REPORT ON THE MINERAL EXPLORATION

MINERAL DEPOSITS AND TECTONICS OF TWO CONTRASTING GEOLOGIC ENVIRONMENTS IN THE REPUBLIC OF THE PHILIPPINES

PHASE III (PartII)

CEBU, PANAY AND ROMBLON AREA

MARCH 1987

JAPAN INTERNATIONAL COOPERATION AGENCY
METAL MINING AGENCY OF JAPAN

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Preface

In response to the request of the Government of the Republic of the Philippines, the Japanese Government decided to conduct a survey on the potential of mineral resources in the eastern Luzon, Visayas and Palawan Project and entrusted the survey to the Japan International Cooperation Agency (J.I.C.A.) and the Metal Mining Agency of Japan (M.M.A.J.).

In its third fiscal year, the J.I.C.A. and the M.M.A.J. sent to the Republic of the Philippines three teams in order to survey Northern Sierra Madre Area, Cebu Panay Romblon Area and Palawan V.VI., Western Negros Area from May, 1986 to March, 1987.

The survey works were carried out on geological, geochemical Surveys and spot investigation for mineral showings according to schedule with great cooperation of the Philippine autholities concerned, especially the Bureau of Mines and Geo-Sciences (BMG), Ministry of Natural Resources.

This report was compiled with the data on various chemical testings, statistical treatment, microscopic observation and fossil identification, which had been performed after the field work.

This volume (Part II) consists of survey details and results of synthetic analysis in Cebu, Panay and Romblon Area.

We hope that this report will serve for the development of the Project and contribute to the promotion of friendly relations between our two countries.

We wish to express my deep appreciation to the officials concerned of the Government of the Republic of the Philippines for their close cooperation to the team.

March, 1987

Keisuke Arita

President
Japan International Cooperation Agency

Junichiro Sato

President
Metal Mining Agency of Japan

Summary

Field survey of Cebu, Panay and Romblon Area carried out from 20th oct. to 20th Dec. in 1986.

This report was compiled with the data on various chemical testings, statistical treeatment, microscopic observation and fossil identification, which had been performed after field work. Summary of these synthetic analysis is as follows.

1) Survey area locate in "Philippine Mobil Belt", Cebu Area and East Panay Area belong "Central Phsiographic Province", basement rocks upheaval in Neogene geo-anticline movement, west Panay Area and Romblon Area belong "Western Phisiographic Provicne", consisting of basement metamorphic rocks, pyroclastics in Paleogene and ophiolitic rocks in Neogene which are intensly deformed by orogenic movement of Antique Mountain Range.

2) Minealization of Cebu and East Panay Area are hydrothermal vein and dissemination deposits of gold and copper which accosiate to Palaeocene diorite and andesite, Toledo Mine in Cebu Is. is known as the largest scale porphyry copper deposit in South-eastern Asia.

   Mineralization of West Panay and Romblon Area are hydrothermal vein and dissemination of gold and copper associated to Miocene diorite, nickeliferous laterite in weathering ophiolite and stratabound manganese deposit in schistose rock in basement.

3) The following promissing area which selected by reference to mineralizations and extracted anomalous zones are as follows.

   1 Poli-Metalic anomalous zone (Cu, Ag, Zn, Co and Mo) around Sigpit Lutupan mineral showing located 10 km SE of Toledo in West Coast Cebu Is.

   2 Poli-Metalic anomalous zone (Cu, Pb, Zn, As, Hg and Mn) at east side of Consolacion mineal showing located 15 km Cebu City.

   3 Poli-Metalic anomalous zone (Cu, Pb, Zn, Ag, Co, Ni, Mn and Mo) at 7 km NE of San Pedro in West Coast of Panay Is.

   4 Poli-Metalic anomalous zone (Cu, Zn, Hg and As) at 30 km SW of Kalibo in North Western Part of Panay Island.

   5 Poli-Metalic anomalous zone (Cu, Pb, Zn, Ag, Ni, Co, As and Hg) at North-western Part of Sibuyan Island.

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1. INTRODUCTION

1. Introduction

1-1 Background and Objective of the Survey

1-1-1 Background and Particulars

Pursuant to the Implementing Arrangement (IA) entered into between the Government of the Philippines through the Bureau of Mines and Geo-Sciences and the Government of Japan through the Japan International Cooperation Agency (JICA) and the Metal Mining Agency of Japan (MMAJ) signed on 26th September 1984.

The third phase of the project (Fisical year 1986) was carried out in Northern Sierra Madre Area from May to July and in Cebu, Panay, Romblom Area from October to December in 1986.

This report particularly embodies the geological and geochemical survey conducted in Cebu, Panay and Romblon Area from Oct. 20, to Dec. 20, 1986.

1-1-2 Objective of the Survey

The objectives of the present survey consist of the preparation of a mineral inventory map and of the selection of mineral potential areas, by means of statistical analysis of chemical assay results, combined with other laboratory tests and examinations on the various samples collected during the geochemical and geological survey of the Cebu, Panay and Romblon Areas, Republic of Philippines. Existing geological data from this area, were also considered in the preparation of this report.

1-2 Contents of the Survey

1-2-1 Fieldwork

During the fieldwork, stream sediments samples were collected at a rate of one sample per 1 - 2 km^2 along the drainage systems in the survey Areas, and micro-chemical analysis of these samples were executed for Cu, Pb, Zn, Ag, As, Hg, Ni, Co, Mn, Mo on the whole area. At the same time, PH value and electric conductivity of the stream water at sampling points were measured. Heavy mineral samples were collected by panning at junctions or mouth of the main drainage systems. The heavy mineral samples were analyzed for Au, Ag and Ga.

In conjunction with the foregoing geochemical survey, mapping and investigation of geological structures and known mineral showings in these Areas were also carried out.

The details of the collected samples are as follows;

1) Cebu Area

Servey Area	5,090 km^2
Stream Sediment Samples	2,703
Duplicate Samples	50
Heavy Mineral Samples	201
Spot survey points	15

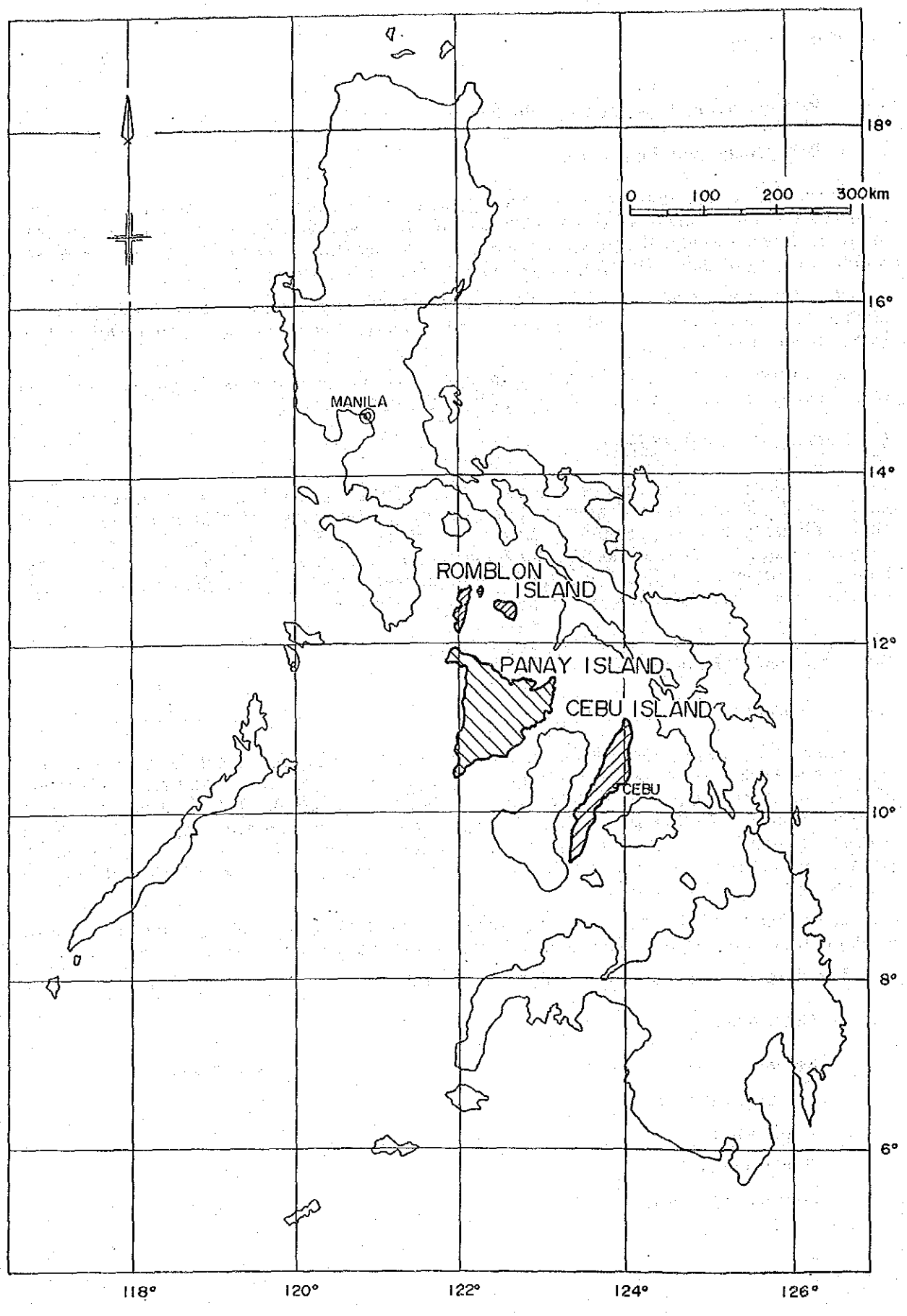

Fig. 1 Location Map of the Survey Area

Samples for petrographic analysis	20 (in which 10 thin sections were made.)
Samples for polished ore sections	15 (in which 10 polished sections were made)
Sample for ore assay analysis	15 (in which 10 assays were made)
X-ray diffraction analysis samples	10
K-Ar dating samples	5 (results not yet available)
Samples for micro-fossil identification	10 (in which 5 micro-fossil identifications were made)
Samples for heavy mineral identification	5

