REPORT
ON
THE COOPERATIVE STUDY PROJECT
ON THE DEEPSEA MINERAL RESOURCES
IN SELECTED OFFSHORE AREAS OF THE SOPAC REGION

(VOLUME 2)

SEA AREA OF
THE REPUBLIC OF FIJI ISLANDS

March, 2002

JAPAN INTERNATIONAL COOPERATION AGENCY
METAL MINING AGENCY OF JAPAN

M P N
CR(2)
02-060

PREFACE

In response to a request by the South Pacific Applied Geosience commission (SOPAC), the Government of Japan has undertaken marine geological and other studies relating to mineral prospecting to assess the mineral resources potential of the deep sea bottom in the offshore regions of SOPAC member countries. Implementation of the survey has been consigned to the Japan International Cooperation Agency (JICA). Considering the technical nature of geological and mineral prospecting studies, JICA commissioned the Metal Mining Agency of Japan (MMAJ) to execute the survey.

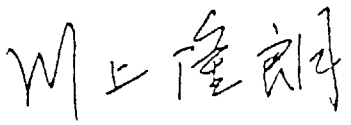
The survey will be undertaken for two terms of three years (a total 6 years) starting from the fiscal year 2000. This is the second year of the project, and the survey was carried out in the Exclusive Economic Zones of the Republic of Fiji Islands. The MMAJ dispatched the Hakurei Maru No.2, a research vessel for investigating deep sea mineral resources, to the survey area for 37 days from November 29, 2001 to January 4, 2002, completing the survey on schedule with the cooperation of the Fiji Government.

The present report sums up the results of this second year survey in the Exclusive Economic Zones of the Republic of Fiji Islands.

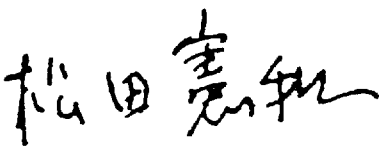
We wish to extend our sincere gratitude to all persons concerned, particularly to the staff of the SOPAC Secretariat, Government of the Republic of Fiji Islands, as well as the Japanese Ministry of Foreign Affairs, the Ministry of Economy, Trade and Industry and the Japanese Embassy in Fiji.

February 2002

Japan International Cooperation Agency
President Takao KAWAKAMI



Metal Mining Agency of Japan
President Norikazu MATSUDA



Abstract

The cooperative study project on the deep-sea mineral resources for SOPAC member courtiers is being scheduled for implementation as two periods of three-years projects starting from the year 2000. The present survey, constituting the work of the second year of the first period, was carried out in the EEZ of the Republic of Fiji Islands. The survey was conducted during the period from November 29, 2001 to January 4, 2002 on the sea within the territory of the Republic of Fiji Islands and the objectives of the survey was to assess the potentiality of the hydrothermal mineralization in the area.

The survey area, which covers the triple junction of the Central Spreading Ridge, is located in the central part of the North Fiji Basin. The topographic and magnetic surveys were conducted over the survey area, while the hydrothermal mineralization survey using BMS and the environmental survey were conducted in the Triple Junction Area located at center of the survey area.

1.Hydrothermal Mineralization Survey

The Triple Junction Area occupies central north of the Central Dome and it includes the Axial Valley at center, the Western Ridge on the west and the scarp toward the Eastern Ridge on the east. The floor of the Axial Valley is dominantly covered by sheet lava, and pillow lava tends to occur on the sheet lava at the higher locations in the Axial Valley. Massive lava showing columnar joint is found along the fault escarpments in the western part of the Triple Junction Area.

