderness" of the deep sea also called in the context of deep-sea mining?
4. Which feature is attributed to the object of deep-sea mining?
5. What would happen to the environment and socio-cultural structures during deep-sea mining?
6. How can we describe the environmental conditions in the deep sea?
7. How does one of the targeted mineral deposits appear?
8. What are regions of the high seas also known as?
9. What is the name of the main regulatory body in international waters regarding deep-sea mining?





10. What is the abbreviation for one of the most significant mineral resource exploration zones?
11. How is the concept of humanity´s heritage described in international waters
12. What does a private company need to be allowed to mine minerals in international waters?
13. What form of personhood do DSM opponents demand regarding the oceans?
14. What is produced by wastewater discharge plumes?
15. What is artificial and does not occur in the deep sea without mining activities?
16. Which ecological damage could also be increased by deep sea mining?
17. What characterizes the nodules and sulfides on the deep-sea floor?


15
1
7
12
17
11
10
8
10
16
2
16
13
3
5
6
12
9
11
4
8
13
4
9
14
14
2
7
1 2 3 4 5 6 7 8
9 10 11 12 13 14 15 16

CIVIL SOCIETY GROUPS

CALL FOR...

1. leadership in defending the oceans from harmful industries(7)
2. greater transparency, public consultation processes, and accountability to future generations in all decision-making processes(*24*, *25*)
3. taking responsibility for protecting the common heritage of humankind and stopping funding DSM projects through the ISA(7)
4. reviewing government statuses as a sponsoring state(*25*)
5. unified national strategies against DSM(*26*, *7*)
6. promoting shared sustainable use of marine ecosystems, ensuring the protection of marine ecosystems and fishing grounds(*27*, *5*)
7. an opportunity for civilians to learn about the issue of deep-sea mining and make them aware of the problems(*5*, *24*)
8. a holistic approach to legislation that constantly evolves with the variability of socio-ecological factors and protects the population's interests(*5*, *25*)
9. ensuring legal ecological personhood of the oceans as another means of adequate protection(*28*)
10. a 10-year moratorium on high-risk, unsustainable deep-sea mining(*25*)


INTERSPECIES
SOLIDARITY

Imprint

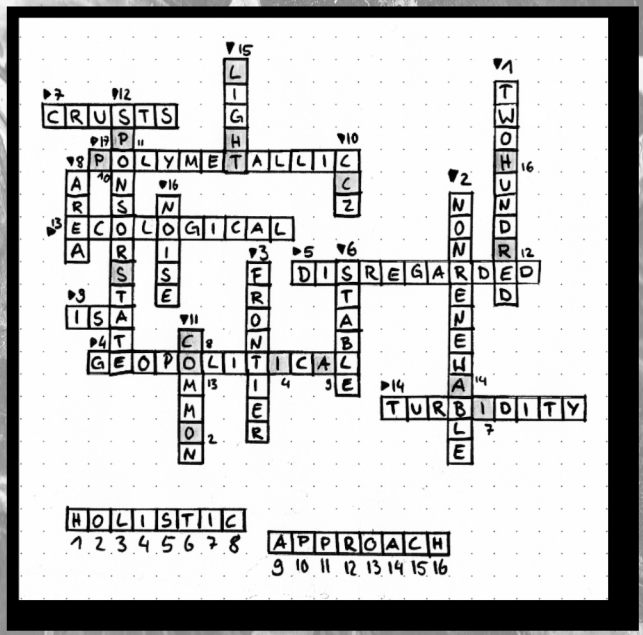
Edition 1, "the Seabed Mining activity and coloring book"

Marine Political Ecology

Helmholtz Institute for Functional Marine Biodiversity

Oldenburg, Germany

Contributors: Anne Wolfgramm, Katherine Sammler, Marie Osterloh, Katharina Ewald



References

(1) Miller, K. A.; Thompson, K. F.; Johnston, P.; Santillo, D. An Overview of Seabed Mining Including the Current State of Development, Environmental Impacts, and Knowledge Gaps. *Front. Mar. Sci.* 2018, *4; DOI* 10.3389/fmars.2017.00418.

(2) Sammler, K. G. The deep Pacific: Island governance and seabed mineral development. In *Island Geographies: Essays and Conversations*: *Essays and conversations*; Stratford, E., Ed.; Routledge studies in human geography; Routledge: New York, N.Y., 2017; pp 10-31.

(3) Gassner, P., Westerveld, L., Fonua, E., Takau, L., Matoto, A. L., Kula, T., Macmillan-Lawler, M., Davey, K., Baker, E., Clark, M., Kaitu'u, J., Wendt, H., Fernandes, L. *Marine Atlas. Maximizing Benefits for Tonga*: Suva, Fiji, 2019.

(4) National Oceanic and Atmospheric Administration (NOAA). What is marine snow? https://oceanservice.noaa.gov/facts/marinesnow.html (accessed February 5, 2023).