2) East Panay Area

Survey Area	5,730 km^2
Stream sediment samples	2,528
Duplicate samples	52
Heavy mineral samples	238
Spot survey points	11
Samples for petrographical analysis	20 (in which 10 thin sections were made)
Samples for polished ore sections	15 (in which 10 polished sections were made)
Samples for whole rock analysis	10 (in which 5 whole rock analysis were made)
Ore assay samples	15 (in which 10 ore assay were made)
X-ray diffraction analysis samples	10 (in which 5 X-ray diffraction charts were made)
K-Ar dating samples	5 (results not yet available)
Samples for micro-fossil identification	10 (in which 5 micro-fossil identifications were made)
Samples for heavy mineral identification	5

3) West Panay Area

Survey Area	2,600 km^2
Stream sediment samples	1,960
Duplicate samples	40
Heavy mineral samples	111
Spot survey points	8

Samples for petrographical analysis	10 (in which 5 thin sections were made)
Samples for polished ore sections	10 (in which 7 polished sections were made)
Samples for whole rock analysis	5 (in which 3 whole rock analysis were made)
Ore assay samples	10 (in which 7 ore assay were made)
X-ray diffraction analysis samples	5 (in which 3 X-ray diffraction charts were made)
K-Ar dating samples	3 (results not yet available)
Samples for micro-fossil identification	5 (in which 3 micro-fossil identifications were made)
Samples for heavy mineral identification	5

4) Romblon Area

Survey Area	1,180 km^2
Stream sediment samples	879
Duplicate samples	18
Heavy mineral samples	61
Samples for petrographical analysis	10 (in which 5 thin sections were made)
Samples for polished ore sections	7 (in which 3 polished sections were made)
Samples for whole rock analysis	5 (in which 2 whole rock analysis were made)
Ore assay samples	5 (in which 3 ore assay were made)
X-ray diffraction analysis samples	5 (in which 2 X-ray diffraction charts were made)
K-Ar dating samples	2 (results not yet available)
Samples for micro-fossil identification	5 (in which 2 micro-fossil identifications were made)
Samples for heavy mineral identification	5

1-2-2 Synthetic Analysis

After accomplished of the fieldwork, analysis of stream sediment samples and heavy mineral samples, statistical treatment of the results of said analysis, microscopic observation of thin and polished sections, X-ray diffraction test, whole rock analysis, ore assay, micro-fossil identification as well as heavy mineral identification were performed. The objectives of the survey are to prepare the mineral inventory map and to select the mineral potential area was pursued by analyzing synthetically the results of these operations.

UNDP data on the southwestern part of Panay Island, specifically the geological maps and raw data stream sediment analysis, were also utilized in the synthetic analysis of all available data. This was made possible through the kindness of Dr. A.H.G. Mitchell, CHief Technical Adviser, UNDP.

1-3 Composition of Members and Itinerary of the Survey Mission

1-3-1 Composition of the Survey Mission

Members of the Japanese and Philippine parties who participated in planning the survey program, in negotiations and in conducting the fieldwork were as follows:

A. Planning of the Survey Program and Negotiations.

Japanese Panel		
Makoto Ishida		MMAJ
Seiichi Ishida		MMAJ
Yoshitaka Hosoi		MMAJ
Yasuo Endo		MMAJ
Philippine Panel		
Benjamin A. Gonzales		BMG
Guillermo R. Balce		BMG
Romeo M. Luis		BMG
Edwin G. Domingo		BMG
Romeo L. Almeda		BMG
Noel V. Ferrer		BMG

B. Member of Survey Mission

Japanese Party:		
Coordinators:	Yoshikazu Okubo	OMRD
	Akira Yatsuji	OMRD
Cebu Area		
Leader	Takashi Isaka	Nikko Exploration Development Co., Ltd. (NED)
	Yukio Yamada	NED
	Kazuyasu Sugawara	NED

East Panay Area

Leader	Haruo Watanabe	Sumiko Consultant Co., Ltd. (Sumi. Con.)
	Norio Nishizawa	Sumi. Con.
	Kazuharu Saito	Sumi. Con.

West Panay & Romblon Area

Leader	Shinichi Doi	Mitsui Mineral Development Eng. Co., Ltd. (MINDECO)
	Seiichi Yokomoto	Mindeco
	Kazuhiro Adachi	Mindeco

Philippine Party

Project Manager	: Romeo L. Almeda	BMG
Assistant Manager	: Noel V. Ferrer	BMG
Analysis Manager	: Edwin G. Domingo	BMG

Cebu Area

Leader	: Wilfredo Diegor	BMG
Sub-leader	: Eugenio Esguerra	BMG
Sub-leader	: Eleazar Mantaring	BMG

East Panay Area

Leader	: Arnulfo Cabantog	BMG
Sub-leader	: Leonardo Morales	BMG
Sub-leader	: Generoso Revilla	BMG

West Panay & Romblon Area

Leader	: Pedro Rovillos	BMG
Sub-leader	: Orlando Pineda	BMG
Sub-leader	: Benjamin Cadawan	BMG

In addition to the above mentioned, personnel some 30 other geologists of the BMG participated in the fieldwork.

C. Composition of the fieldwork party

One field party was composed of one Japanese geologist and 3 BMG geologists, and 3 such parties were assigned to each survey area. Furthermore, one geologic aide was assigned for each area at the base camp to take charge of the drying and sieving of samples and in coordinating material supplies.

D. Treatment disposal of chemical analysis

In this survey, micro-chemical analysis of 8,030 stream sediment samples (including 160 duplicate samples, 10 element analysis) and 611 heavy mineral samples (3 element analysis were conducted) were treated. This endeavor was accomplished by means of atomic absorption spectrometry (AAS), in which 4,651 stream

sediment samples in Panay Area and 611 heavy mineral analysis were carried out in Petrolab, and 3,650 stream sediment samples were analyzed in Chemex laboratory in Canada according to the same treatment done at Petrolab.

As in the preceeding year, for the purpose of increasing the analyzing capacity, one Japanese analyst specialist was assigned to check the above operations and supply the necessary materials.

Laboratory works in Petrolab were carried out with 3 irregular shifts up to 15th of Jan. 1987 for 4,651 streamsediment and 611 heavy mineral samples.

The Chemex Co., Canada submitted analytical results for 3,650 stream sediment samples on the 20th Jan. 1987.

1-3-2 Itinerary of the Survey

The details of the itinerary are shown in Table-1 below.

	Oct.	Nov.	Dec.	Jan.	Feb.
Meeting & Data Arrangement at BMG	20 - 26		15 - 19		
Field Survey	26 ←	———	→ 14		
Chemical Analysis at Petrolab & Chemex Canada			25 ← ——— → 15 25 ← ——— → 20		
Synthetic analysis				16 ← ——— →	28

Table-1 Schedule of Field Survey and Analysis

2. GENERAL DESCRIPTION OF PHYSIOGRAPHY, GEOLOGY AND MINERAL DEPOSIT IN THE SURVEY AREA

2. General Description of Physiography, Geology and Mineral Deposit in the Survey Area

2-1 Physiography and Geology

All of the survey areas belong to the so-called Philippine mobil belt. Cebu and East Panay belong to the Central Phisiographic Region whereas West Panay Area and Romblon are located in the Western Physiographic Region. Cebu Island is a NE trending geoanticlinal ridge formed during a folding episode in Late Miocene to Pliocene. It became fully emergent since Late Pleistocene. The core is composed of Lower Cretaceous to Paleocene/Early Eocene basaltic to andesitic metavolcanics, metasediments, deep water to reefal limestone and quartzdiorite-granodiorite batholiths intruded in Palocene to Early Eocene (one K-Ar date: 59 m.y.) These are overlain unconformably by Oligocene to Middle Miocene shallow marine clastics and limestone. Magmatism at the start of Middle Miocene deposited substantial amounts of andesite lavas and pyroclastics in the eastern part of the island. The plutonic equivalent is the Talamban diorite which intrudes Lower Miocene strata. Contemporaneous with the Late Miocene-Pliocene geanticlinal development, shallow marine to terrestrial molasse was deposited on the eastern and western flank of the island. Pleistocene reef limestone is the youngest rock unit in the Area.

Eastern Panay Island constitute a belt of Paleogene diorite-granodiorite batholith (one K-Ar date: 59 m.y.) intruding presumably Cretaceous to Paleogene metavolcanics and meta sediments. Offshore data show that the belt is actually a continuous ridge between the Tertiary Iloilo and Visayan Basins. The Cretaceous to Palaeogene rocks are overlain unconformably by Late Oligocene to Middle Miocene clastics and limestone, slightly folded during Late Miocene and intruded by small quartzdiorite porphyry stocks. Undeformed cover ranges from Late Miocene to Recent.

The Western Panay Area and Romblon Area include Buruanga Peninsula and Antique Range. Buruanga Peninsula is composed almost wholly of Carboniferous to Early Jurassic continental-type basement. In contrast, Antique Range is composed of a highly deformed complex of Mesozoic to Miocene ophiolite, overlain unconformably by Miocene reefal limestone and shallow marine clastics. The complex folding and thrust faulting evidently occurred in Late Miocene, when the blue-schist bearing melange, the Paniciuan Formation, was emplaced. This tectonic activity was accompanied by limited andesite volcanism. The Pliocene to Recent formations is covered all of them.

2-2 Ore Deposits

Abstracts of mineralization in the survey area are as follows:

Vein and disseminated type Au, Ag, and sulfide deposit associated with diorite and andesite which include the Toledo porphry copper deposit characterize the type of mineralization in Cebu. Contact metamorphic deposite accompanied diorite is also reported.

As for non-metallic deposite, bentonite deposit related to the Miocene andesite and limestone, dolomite deposit in Pleistocene limestone and guano phosphate deposit in limestone cave are known.

Eastern Panay, like Cebu, is characterized by vein type and disseminated type Au, Cu, Pb, Zn, Mo, deposits associated with diorite and andesite. Non-metallic deposits consist of limestone and ball clay derived from bog soil. In western Panay Is., disseminated deposite in dolerite and stratabound manganese deposite in Pre-Tertiary

chert are known, non-metallic deposits, include vein type graphite deposite in Pre-Tertiary quartz vein, silica in chart and marble in Pre-Tertiary limestone.

