



The discovery of polymetallic nodules

Polymetallic nodules were first widely reported from the global expedition by the HMS Challenger (1872-1876) which recovered nodules from the Indian, Pacific and Atlantic oceans.

USSR and US marine expeditions in late 1960s, made the discovery of nodules within the Cook Islands national waters.

What are polymetallic nodules?

Polymetallic nodules are mineral concretions (solid mixture) made up of manganese and iron oxides. These metals are found in ocean waters but are not stable as a solution so precipitate out onto any stable surface.

Nodules are formed (as opposed to crusts) when the precipitates form on soft clay-ooze and where they are periodically moved by currents and seabed animals.

Nodules can be as small as a dollar coin or as large as a potato. They can be smooth or have a botryoidal surface (shaped like a cluster of grapes).

Some areas having been observed to have high abundance of nodules such as the Clarion Clipperton zone (CCZ) and South Penrhyn Basin (Cook Islands).

Cook Islands nodules are most frequent at depths of approx. 4500 to 6000 metres where old oxygen rich currents (AABW – Antarctic Bottom Water) run along the seafloor.

Nodule growth

Nodule growth is very slow at around 1 to 10 mm for every million years.

Depending on their location formation occurs in two ways,

The Hydrogenetic Process

This occurs when minerals precipitate from cold ambient seawater onto the exposed parts of nodule; and

The Diagenetic Process

“this occurs when minerals precipitate from sediment-pore waters onto the submerged parts of nodules



1cm



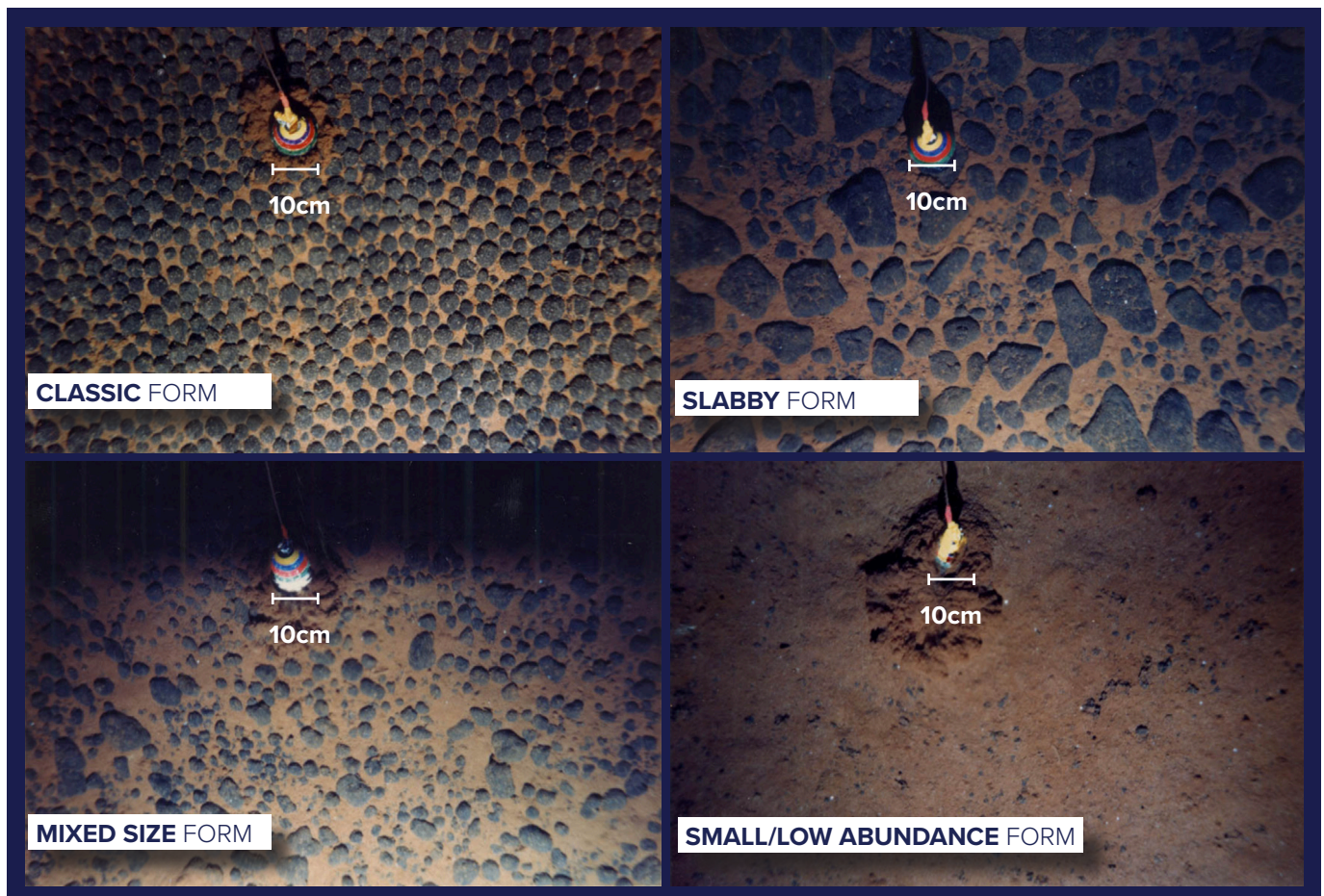
Cross section of nodules from the Clarion Clipperton zone (CCZ) and South Penrhyn Basin.

Our Cook Islands nodules

Nodules within the Cook Islands have a classic spherical form (as shown below) but are also found in other forms as shown below.

As the form of a nodules reflects its growth history over millions of years, the different forms are thus thought to

be a result of different local conditions, e.g. in terms of the stability and thickness of the chemically active zone (Environment e.g thicker or thinner sediment layers) from which they grow.



Importance of our nodules

The nodules in the Cook Islands have a high cobalt content, which is of special interest to battery manufacturers. They also contain manganese, iron, nickel, copper and rare earth elements that are likely to be of interest also.

Currently, the world has a growing demand for battery metals due to the transition from fossil fuel powered energy to clean energy (renewables).

The metals in nodules are especially needed in electric vehicle (EV) batteries. Very strong forecast growth in demand for these metals has led some companies to the Cook Islands to explore and maybe one day harvest nodules.

Average composition of our nodules