(5) Tilot, V.; Willaert, K.; Guilloux, B.; Chen, W.; Mulalap, C. Y.; Gaulme, F.; Bambridge, T.; Peters, K.; Dahl, A. Traditional Dimensions of Seabed Resource Management in the Context of Deep Sea Mining in the Pacific: Learning From the Socio-Ecological Interconnectivity Between Island Communities and the Ocean Realm. *Front. Mar. Sci.* 2021, *8; DOI* 10.3389/fmars.2021.637938.

(6) Hallgren, A.; Hansson, A. Conflicting Narratives of Deep Sea Mining. *Sustainability* 2021, *13* (9), 5261; DOI 10.3390/su13095261.

(7) Slatter, Claire. *Intersecting interests in Deep-sea mining: Pacific SIDS, venture capital companies and institutional actors*; DAWNInforms ISSN 2413-1512: Suva, Fiji, 2020.

(8) Fawcett, Leesa, Havice, Elizabeth, Zalik, Anna. *Privatize, Democratize, Decolonize: Ocean Epistemologies in the 21st Century*, 2021.

(9) Martin, Cyrill, Weilgart, Lindy, Amon, Diva J., Muller, Johannes. *Deep-Sea Mining: A noisy affair. Overview and Recommendations* No. 44598: Switzerland, 2021.

(10) Metaxas, A.; Snelgrove, P. Caring for the Deep Sea. In *The Future of Ocean Governance and Capacity Development*; Institute-Can, I. O., Ed.; Brill | Nijhoff, 2018; pp 245-251.

(11) International Seabed Authority. *Small Island Developing States and the law of the sea: an ocean of opportunity*: Kingston, Jamaica, 2021.

(12) Sloan, James. *The legal risks of seabed mining: what should be taken into account by decision-makers in Pacific Island States as they consider how to develop their Blue Economies?*; DAWNInforms ISSN 2413-1512: Suva, Fiji, 2020.

(13) Greenpeace International. *Deep trouble. The murky world of the deep sea mining industry*: Amsterdam, The Netherlands, 2020.

(14) Hunter, J.; Singh, P.; Aguon, J. Broadening Common Heritage: Addressing Gaps in the Deep Sea Mining Regulatory Regime. *The Harvard environmental law review: HELR* 2018.

(15) Carver, R.; Childs, J.; Steinberg, P.; Mabon, L.; Matsuda, H.; Squire, R.; McLellan, B.; Esteban, M. A critical social perspective on deep sea mining: Lessons from the emergent industry in Japan. *Ocean & Coastal Management* 2020 (193), 105242; DOI 10.1016/j.ocecoaman.2020.105242.

(16) Hau'ofa, E. Our Sea of Islands. *The Contemporary Pacific* 1994, *6* (1), 148-161.

(17) Mangioni, Talei Luscia. *The transnational struggle against nuclear colonialism in the "sea of islands"*; The Funambulist No. 39: Paris, France, 2022.

(18) Reid, S. 1. SOLWARA 1 AND THE SESSILE ONES. *I. Braverman & E. Johnson (Ed.), Blue Legalities: The Life and Laws of the Sea*; pp 25-44.

(19) Mike Gaworecki. New tool lets anyone find out if deep sea mining is happening in their ocean backyard. https://dsmobserver.com/2016/10/new-tool-deep-sea-mining/ (accessed January 8, 2023).

(20) Squire, R. *Undersea geopolitics. Sealab, science, and the Cold War*; Geopolitical bodies, material worlds; Rowman & Littlefield Publishers: Lanham, 2021.

(21) Fact Animal. 14 Incredible Yeti Crab Facts - Fact Animal. https://factanimal.com/yeti-crab/ (accessed January 8, 2023).

(22) Fact Animal. 8 Fun Giant Tube Worm Facts - Fact Animal. https://factanimal.com/giant-tube-worm/ (accessed January 8, 2023).

(23) Fact Animal. 23 Astonishing Blue Whale Facts - Fact Animal. https://factanimal.com/blue-whale/ (accessed January 8, 2023).

(24) PANG Media. Malu'i e Oseni - The Deep Sea Minders of Tonga, Conference. https://www.youtube.com/watch?v=c640yiViTew (accessed June 30, 2022).

(25) Civil Society Forum of Tonga. *RE: Tonga's Deep-Seabed Mining Status*: Nuku'alofa, Tonga, 2020. https://miningwatch.ca/sites/default/files/lettertotongapmseabedmining.pdf.

(26) Brown Pulu, Teena. *Modern Colonialism: Dialogues with Sefita Hao'uli, Kalafi Moala, and Melino Maka*; Te Kaharoa: the e-Journal on Indigenous Pacific Issues No. 1: Auckland, New Zealand, 2013.

(27) PANG Media. Malu'i e Oseni - The Deep Sea Minders of Tonga, Documentary. https://www.youtube.com/watch?v=3SaXVmP00QA (accessed June 30, 2022).

(28) Slatter, C. Securing the pacific in a globalised world: New and emerging developments in international law. *Canterbury Law Review* 2020 (27), 5-20.