In Romblon Area, porphry copper type and vein type deposits that accompanied diorite intrusion, nickeliferous laterite derived from wethering serpentinized peridotite and placer gold in alternation zone are known.

3. RESULTS OF GEOLOGICAL SURVEY OF ORE DEPOSIT

3. Results of Geological Survey and Investigation of Ore Deposits

3-1 Geology and Ore Deposits of the Cebu Island (Ref. Attached Plate 1)

3-1-1 General Situation

Cebu Island belongs to Region VII, with Cebu City (2nd largest city in the Philippines) located in the central eastern portion this island. Main industries are agriculture, fishery and mining.

Transportation from Manila, by air or sea are available, with 4 round trip flights from Manila to Cebu City per day, travel time is 1 hour 10 minutes one way.

Coastal roads around Cebu Is. are arranged well Travel time between Cebu City and Bogo (northern Cebu Is.) takes 3 hours by car, and to Santander (southern Cebu Is.) 4 hours, but inland road especially those connecting between east and west coast is not well maintained.

The geographic situation are as follows:

Area	5,090 km^2
Elevation	0 - 860.6 m
Temperature	Max. 31.4°; Min. 23.6°C
Precipitation	1,638 mm/year

3-1-2 Stratigraphy (Ref. Fig. 2)

The geology of the Cebu Area consists of Pre-Cretaceous chlorite schist (Ts) and Cretaceous - Paleocene Formation made up of limestone, andesite, basalt and volcanic clastics (Mg) which are intruded by diorite (Ld). Eocene limestone (BF), Early Oligocene limestone-sandstone sequence (LHF), Late Oligocene boulder limestone (CF) and Early Miocene alternating mudstone-shale sequence unconformably overlie the basement. Cebu Area uplifted in Middle Miocene sad formed sandstone mudstone alternation (LF), massive limestone (UL) and sandstone shale alternation as Middle-Miocene sediment. Talamban Diorite (TD) and serpentinized peridotite were intruded during Middle Miocene too.

Late Miocene Conglomerate (Mts) formation unconformably overlies Middle Miocene Formation and is covered unconformably Late Pliocene limestone and marl formation (BIF). Pleistocene uplifted coral limestone (Cal) distributed in the fringes of Island.

Pre-Cretaceous Series: Tunlob Schist (TS)

This formation is considered to form the basement of the area.
At northwestern part of Cebu central highland, several N-S or NNE-SSW elongated outcrops are observed.
Rock facies is chlorite schist and small amount of pyrite dissemination is observed. Shistosity is well developed.

Cretaceous-Paleocene Series: Mananga Formation (MG)

This series consists of a lower and upper formations, lower formation is composed of sedimentary origine material as chart, sandstone and conglomerate, while upper formation is composed of basaltic - andesitic volcanic rocks and breccias. The lower formation is exposed at northwest highland, while the upper formation is distributed along east side, south side and southwest side of Cebu Is. It has been generally recognized, along andesite usually occupy outer margine of lava flow and these rocks grade into basalt in the inner portion.
All volcanic rocks and volcanic clastics are chloritized, epidotized and pyritized as the result of regional propyritization.

Eocene Series: Baye Formation (BF)

Previous works reported that this formation consisted of massive limestone that includes abundant Nummulites but in this survey, only one weathered outcrop of this formation near Santa Rita in north-west central highland has been recognized.

Early-Oligocene series: Lutak Hill Formation (LHF)

Previous survey reported that this Formation is consisted of sandstone and limestone distributed in two outcrops in central highland, but in this time survey, unfortunately field team could not find the said outcrops. Reported foraminifera fossils include Lepidocyclina, Nummulites were known.

Later Oligocene Series: Cebu Formation (CF)

This Formation is composed of basal conglomerate, clastic sediments with interbedded coal deposits and upper limestone, and the limestone is the dominant lithology. The exposure of this formation are distributed east side Mananga Formation in east side of Central highland and some parts of southern Central Highland. The limestone show white to pink color, sometimes exhibiting massive to boulder-like apperance. This Formation have abundant foraminifera recognized include Lepidocyclina and Nummulites: Some coal deposts in this formation are into production in places.
(Micro-fossil Identification)
According to the study on nannoplankton, this formation is correlated to late Oligocene (CP17 nanno zone), including some CN1 nanno zone planktons (correlated to early Miocene).

Early Miocene Sereis: Malbog Formation (MDF)

This Formation and is composed of mudstone-shale interbedded conglomerate, limestone and coal conformably overlies the Cebu Formation.
Gray to black colored mudstone and shale are the dominant lithology of this formation.
Distribution of this formation are seen in Central Highland of Cebu Is. as NNE- SSW elongated shape and its width reaches 5 kms sometimes.
Some coal production are carried out in places.
(Micro-fossil Identification)
According to the study on nannoplankton, this formation is correlated to early to middle Miocene (CN 3 to 4 nanno zone).

Middle Miocene Series: Luka Formation (LF), Uling Limestone (UL),
Toledo Formation (TF)

The Luka Formation which is conformably overlain by the Uling Limestone has a very limited exposure. The Uling Formation which is the dominant unit of middle Miocene Series consists of coral limestone which sometimes assume massive and compact appearance. Porous ones have also been encountered.

Geologic Age				Columnar Section	Rock Facies
Quaternary	Holocene		0.01Ma	Alluvium	Coral reef & Clastic sediments
	Pleistocene		1.7	Carcar Formation	Coral limestone (Dolomite) (abundant marine fossil)
Tertiary	Pliocene		5.7	Barili Formation	Upper: Marl Lower: Coral limestone
	Miocene	Late	9.2	Maingit Formation	Conglomerate (fine to medium size) accompanied sandstone, limestone and shale
		Middle		Toledo Formation	Sandstone, shale (Limestone, Calcarenite)
				Uling limestone	Limestone
			16.0	Luka Formation	Mudstone (interbedded sandstone accompanied by conglomerate & ls.)
		Early	24.0	Malbog Formation	Mudstone, Shale (conglomeratic limestone)
	Oligocene	Late		Cebu Formation	Upper : limestone Middle: clastics Base : conglomerate
		Early	37.0	Lutak Hill Formation	Limestone (lepidocyclina, nummulites)
	Eocene		54.0	Baye Formation	Limestone (nummulites: abundant)
	Paleocene		64.0 64.0	Mananga Formation	Conglomerate, sandstone, calcareous mudstone
Cretaceous		Late	94.0		Limestone, clastic sediments (contained andesite, basalt and their clastics)
		Early	140.0		Limestone, clastic sediments, andesite, basalt & their clastics
Pre-Cretaceous				Tunlob schist group	Chrolite schist, mica-schist (albite-epidote-hornblende facies)

Fig.- 2 Succession of Formations in Cebu Area

The Toledo Formation on the other hand, which is composed of clastic sediments with occasional limestone and calcarenite is deposited around the Uling Formation.

Late Miocene Series: Maingit Formation (MiF)

This formation is composed of conglomerate which contain big or medium sized, rounded to sub-rounded clasts of volcanic rocks, sandstone and shale. The basal section of the formation is characterized by bigger clasts.
This Formation distribute around Central Highland of Cebu Is. and small outcrops have been encountered southwest of the island.
(Micro-fossil Identification)
According to the study on nanno plankton, this formation is correlated to late Miocene (CN 9a nanno zone).

Pliocene Series: Barili Formation (BiF)

This Formation consists of a lower coral limestone unit and upper marl unit. The lower coral limestone exhibiting pale brown to yellowish brown color. The main part is massive though porous and powderly is loosely compacted compared to the older limestone part have been noted. Basal part grades to sandy-silty-conglomerate and weak bedding plane are visible.
This limestone makes sometimes steep criff.
Upper marl unit are composed of clacareous and soft silt-sandstone, appeared upper part of this formation but outcrops is intermittently, the distribution area of this formation almost along Central Highland of Cebu Is.
(Micro-fossil Identification)
According to the study on nanno plankton, this formation is correlated to the late Miocene (CN 9a nanno zone), but on foraminifera study, this formation is correlated to early Pliocene (N 19 folaminifera zone).

Pleistocene Series: Carcar Formation (CaF)

Coral limestone including abundant marine fossils forms the main part of this formation. Most of the limestone are powderly though massive ones are distributed locally.
Dolomitic part occur and sometimes are being mined in places.
This Formation is hard to distinguish from Pliocene Barili Formation. However this formation is characterized by a gentle dip than Barili F., and mostly consists of powdery limestone containing abundant marine fossils. It is distributed around the Tertiary and Pre-Tertiary units in Cebu Island.

3-1-3 Intrusive Rocks

Lutopan diorite (LD)

This diorite body intruded the Mananga Formation; it consists mainly of medium to coarse grained equigranular hornblende biotite diorite, grading into quartzdiorite and granodiorite. Chloritization is widely visible.
There are 4 intrusive bodies exposed along the central highland.

(Result of Microscopic Observation)
The sample of this rock (No. CN-042R) which collected 12 km ENE of Toledo is medium grained quartz, hornblend, clino pyroxene diorite bearing small to rare amount of chlorite, sericite and epidote as alternation minerals, showing strong magnetism.

The sample of this rock (CM-019R) of this rock which collected 11 kms west Danao in east coast is potash feldspar bearing hornblende tonalite to hornblend grano-diorite, potash feldspar shows perthite structure, small to rare amount chlorite, sericite, calcite and epidote occures as alternation minerals.

(Results of K-Ar Dating)
After BMG. Absolute age of this diorite was determined as 59 m.y. (Paleocene)

Serpentinized Peridotite (Sp)

Strongly serpenitized preidotite intruded the Mananga Formation. Exposures have the form of smal stocks and lens shape bodies.

(Results of Microscopic Observation)
The sample of this rock (CA101R) which collected 19 kms west of Cebu City is completely serpentinized and has network structure, segregated magnetite occures ribbon and dust shape. From assumed original mineral, the original rock assumed to be dunite.

Talamban Diorite (TD)

Fine-medium grained hornblend comparable fresh diorite, exposing near east side of Central Highland accompanied Bulacano Andesite.

(Results of Microscopic Observation)
The sample of this rock (CE-003R) which collected 9 kms north of Cebu City is fine grained holocrystalline two mica granite which consists of quartz, potash feldspar, plagioclase, biotite and muscobite. Zircon and pyrite occur as accessory minerals.