The results of the seafloor observations by BMS and FDC show that the ore showings of the Triple Junction Area occur concentrated in two areas, the West Area and the East Area, separated by 173° 55.2'E line, and they tend to occur on and near the boundary between sheet lava and pillow lava. The ore showing of the area consists of hydrothermal mound with inactive chimneys. Reddish brown fragments of 0.5-3m across consisting of chimney relic, sulfide ore and basalt are accumulated on the mound, and at some places on the mound, sheets of massive sulfide with a rough surface are partly exposed covered by reddish brown sediments with white and brownish yellow patches. The numbers of the ore showings confirmed by the seafloor observations are 11 in the West Area and 22 in the East Area. Among them, relatively large ore showing, with a mound extending more than 100m and uprising approximately 10m high from the surrounding seafloor, was found at 4 locations in the West Area and 7 locations in

the East Area.

The constituents of the hydrothermal mound were documented by the drilling of 22 holes conducted on and around the hydrothermal mound of the ore showings. The massive sulfide occurs on the top of the mound, and the thickness of it corresponds to the height of the mound rising from the surrounding sea floor. The massive sulfide is underlain by altered hyaloclastite, which forms the alteration zone of the footwall. Although the massive sulfide is not found at the vicinity of the mound, alteration and stockwork zones occur as the marginal zone of the mineralization. The massive sulfide consisting mainly of pyrite, calcopyrite and sphalerite was collected at three ore showings in the West Area and three ore showings in the East Area. Among these ore showings, the massive sulfide ores as thick as 5.96m and 7.62m were confirmed at the two drill holes in the Ore Showing W3 in the West Area. .

The relatively large mounds extending over an area of approximately 100m and rising 10m high from the surrounding sea floor occur in the Triple Junction Area. Chimneys of 3-5m high stand on the mound, and they are surrounded by fragments of chimney and sulfide ore. After the formation of chimney at the first stage, the mound starts to build with accumulation of collapsed chimney and Zn-Au-Ag rich ore of Cu4.04%, Zn3.17%, Au1.83g/t and Ag71.20g/t is formed on the surface of the mound. As formation of the mound continues, Cu-rich massive sulfide of Cu6.93%, Zn0.61%, Au0.85% and Ag24.39% is formed in the core of the mound. In the ore showing of the West Area, the Zu-Au-Ag rich ore was not confirmed and the Cu-rich ore seems to be exposed on the surface. In the Ore Showing W3 in the West Area, thickness of the Cu-rich ore was confirmed to be 6.0m to 7.5m. In the East Area, on the other hand, fragments of chimney and massive sulfide of the mound with 80cm thick were collected. A part of Zn-Au-Ag ore of the surface was collected and Cu-rich ore beneath this was not hit by the drilling in the East Area. Because of the locations of mounds in the East Area being distributed on slop and of rough surface of mounds, Cu-rich ore could not be hit by drilling.

The survey suggests that more than seven ore showings, with ore reserves of more or less 70,000t at the grade of Cu6.93%, Zn0.61%, Au0.85% and Ag24.39%, are expected to exist in the Triple Junction Area. Although the scale of the ore body is small compared to on land copper mine, Cu grade is high considering the Cu grades of on land mine. Further, a possibility still remains finding more ore showings in the Triple Junction Area by a detail survey in future.

2. Environmental Survey

The environmental survey was conducted as a baseline study of the area to predict the magnitude of mining impacts on the deep-sea environment.

Abnormal distributions of potential water temperature, concentrations of methane, light transmission and the biomass of bacterioplankton were observed lower than 100 m above the seafloor and they strongly suggest the existence of plume derived from hydrothermal vent.

On the other hand, the remarkable high concentration of inorganic carbon was observed deeper than 5cm in the sediment at the site of 01SFMC05. From this result, it was inferred that calcium carbonate derived from hot water was precipitated in the sediments.

Judging from total points of view, hydrothermal vent was confirmed in this site, and the effects of it extent to this area. However there were also unexplainable results, i.e. the data of light transmission was not correspond to that of suspended solid, there was no obvious difference in abundance of benthic organisms between the stations of much inorganic carbon and less inorganic carbon. It suggests the necessity of more detail survey in the future.

CONTENTS

[List of Inserted Figures]

[List of Tables]

[List of Appendix]