

Conservation news

New report applies the mitigation hierarchy and deep-ocean science to determine risks and impacts of deep-seabed mining

The current urgent focus on deep-seabed mining is driven by two things: the argument that seabed minerals are necessary to decarbonize our economies and mitigate climate change (with a rush for minerals and metals used in technologies associated with renewable energy); and the International Seabed Authority's self-imposed 2020 deadline to complete the rules and regulations governing deep-seabed mineral exploitation in international waters, thereby enabling contracts for exploitation.

A report published in March 2020 by Fauna & Flora International responds to this critical issue, assessing the latest scientific evidence. The report highlights the extraordinary complexity of ocean ecosystems, providing a system-scale insight into the connectivity of ocean chemistry, ecological function, the role of oceans in climate regulation and primary production, and the interdependence of these processes to maintain a healthy, functioning and productive ocean system.

The report found different policy and governance regimes apply to national and international waters, and, overall, governance of marine mining is fragmented and inconsistent. Attempts to determine impacts of mining are hampered by a significant lack of knowledge of deep ocean biodiversity. Furthermore, different risks and impacts are associated with the various methods of deep-seabed resource extraction. Some ecosystems are naturally highly dynamic and may be resilient to perturbations and violent physical disturbances associated with plate tectonics and volcanic activity (e.g. metal sulphides associated with hydrothermal vents). However, research shows that most deep-seabed ecosystems are very vulnerable, comprising highly specialized biodiversity, with slow growing, long-lived species. Evidence from projects monitoring pilot excavations indicate that impacts to these systems are likely to be long-term (in geological time frames) and widespread. All deep-sea extraction methods require removal of entire substrates from the ocean environment (e.g. phosphates, seafloor massive sulphides, cobalt crusts and polymetallic nodules).

Emerging science describes the complexities of ecosystem function and the relationship between target mineral resources, the biogeochemistry responsible for their formation and the overall health and function of the ocean. Deep-seabed mining will result in large-scale loss of habitat (i.e. loss of substrates) and associated biodiversity, including the unknown diversity of macrofauna and microbial systems underpinning primary production, carbon dioxide and trace metal sequestration and cycling, and will produce sediment plumes that will disrupt ecological function and

behavioural ecology of deep-ocean species, smothering fundamental ecological processes over vast (and difficult to predict) areas. We simply do not know enough about deep-sea ecosystems to predict impacts with any confidence. However, through application of a mitigation hierarchy approach, the report's assessment reveals evidence for significant and currently immitigable impacts of deep-seabed mining on biodiversity.

The report raises the importance of poorly understood biogeochemical processes that drive ocean chemistry and ecological functions and highlights recent science that builds a strong case for the important role of deep-sea biological systems in driving planetary carbon sequestration. Deep-seabed mining has the potential to cause disruption and potential collapse of these processes and could exacerbate our current crises of climate change and biodiversity loss. Combined with the considerable gaps in the knowledge of ocean complexity and how this relates to earth-system processes, there is no adequate basis on which to grant mining exploitation contracts.

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Searching for *Vatica pentandra*, a tree endemic to Kalimantan and known only from a single collection in 1955

Vatica pentandra (Dipterocarpaceae) is an endemic tree found only in Kutai Kartanegara Regency, East Kalimantan Province, Indonesia. The species is categorized as Critically Endangered on the IUCN Red List using criteria A1c, C2a, D, which focus on population size and reduction (P. Ashton, 1998, dx.doi.org/10.2305/IUCN.UK.1998.RLTS.T33455A9785565.en). The tree is known from only a single collection, made in 1955 along the Belayan River near Tabang District (P. Ashton, 1978, *Gardens' Bulletin*, Singapore, XXXI, 5–48). There has been no further record of this tree, and it is not known to be present in any ex situ conservation collections (BGCI, 2020, *PlantSearch* database).

To provide information for an updated assessment of this threatened species, we conducted a survey in February 2020 in a total of 14 localities along the Belayan River, within the villages of Sungai Lunuk, Umaq Dian and Gunung Sari in Tabang District and Long Beleh Village in Kembang Janggut District. We tried to survey as wide a range of habitats as possible: from hilly, upstream areas of Sungai Lunuk