Bulacao Andesite (Ba)

This andesite bodies exposed along the central highland associated with the Talamban Diorite. Fresh hornblende phenocrysts are visible.

(Results of Microscopic Observation)
The sample of this rock (CK-016R) which collected 15 kms north of Mandawe in east coast is two pyroxene andesite which has intersertal structure. Plagioclase, clino pyroxene, ortho pyroxene and magnetite recognize as phenocryst and small to rare amount of chlorite and calcite occure as alternation products.

3-1-4 Geological Structure (Ref. attached Plate 1.)

The pre-Paleocene basement complex and the unconformably overlying Eocene to middle Miocene formations are cut and divided into several blocks by NNE - SSW trending faults that resulted from the middle Miocene orogenic upheaval. This upheaval led to the intrusion and extrusion of the Talamban Diorite, Bulacao Andesite and the serpentinized peridotite along the NNE - SSW trending faultzone.

The end of middle Miocene occur the upliftment of all above mentioned formations leading to the formation of the central highland of Cebu Island.
Post-Pliocene formations consisting mainly of coral limestone are distributed around the central high land and as hill range in the northern and southern parts of island.

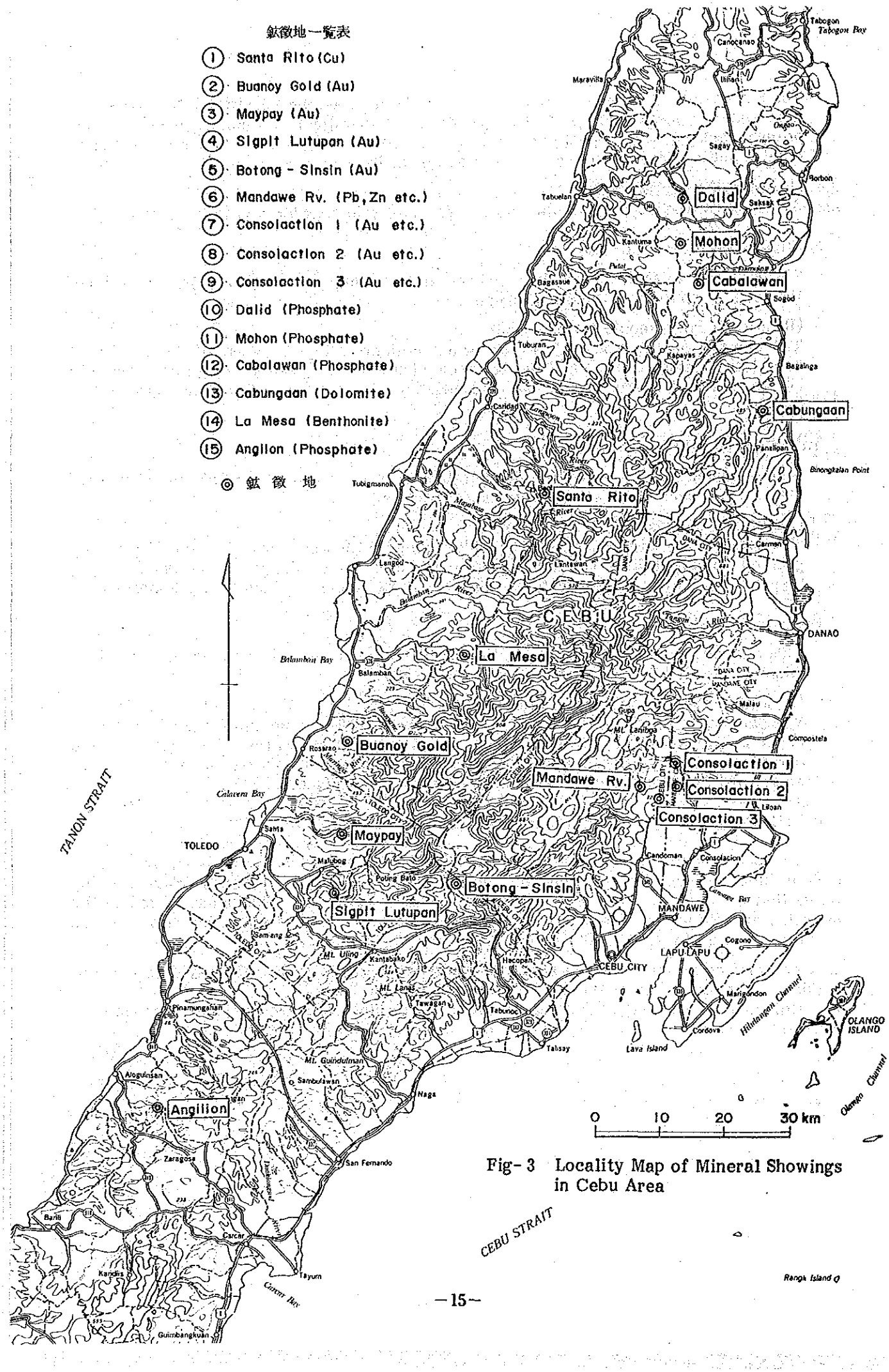

Fig- 3 Locality Map of Mineral Showings in Cebu Area

Table- 2 Abstract of Spot Investigation Results

No.	Mineral Showing Name	Topo. Map Name	Map No.	Coordinates		Type of ore	Occurance	Evaluation	Remarks
				Easting	Northing				
1	Santa Rita	Balamban	3751I	21,600	13,450	Copper	Vein Type	B	Vein type deposit in Mananga F. Bornite, malachite, covellite noted. Country rock: weakly altered andesite
2	Buanoy Gold	Buanoy	3751II	6,850	13,450	Gold	Vein Type	C	Suspended operation. Limonite in chloritized zone is visible Assay grade:
3	Haypay	Buanoy	3751II	6,250	6,500	Gold	Disseminated.	C	Suspended operation. Country rock is chloritized & sericitized andesite Assay grade:
4	Sigpit Lutupan	Buanoy	3751II	5,650	17,000	Gold	Vein Type	B	About 50 gold panners noted. Country rock: andesite in Mananga F. Crude ore grade: 20 gr/t Au.
5	Botong Sinsin	Buanoy	3751II	14,100	1,700	Gold	Vein Type; Disseminated	C	Upstream of Toledo Mine. Disseminated zone in sericite alternation zone. Assay grade:
6	Mandawe Rv.	Liloan	3851III	1,500	9,700	Pb, Zn others	Skarn	C	Massive pyrite accompanied epidote skarn. Concerned ore Miocene diorite?
7	Consolacion 1	Liloan	3851III	4,350	11,850	Au, Cu, Zn, (Vein)	Disseminated to Massive	D	Veined or disseminated pyrite in silicified or clay zones of Balacao Andesite. Assay grade:
8	Consolacion 2	Liloan	3851III	4,300	10,000			D	
9	Consolacion 3	Liloan	3851III	3,025	9,200			D	
10	Dalid	Catmon	3852III	5,000	17,300	Phosphate	Sediments	D	Small scale guano type deposit.
11	Mohon	Catmon	3852III	4,800	13,800	Phosphate	Sediments	D	ditto
12	Cabalawan	Catmon	3852III	5,700	10,850	Phosphate	Sediments	D	ditto
13	Cabungaan	Catmon	3852III	11,000	1,050	Dolomite	Layer	D	Small scale dolomite layer in Carcar F.
14	La Mesa	Balamban	3751I	15,300	1,200	Bentonite	Layer	C	6 old pits are known, potential visible
15	Angilon	Pinamungahan	3650I	23,600	5,400	Phosphate	Sediments	D	Small scale guano type deposit

The results of field survey and indoor testing for main mineral showings are as follows.

Santa Rita (Spot investigation No. 1)

Locality; 35 kms NE of Toledo at eastern side Pre-Cretaceous exposed area. Topographic Map (1/50,000) Balamban (3751I) Easting 21,600 m Northing 13,450 m

Mineralization; Hydrothermal vein in Paleogene Series.

Ore Minerals; Bornite, Chalcocite, Malachite, Covelite, Molybdenite (Ref. Microscopic Photograph (CR-209R·1) Appendix-2)

Situation; In 40 years ago, exploration were carried out by American Engineer.

Ore assay (CF-209R·1)	Au g/t	Ag g/t	Cu %	Pb %	Zn %
	0.03	72	21.4	0.01	0.01

Elevation; High grade but small amount ore reservoir is expected.

Sigpit Lutupan (Spot investigation No. 4)

Locality; 8 kms SE of Toledo nearsite of Lutupan Diorite stocks. Topographic Map (1/50,000) Buanoy (3751II) Easting 5,650 m northing 17,000 m.

Mineralization; Hydrothermal Vein in Paleocene andesitic pyroclastic.

Ore minerals; Pyrite, Sphalerite, Chalcopyrite which accompany gold.

Situation; About 50 gold panner working at weathered outcrop part.

Ore assay (CF-995R)	Au gr/t	Ag gr/t	Cu %	Pb %	Zn %
	9.85	2.6	0.06	0.69	0.11

Evaluation; Under ground exploration is expected.

3-1-5 Results of Mineral Showing Survey

The number of surveyed mineral showings in the present survey include 9 metallic deposits and 6 non-metallic deposits, the localities of which are shown in Fig. 3. Spot investigation data sheets route maps and sketches are shown in Appendix 9 & 10. The Toledo Mine of Atlas Co. has many published data, and so is excluded in present survey.

3-2 Geology and Ore Deposits of East Panay Area (Ref. Attached Plate 1)

3-2-1 General Situation

East Panay Area belongs to Region VI and consists of Iloilo Province (Provincial capital is Iloilo City in the south), Capiz Province (Provincial capital is Roxas City in the north) and some part of Aklan province.

Main industries are agriculture, cattle breeding and fishery.

Transportation from Manila, by air or sea are available, with 2 roundtrip flights from Manila to Iloilo City per day, travel time of which is about 1 hour one way. Coastal and central roads between Iloilo City and Roxas City are well maintained. It takes 2 hours from Iloilo CIty to Roxas City through the central road, while the east coastal road takes 4 hours to travel the interval. Inland roads however, are not well maintained.

The geographical situation are as follows:

Area	5,730 km^2 (including Guimaras & Calagnan Is.)
Elevation	1,950 m (Mt. Badoy)
Temperature	Max. 31.9° Min. 24.3°C
Precipitation/year	2,238 mm

Distinction between dry and wet season is clear at the southern part but not so clear at the northern part. Typhoon influence is not as strong as that of Luzon and East Visayas.

3-2-2 Stratigraphy (Ref. Table- 3)

The stratigraphy of the eastern and central parts of Panay Island had been defined by the BMG (1981). The present survey had come out with another stratigraphy for the Guimaras Island.

In general, a difference exist on the underlying Pre-Middle Miocene formations of Central and Eastern Panay, Central Panay is characterized by the Pre-Tertiary formation unconformably overlain Oligo-Miocene Singit formation is exposed at the east side of the Antique Range. While Eastern Panay, is underlain by the Paleocene Sibara Formation unconformably overlain by the Middle Miocene Passi Formation or Bayuso Volcanics.

No obvious difference is present between the two areas after the middle Tertiary. Details of each formation are as follows.

Pre-Tertiary System: Basement (Bm)

This basement consists of amygdaloidal basaltic clastics, brecciated lavas, cherts, cherty mudstones, glaucophene schists and black phyllites showing steep dips which is entirely different from the tertiary system.

Table-3 Correlation Table of Stratigraphy in Eastern Panay Area

Geological Age			Panay Central Plain	Eastern Panay	Guimaras Is.
Epoch		Stage	BMG 1981	BMG 1981	Present Survey (1986)
Quaternary	Holocene		(Qal)	(Qal)	(Qal)
	Pleistocene	Late	Cabatuan Formation (Q_2)	Cabatuan Formation (Q_2)	Guimaras Limestone (Q_1l)
		Early			
Tertiary	Pliocene	Late	Uliam F. (N_2a)	Odiongan Volcanics(N_2r)	
		Early	Iday F. (N_2PC)	Ulian F. (N_2a)	Guimaras F. (N_2a)
	Miocene	Late	Tarao F. (N_1ml) (N_1l)	Dingle F. (N_1l)	
		Middle	Igupaco Volcanics (Ir)	Passi F. (N_1s) Bayuso Volcanics (Ir)	Bayuso Volcanics (Iv)
		Early	Singit F. (N_1s)		
	Oligocene	Late			
		Early			
	Eocene	Late			
		Early			
	Palaeocene	Late		Sara Diorite (Di) / Pilar Monzonite (Mo)	Guimaras Diorite (Di)
		Early		Sibara F. (Si)	Sibara F. (Si)
Pre-Tertiary			Basement Rocks (Bm)	?	?
			?		

The basement is exposed from Mt. Tiglayo (16 km WNW of Lambnao) up to the southern ridge and is assumed to be the oldest rock facies in Panay Is.

Late Palaeocene Series: Sibara Formation (Si)

This formation consists mainly of andesitic (partially basaltic) tuff, tuff-breccia and lava. Around intrusive body of diorite, this formation unit show fresh green color as the result of strong propyritization, interbed gray to graish-brown color massive graywacke and massive mudstone and fine alternation of chert, siltstone and conglomerate have been noted too. This formation is distributed the northeastern parts of Panay Is. and Guimaras Is., and construct basement Formation in these area.

Oligocene to Miocene Series: Singit Formation (Central Panay),
Passi Formation (Eastern Panay) (Nis)

This Formation consists of layered to massive wacke, slate, interbedded fossiliferous sandstone, shale and thickly bedded coarse grained conglomeratic sandstone.
Its' distribution are around Bm at the western part of central Panay.

(Micro-Fossil Identification)
According to the study on nanno plankton, this formation is correlated to late Miocene (N 9a nanno zone), while on the study of foraminifera, this formation corresponds to middle Miocene (N 9 foraminifera zone)

Middle Miocene Series: Bayuso Volcanics (Iv)

These volcanics consists mainly of aggromeratic basalt lavas and breccias, accompanied by basaltic andesite clastics which contain amygdaloidal breccias.
These volcanics are distributed at east 10 km from Passi (town along the central highway) with a N-S elongation to the central part of Guimaras Is.

Late Miocene - Pliocene Series: Dingle Formation, Tarao Formation (N1L, N1ML)

These formations consist of clastic sediments (N1L) and limestone (N1ML). The clastic sediments are composed of medium to coarse grained sandstone and fossiliferous shale. The limestone show pale gray color and is massive to layered in appearance.
The clastic sediments are distributed in wide area of the central Panay plain while the limestone forms hill groups north of Passi (twon along the central highway).

(Microfossil Identification)
According to the study on nanno plankton, this formation is correlated to middle Miocene (CN 4 nanno zone).

Pliocene Series: Idai Formation (N2PC)

This formation consists of irregular alternation of calcareous conglomerate, fine grained sandstone and slate and is distributed from the western part of central Panay plain to the northeastern part of the island.
(Microfossil Identification)
According to the study on nanno plankton this formation is correlated to early Pleistocene (CN 14a nanno zone).

Pliocene Series: Ulian Formation (N2a), Guimaras Sediments (N2a)

These formations consist of impure limestone with appearance of pale brown to gray colored mudstone, calcareous mudstone and siltstone, and are distributed in the middle to southern part of the central Panay plain. In the northern and western parts of Guimaras Island, outcrops of these formations trend NNE.

Pleistocene Series: Cabatuan Formation (Q2)

This formation consists mainly of reddish brown false bedded sandstone including dark gray fossiliferous homogeneous soft mudstones and fine sandstone. This formation is widely distributed in the middle to southern part of Central Panay Plain.

Pleistocene Series: Guimaras Limestone (Q11)

This porous limestone unit includes abundant corals and fossil bearing, interbedded with calcareous clear bedded mudstone. Although the unit is basically dated as Pleislocene, Pliocene, Pliocene portion had also been encountered.

3-2-3 Intrusive Rocks

The intrusive rocks in east Panay Area are 1) Paleocene Sara DIorite and Pilar Monzonite. 2) Middle Miocene Bayuso and Igupaco Volcanics. and 3) Late Pliocene Odiongon Volcanics.

Sara Diorite (Di)

The Sara Diorite intruded the Sibara Formation and is exposed over an area of 600 km^2 around Lemery, a town at the eastern side of Panay Island. This intrusive rock is sometimes exposed as erosional window in the Sibara Formation. The diorite is usualy gray colored, medum grained and holocrystalline. Main minerals are feldspar, hornblend, biotite and magnetite. Quartz diorite facies is rare.
The marginal borders of the intrusive body is fine grained. Contact with the Sibara Formation is characterized by intense alternation like propyritization.
4 kms NE of Sara, a twon at the eastern side of Panay, this contact is defined by the Masonson Schist that resulted probably due to contact metamorphism.

(Result of Microscopic Observation)
The sample of this rock (AB-31) which collected 10 km north of San Francisco in south coast is holocrystalline fresh medium grained biotite hornblend granodiorite.

Guimaras Diorite (Di)

This diorite exposed at the central Guimaras Is. is a NE elongated stock which has a 9 x 4 km size. Field appearance is gray medium graine, main minerals are plagioclase, quartz, hornblend and pyroxene. This unit may have formed as a result of the same igneous activity that formed the Sara diorite.

Pilar Monzonite (Pm)

This rock is exposed as a 3 x 5 km stock near Pilar (Northeastern most town in the survey area). Several small stocks are also recognized around above area.
This rock has pink to pale gray color, contains large (5 mm - 1 cm) potash feldspar, biotite and plagioclase.

(Result of Microscopic Observation)
The sample of this rock (AA-96R) which collected 6 kms east of President Roxas in northern Coast is holocrystalline porphyritic texture monzonite porphyry which consist of potash feldspar, plagioclase, green hornblend, brotite, clino-pyroxene and ortho-pyroxene, exhibited strong magnetism, accompanied magnetite, sphene and apatite as accessory minerals. Rare amount of chlorite and sericite are visible as alternation products.

Bayuso Volcanics (IV)

These volcanics consist mainly of aggromeratic basalt lavas and breccias accompanied by basaltic andesite volcanic clastics including several mm to several 10 cm rounded to sub-rounded breccia and boulder which amygdaloidal structure in places. Distribution of these rocks are seen at the east side of the Panay central highway as NS elongated outcrop, in the central part of the Guimaras Is. and in the westernmost of the survey areas as Igupaco Volcanics which has NS intermittent outcrops.

(Results of Microscopic Observation)

The sample of this rock (AK-075) which collected 36 kms NE of Iloilo city is strong altered two pyroxene andesite. Plagioclase, clino pyroxene and orthopyroxene phenocrysts are observed but orthopyroxene is completely altered to chlorite and fair amount of zeolite occur in cavities.

Odiongan Volcanics (N2V)

These volcanics consist of pale grayish-brown colored hornblend andesite and porphyritic plagioclase andesite which show tracytic texture, wherein the hornblend are arranged parallels. Strong alternations such are silicification, pyritization and argillization observed. Some kaolin deposits are being mined at argillized zones.

Distributions of this rock unit are observed along the eastcoast of Panay Is. as NNE-SSW elongated intermittent outcrops, in Calagnaan Is. and in the western of Barotac Viejo.

(Result of Microscopic Observation)

The sample of this rock (AA-81R) which collected 4 kms SSE of Concepcion in the east coast is hornblend andesite which has hyalopilitic texture and phenocrysts of plagioclase and green hornblend. Alternation is generally weak.

3-2-4 Geological Structure

The N-S trending geologic structures of East Pany Area had an immense influence in the formation of the Iloilo Basin and the NE Panay.

The geological structure of East Panay Area construct Iloilo Basin and North-East Panay mountain range which has controled N-S direction structure.

Guimaras Is. has similar structures as that of NE Panay Mountain Range.

Iloilo Basin

This N-S trending zonal shape sedimentary basin is filled up by Oligocene to Pleistocene rocks. These sediments asymmetrically distribute in E-W section, with the sediments thickness in the west are about 10,000 m while in east side about 500 m.

The Formations in the basin show N-S elongated arrangement and gentry decline to west, from center to northern part of the basin, the basin depth change to shallow as the reason existence of Sibara Formation and the depth is increasing to south side to the direction of Guimaras Is.

N-S direction fault is assumed by arrangement of Formations.

North-East Panay Mountain Range

In this mountain range Sibara Formation and Sara Diorite have broad distribution and construct mountain range, and along the east coast Odiongan Volcanics make Pliocene to Pleistocene volcanic range.

Sibara Formation are composed of volcanics and interbedded sediments and shown broad distribution in this range. This Formation show generally N-S direction folding, and anti cline parts are consisted highland.

Sara diorite, which is batholith occupied over 600 km^2 exposed area, intrued in Sibara Formation. Outcrops of this rock compose relatively lower hill range, because resistivity for weathering of this rock is lower than Sibara Formation.
The outcrops elongate NNE-SSW direction and the fault between this rock and Sibara Formation is assumed.
Odiongan Volcanics conform young volcano shape mountain range at east coast of Panay Island and this mountain range elongate to NNE up to Calangaan Island.

Guimaras Island

Each formation of in this Island show elongation NNE-SSW trend, Sibara Formation contact to other younger Formation with the fault of NNE direction.
Guimaras Diorite intrusive stocks locate at center of the Is. and NE-SW Fault develope between this rock and Sibara Formation. NW-SE faults parpendicular to above mentioned recognize in places.

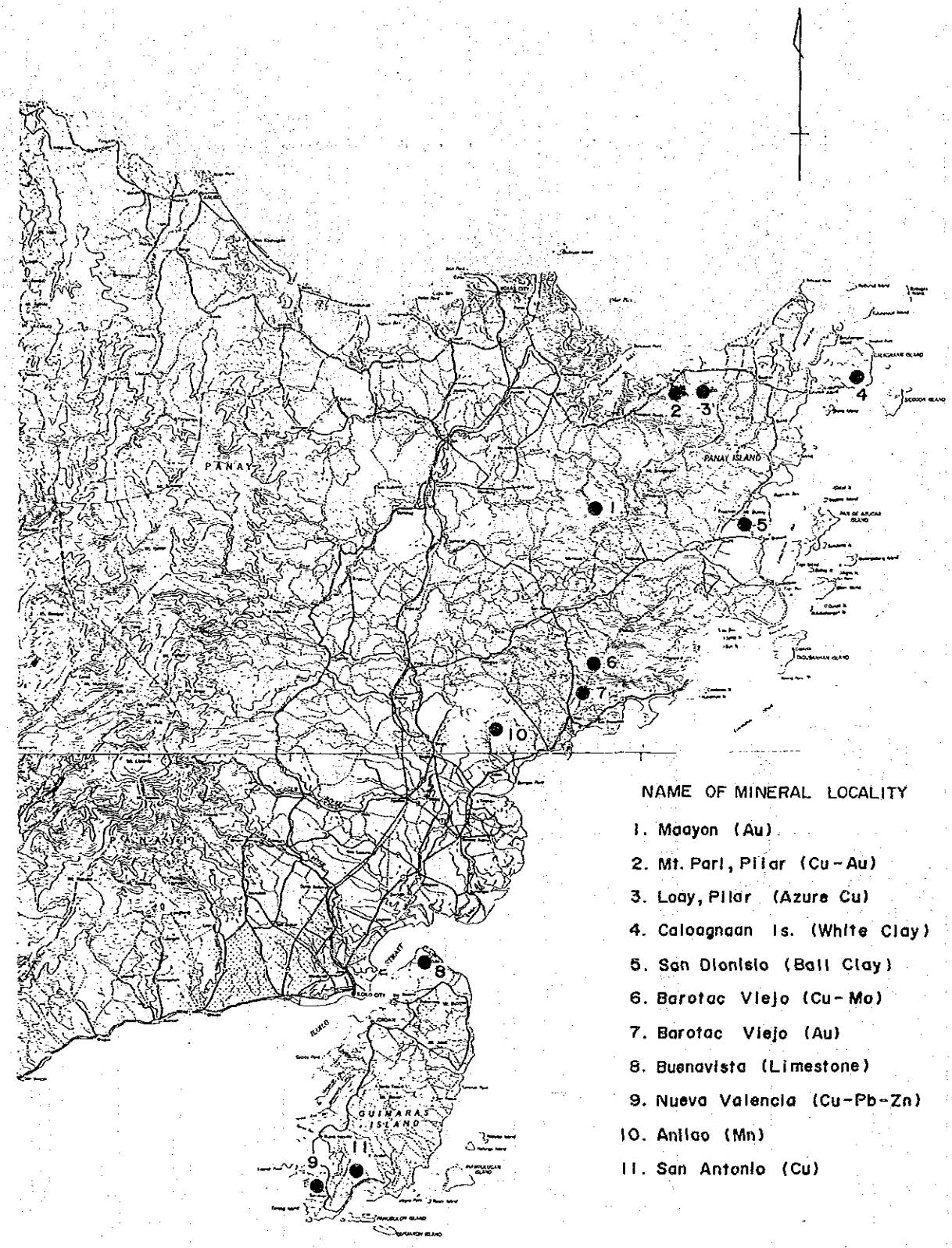

Fig-4 LOCATION MAP OF SPOT INVESTIGATION

Table-4 Abstract of Spot Investigation Results

No.	Name of Showing	Topo. Map 1/50,000				Type of Ore	Occur-ance	Evalua-tion	Remarks
		Name	No.	Easting	Northing				
1	Quinabonglan (Maayon)	Lemery	35531	17,600	14,000	Au	Vein	C	Diorite region, Atlas Co. 1 drilling carried out 10 years ago SW side of placer gold zone, Expected amount of ore is small. Malachite visible in small amount.
2	Pari (Mt. Pari, Plar)	Panitan	3554II	25,400	13,600	Cu, Au	Vein	B	Operated 30 years ago. Vein type deposit in Andesite. Malachite & Azurite are visible, Small amount high grade of ore is possible.
3	Loay (Polo, Pilar)	Estancia	3654III	01,000	12,900	Cu	Vein	B	Azure Mining Co operated up to 3 years ago. 3,000 m 3 level adit were developed. Chalcopyrite & chalcocite vein in andesite. Follow up survey highly recommended.
4	Calagnaan Is.	Estancia	3654III	22,800	15,000	White Clay	Hydro-thermal	C	White clay at volcanic neck. Such deposit is distributed band shaped in east Panay Is.
5	San Dionisio	Sara	3653IV	07,700	13,650	Ball Clay	Sedimen-tary	B	Ball clay (Bog originated clay) around andesite body. Being mined depending on the demand.
6	Del Pilar (Barotac Viejo)	Barotac Viejo	3553II	18,800	14,100	Cu, Mo	Vein	D	MineraLized zone located between the andesitic clastics and Qu-diorite; Pyrite is the main, ore-mineral malachite noted in small amount.
7	Santo Tomas (Barotac Viejo)	Barotac Viejo	3553II	14,200	08,400	Au	Vein	C	Atlas Co. conducted test pitting, auger drilling. Mineralized & silicified zone between andesite and diorite.
8	Excelesa Munez (Buenavista)	Dumangas (Iloilo)	3552II (3552III)	00,200 (24,800)	06,300 (04,400)	Limestone	Sedimen-tary	B	Slaked lime production carried out 10 - 15 t/day since 3 years ago. Pleistocene limestone is the one being mined. Improvement of equipment is desirable.
9	Salvacion (Nueva Valencia)	Cabalagnan	3551III	13,600	13,600	Cu, Pb, Zn	Vein	C	Vein type deposit in diorite. Gossan & Quartz veins are visible. Au & Ag grade will decide evaluation.
10	Anilao	Passi	3553III	25,700	04,600	Mn	Vein	C	Lens shapes deposits in andesite; Several hundred tons of Mn crude ore produced; High grade ore is expected.
11	San Antonio	Cabalagnan	3551III	19,000	13,600	Cu	Vein	D	Quartz veinlets in basaltic andesite; Several tons of ore mined out a few years ago.

The results of field survey and indoor testing for main mineral showings are as follows.

Pari (spot investigation No. 2)

Locality; 4 kms SSW of Pilar in northern coast of Panay Island Topographic Map (1/50,000) Panitan (3554II) Easting 25,400 Northing 13,600

Mineralization; Hydrothermal vein in Paleogene Series.

Ore Minerals; Covellite, Cuprite and Marachite
(Ref. Microscopic Photograph AE-30 in Appendix-2)

Situation; Ishihara Industry Co. carried out exploration about 40 years ago. At that time mining adits had developed total about 500 m for 5 levels.

Ore assay	Au g/t	Ag g/t	Cu %	Pb %	Zn %
(AE-32)	0.06	3	6.1	0.01	0.02

Elevation; High grade but small amount ore reservoir is expected.

Loay (spot investigation No. 3)

Locality; 4 kms SSE of Pilar in northern coast of Panay Island Topographic map (1/50,000) Estancia (3654III) Easting 1000 m Northing 12,900 m

Mineralization; Chalcopyrite (partially disseminated.) Pyrite, Chalcocite
(Ref. Microscopic Photograph AE-36 in Appendix-2)

Situation; Azur Mining Co. carried out exploration up to 3 years ago. Mining adits developed about 3,000 m in 3 levels.

Ore assay	Au g/t	Ag g/t	Cu %	Pb %	Zn %
AE-36	0.03	15.59	8.70	0.01	0.03
AE-38	0.09	11.06	6.10	0.02	0.02

Evaluation; High grade but small amount ore reservoir is expected.

3-2-5 Results of Mineral Showing Survey

Number of surveyed mineral showings in the present survey are 7 in East Panay and 3 in Guimaras Is., Location of these showings are shown in Fig.-4. and spot investigation data sheets and route maps and sketches are shown in Appendix-10. Actual mining for metallic ore in the area is only for placer gold and several hundreds of persons are engaged in this work. As for non-metallic mining small scale limestone production are carried out and white clay, ball clay intermittent production take place in Northeast Panay Is.

The metallic mineral deposits in this area are almost always associate with diorite and monzonite intrusive stocks, usually located near the boundaries of the intrusive rocks.

The scale of showing are small, but high grade ores are expected at No. 2 Pari (Cu), No. 3 Loay (Cu) and No. 10 Anilao (Mn).

Placer gold deposits are expected in a broader area around the diorite intrusive body. Kaoline deposits have considerable ore reserve so development just depend on the prevailing market price.

3-3 Geology and Ore Deposits of West Panay Area (Ref. Attached Plate-1)

3-3-1 General Situation

West Panay Area located SSE 300 km from Manila, belongs to Region VI and consists of Antique Province, Aklan Province and part of Capiz and Iloilo Province Main industries are agriculture, logging and fishery.

Transportation from Manila, by air and by sea are available. Generally airway (Manila-Kalibo or Manila-Iloilo) are using, travel time is about 1 hour in one way.

The geographical situation are as follows.

Area	2,600 km^2
Elevation	0 - 2,117 m (Mt. Maiac)
Temperature	Max. 30.7° Min. 22.8°C
Precipitation	2,933 mm per year

This area belong to the West Pacific Monsoon Region and the difference between dry season (Jan. to Mar.), and wet season (Nov. to Dec.) is clear.

Rice plantation is carried out near plane of Kalibo City (Capital of Capiz Province) and West Panay Mountain Range which occupy over 70% of survey area is still covered virgin forest.

This area is malariacontamination area, electrisity is limited only coast area, innerland road not yet fully maintained

3-3-2 Stratigraphy (Ref. Fig-5)

The schematic columnar section of West Panay Area as compiled from the BMG (1981) and UNDP survey results is as follow:

Fig-5 Shematic Compiled Columnar Section on Panay Is. (Whole)
(Attached Correlation Table of Western Panay Area)

Period	Epoch	Age	Compiled Columnar Section	Details
Quarternary	Holocene		Qal	Santa Cruz Formation (sandstone, conglo. limestone) Ulian F. (Mud-silt stone) Iday F. (sandstone calcareous conglomerate)
	Pleistocene	Late	Q_2	
		Early	Q_1l	
Tertiary	Pliocene	Late	N_2a	
		Early	N_2PC	
	Miocene	Late	N_1m N_1ml	Makato Formation (sandstone, conglomerate, limestone, volc. clastics) Igpao volc. Libacao F. Antique Oph. Ps: Serpentine Pd: Diabase Pg: Gabbro Ppl: Pillow Basalt (sandstone conglomerate volc. clastics limestone)
		Middle	N_1l N_1mw Iv	
		Early	N_1i Gd Oph N_1s N_1sl	
	Oligocene	Late	Ppb	
		Early	Pbv	
	Eocene	Late	Pl	
		Early	Pipc	
	Palaeocene	Late		
	Palaeocene	Early		
Pre-Tertiary			Bm Bml	Buruanga Metamorphic Rocks (schist, slate, phyllite chert, limestone)

Pre-Tertiary System: Buruanga Metamorphic Rocks (Bm)

This metamorphic rock unit consists of pre-Tertiary crystalline limestone and chert and is exposed at Buruanga Peninsula. Units has N-S strike and decline 20° - 40° to east or west, drag folding is almost unrecognized.

(Results of Microscopic Observation)
The sample of this rock (ER-46) which collected 2 kms north of Libertad in southern coast Buruanga Peninsula is zoisite bearing semischist which consists of quartz, k-feldspar, plagioclase, sericite, zoisite chlorite and Fe-mineral.

Early Eocene Series: Igbao Sediments (Pipc)

These sediments consisting of mudstone, chert, siltstone and including a small amount of basaltic pillow lava and sheet of intruded serpentine is exposed 17 km NE of San Jose (southern part of Antique Province).

Late Eocene Series: Lumbayan Formation (Pl)

This formation consists of calcite vein bearing mudstone, turbidite and volcanic clastics, expose at NE of San Jose associated with Antique Ophyolite.

Oligocene Series: Mt. Baloy Volcanics (Pbv), Panpanan Basaltic Rocks (Ppb)

This volcanic rocks conform earlier group which predominant pillow lava breccia (Pbv) and later part which predominant basaltic lava and breccia, and green tuff (Ppb).
50 km NNE elongated expoer is observed at 25 km east of San Jose.
This Formation is penetrated by gabbro belonging Antique Ophyolite.

Late Oligocene to Early Miocene Series: Libacao Formation (in South), Sewaragan Formation (in North) ($N_1s \cdot N_1sl$)
These formations consist of mudstone, sandstone, basaltic volcanic breccia and basal conglomerate including rare thin layers of limestone. A 10 km wide belt shaped distribution is observed near San Joaquin, SW Iloilo Province extending up to Kalibo of Aklan Province. Other outcrops are distributed at the northwest coast of Panay Is.

Early Miocene Series: Igsawa Volcanic Clastics (In South), Igpaco Volcanics (IN North) (Iv)

These volcanic complexes consist of andesite flow and breccia, tuff wacke and conglomerate with limited calcanous portions noted.
Intermittent exposures are observed from Patnongon (southern part of the west coast) to Tibiao (50 km north of Patnongon) following a NE trending syncline. In Northern Panay these rocks show monoclinal outcrops (strike NE-SW, Dip 30°E) near Altavas.

Middle Miocene Series: Maliao Wacke Formation (N_1mw) (IN South)

This formation consists of turbidites, wackes and andesite flows including thin layers of siltstone, exposed at the east side of Tibiao in the western coastal area.

Middle Miocene Series: Makato Formation (In north), Lagdo Formation (IN south) (N_11)

These formations consist of siltstone, mudstone, tuff and wacke including small amount of conglomerate.
Exposed areas show a wide spread from Patnongon via east side of West Panay Mountain Range to Kalibo.

Late Miocene Series: Manlacbo Formation (In south) (N_1m, N_1ml)

This formation consists of calcareous sandstone, siltstone, mudstone, conglomerate and basaltic clastics, distributed from the southern part of the west coast to the southwest part of Iloilo City.

Early Pliocene Series: Ida Formation (In north) Panlupan Formation (In north) (N_2pc)

Main part is conglomerate, outcrops are seen from west part of Iloilo Province to Jamindan of Capiz Province.

Late Pliocene Series: Apdo Formation (Insouth) (N_2a)

This formation consists of loose compacted material as mudstone and marl.
Outcrops are seen at lowland near Tibiao in the west coast.

Early Pleistocene: Santa Curz Formation (In north) (Q_1^0)

Consists of coral limestone, exposed at the west and north coast of Buruanga Peninsula.

Late Pleistocene Series: Ulian Formation (In north)(Q_2),
Panicuian Clastic Flow (In south)(Qpdf)

Ulian Formation consists of mudstone and siltstone, exposed at the lowland around Buruanga Peninsula.
Panicuian Clastic Flow distributed 30 km in a NE-SW elongated belt NE of San Jose (southern part of west coast), covers basaltic lava and breccia. This flow seems to be a residual debris as a result of the sudden uplift of the mountain ranges during the Pleistocene.

3-3-3 Intrusive Rocks

Igpaco Volcanics (Iv)

This volcanic unit consists of lava flow and breccia of basaltic andesite and basalt, tuff breccia (partially lapplituff), tuffaceous sandstone and sandstone. Outcrops are seen near Altavas of north coast and show NE-SW strike, 30°E dip monoclinal structure.

Antique Ultramafic Rocks

This unit consists of serpenitized periodotite (Ps), gabbro (Pg), diabase (Pd), and pillow basaltic lava (Ppl), intruded in the early Miocene Series as lens, stock and vein, distributed west of Manilao in the northern part, and east side of Patnongon in the southern part.
(Results of Microscopic Observation)
The sample of this rock (BR-08) which collected 15 kms SW of Kalibo in NW of Panay Island is holocrystalline equigranular olivine gabbro which consists of olivine, clinopyroxene and plagioclase, altered minerals are serpentine, talc and brucite.

Pacol Diorite (IN north), Libato Diorite (In south) (Gd)

These diorites include biotite hornblend diorite, biotite hornblend quartzdiorite biotite and hornblend granodiorite, etc.
Intrusive bodies are recognized west of Madalag, Aklan Province and SSE of Libacao. Age of intrusion is assumed to be after Early Miocene. A small skarn is observed at the contact between crystalline limestone of Buruanga Formation and the Pacol Diorite.
(Results of Microscopic Observation)
The sample of this rock (HR-12) which collected 9 kms W of Libertad at southern coast of Buruanga Peninsula is holocrystalline equigranular hronblend biotite granodiorite which has fresh appearance and weak alternation.

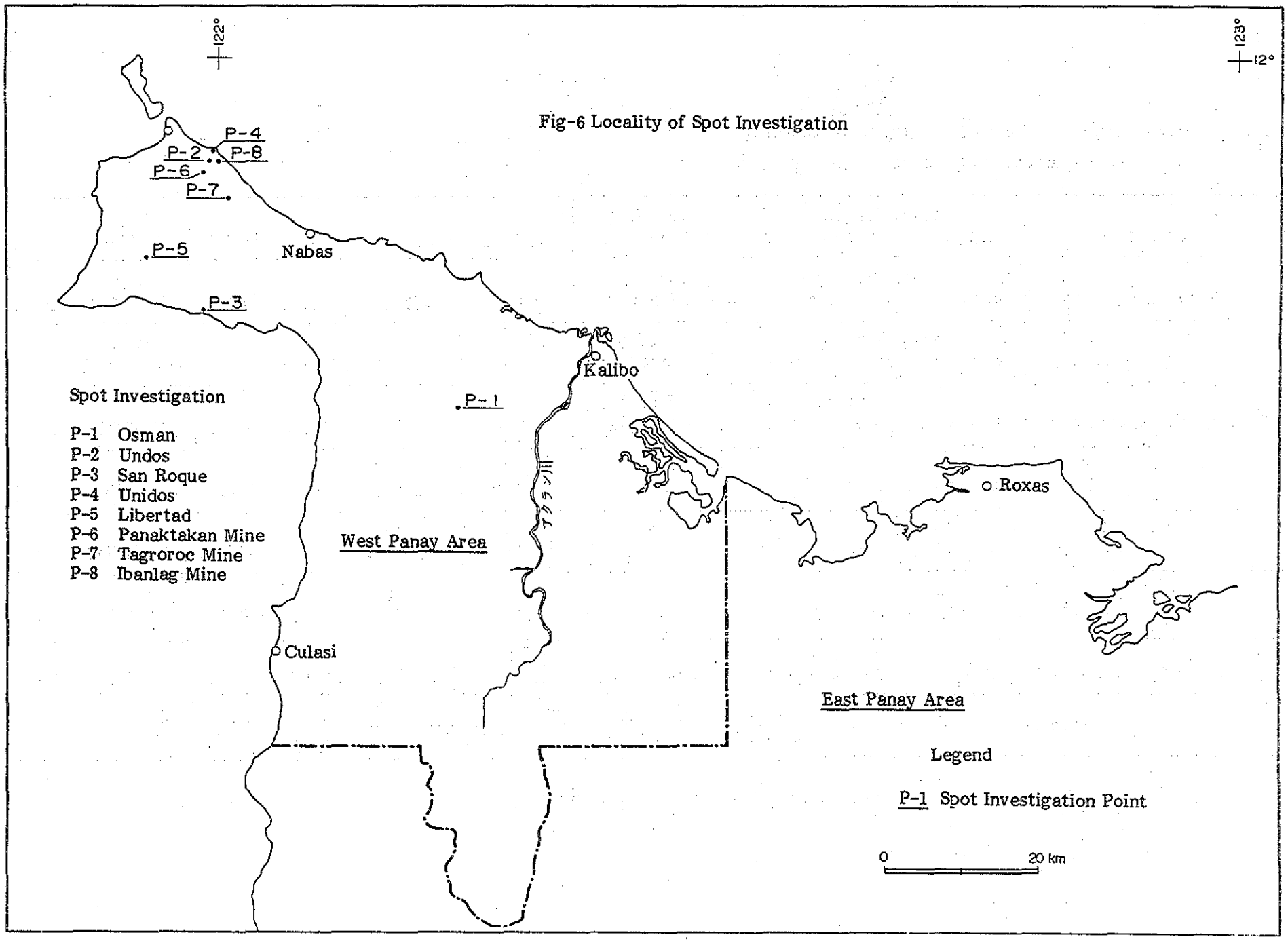

Fig-6 Locality of Spot Investigation

Table- 5 Abstract of Spot Investigation Results

No.	Name of Showing	Name of Topo map	Map No.	Coordinates		Type of Deposit	Evaluation	Remarks
				Easting	Northing			
P-1	Osman	Sebaste	34544	25,400	17,800	Disseminated	C	Pyrite & chalcopyrite associated with clay veins in dolerite
P-2	Unidos	Malay	33551	13,300 - 13,750	7,200 - 7,900	Silica	D	Chert in Pre-Tertiary Formation
P-3	San Roque	Nabas	33552	16,000 - 10,500	9,600 - 10,200	Marble	D	Limestone in Pre-Tertiary Formation
P-4	Unidos	Malay	33551	13,800 - 14,150	8,200 - 8,800	Silica	D	Chert in Pre-Tertiary Formation
P-5	Libertad	Nabas	33552	10,450	14,100	Vein type Graphite	D	Graphite accompanied Quartz vein in Pre-Tertiary Formation
P-6	Panaktakan Mine	Malay	33551	12,800	6,050	Stratabound Manganese	C	Interbedded Mn silicate & Mn oxide in Pre-Tertiary chert
P-7	Tacororoc Mine	Malay	33551	15,550	3,050	Stratabound Manganese	D	Interbedded Mn Silicate & Mn oxide in Pre-Tertiary chert
P-8	Ibanlac Mine	Malay	33551	14,450	7,100	Stratabound Manganese	D	Interbedded Mn Silicate & Mn oxide in Pre-Tertiary chert

* C: Follow up survey is highly recommended

D: Necessity of follow up survey is not highly recommended

The results of field survey and indoor testing for main mineral showings are as follows.

Osman (spot investigation No. P-1)

Locality;	16 kms SW of Kalibo in northeastern Panay Island. Topographic map (1/50,000) Sebaste (3454IV) Easting 25,400 m Northing 17,800 m.
Mineralization;	Hydrothermal vein and dissemination deposit in argillized zone in dolerite.
Ore Minerals;	Pyrite (Auriferous) Chalcopyrite (Ref. Microscopic Photograph BR-16 in Appendix-2.)
Situation;	1 Gold panning in argillized zone is carried on. 3 drilling exploration is performed by Philex Co. in 1984.
Elevation;	Electrum is recognized by reflection microscope, but grade and amount is unknown.

Panatakan Mine (spot investigation No. P-6)

Locality;	6.5 kms SE of Caticulan in Northwestmost of Panay Island. Topographic map (1/50,000) Malay (3355I) Easting 12,800 m Northing 6,000 m
Mineralization;	Strata-bond manganese deposit in semischist.
Ore minerals;	Rhodonite, Phodochrosite and Manganese oxide manganese oxide occurs in Rodonite as vein form. (Ref. Microscopic Photograph BR-18 in Appendix-2)
Situation;	Mining operation were suspended since June 1983.

Ore assay;	Total Fe%	MnO%	P_2O_5%	SiO_2%	S%
ER-17	0.38	72.90	0.19	0.70	-0.001
ER-18	0.33	17.20	0.05	70.40	0.007

Evaluation; Expectation of much amount of ore reservoir is hard.

3-3-4 Geological Structure

This area belongs to the West Physiographic Province of the Philippine Mobil Belt. Western and Eastern sides of Antique Mountain Range (West Panay Mountain Range) have contrast on structual features, namely in western side Paleogene Fonations which show many NE axis folding are divided by NE direction thrust, intruded by diorite and opholite in Middle Miocene and after that strong upheaval movement take place at along present mountain range, Pleistocene clastic flow (Qpdf) seems to produce as the result of this upheaval. On the contrary, in eastern side Neogene Formations have broad distribution, according to east declined monoclinic structure, younger formation arrange from center of mountain range to eastern side. This monoclinic zone has NS strike and some strike faults are visible, along such fault Middle Miocene diorite and ophiolite intrude.

Buruanga metamorphic rock which assumed as Carboniferous to Jurassic origine and construct basement in this area,expose at Buruanga Peninsula (northern most of this area.)

3-3-5 Results of Mineral Showing Survey

Number of surveyed mineral showings in West Panay Area are 8; location of these showings are shown in Fig.-6. and spot investigation data sheets, route maps and sketches are shown in Appendix 9 & 10.

In these showings, 4 metalic deposits (1 disseminated copper (Osman), 3 strata-bound manganese (Buruanga), 2 silicastone, 1 marble, and 1 vein type graphite deposits were encountered.

3-4 Geology and Ore Deposits of Romblon Area (Ref. Attached Plate-2)

3-4-1 General Situation

Romblon Area belongs to Region IV Romblon Province, located about 300 km SSE of Manila is composed of Tablas Is., Romblon Is. and S. buyan Is. Transportation is by boat only, one round trip liner (about 10 ton) each day through Boracay Is., Carabao Is. to Tablas, Romblon and Sibuyan Is. which starts from Caticlan at the northwestern end of Panay Is.

Kalibo — car 1 hour — Caticlan — boat 1.5 hours — Tablas Is. — boat 3 hours — Romblon Is. — boat 2.5 hours — Sibuyan Is.

Direct Sightseeing Liner from Manila is also available.

Geographical situation are as follows.

Area	1,180 km^2
Elevation	0 - 2,050 m (Mt. Guitiguitin in Sibuyan Is.)
Temperature	27° C (Annual average)
Precipitation	2,039 mm/year

This area belongs to the tropical monsoon climate zone of West Pacific and distinction between dry (Jan. - Mar.) and wet (Nov. - Dec.) seasons is clear. Each Is. is surrounded by coral reefs. Main industries are agriculture at coastal plains, coconut plantation and fishery. In Romblon Is. good quality marbles are produced and processed.

3-4-2 Stratigraphy (Ref. Fig-7)

Schematic columnar section in Romblon area is as follows.

Pre-Tertiary System: Romblon Metamorphic Rocks (Rm, Rml)

This rock unit consists of quartz mica schist, quartzose sandstone and crystalline limestone; Schistosity is clear and quartz lenses arrange parallel to schistosity are present. Graphic appearance in places. Strong drag folds are visible near the ultramafic rock intrusive body.
This rock unit is distributed south and north of Tablas Is., whole area of Romblon and east and west parts of Sibuyan Is. At south of Tablas this rocks contacts to Oligocene Tablas volcanics with NNE-SSW fault, and at north part contacts to Sibuyan ultramafic rocks with high angle thrust.
Age of this rock unit is assumed to be Paleozoic (Carboniferous?).
(Microscopic Observation Results)
The sample of this rock (LR-2) which collected 2-7 kms of SSE of Caltrava at north coast Tables Is. is hornblend quartz schist which consists of green hornblend and quartz as main minerals, accompanies K-feldspar and plagioelase as accessory minerals, having nematoblastic texture and samll to rare amount of sericite and epidote as altered products.

Oligocene Series: Tablas Volcanic rocks (Tv)

This rock unit consists of basalt, andesite, porphyritic andesite, porphyritic basalt and volcanic breccia unconformably covering the Romblon metamorphic rocks and penetrated by quartzdiorite at center of Tablas Is: From these facts age of this rock unit is assumed to be Paleogene.
Distribution of this rock unit are in central Tablas Is. and north Sibuyan Is.

Late Miocene Series: Binoog Formation (Bf, Bf1)

This formation consists of wacke, tuffaceous wacke, calcarenite and coral limestone, distributed east of central and north of Tablas Is.
At central Tablas NW-SW wavy folds are observed and the axis elongate 4 - 10 km; At South Tablas Is., it has NNE-SSW strike and 20 - 40°E dip. Maximum thickness of this formation is 400 m. Age of this formation is assumed to be Middle to Late Miocene.

Pliocene to Pleistocene Series: Formation (Af, Af1)

This formation consists of basal conglomerate, sandstone, mudstone, calcarenite and clastic limestone, distributed west of Tablas Is. North of Looc (southwest Tablas Is.) NW-SSE trending folds are observed the direction of which is the same as the general strike of this formation. Age of this formation is assumed to be Pliocene.

Pleistocene Series: Peli Formation (Pf)

This formation consists of porous coral limestone, conglomerate and shale, distributed along the west side of central Tablas Is., unconformably covering the Anahao Formation. General strike is NNW-SSE similar to the Anahao formation.
Age of this formation is assumed to be Pleistocene.

Fig -7 Schematic Columnar Section in Romblon Area