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# Marine mineral occurrences and deposits of the economic exclusive zones

Jean-Pierre Lenoble  
Claude Augris  
Régis Cambon  
Philippe Saget

Marmin  
A data base



**Ifremer**

The book

# MARINE MINERAL OCCURRENCES AND DEPOSITS OF THE ECONOMIC EXCLUSIVE ZONE

## **MARMIN : a data base**

was realised by

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## PRESENTATION OF THE DATA BASE : *MARMIN*

During the last thirty years, many occurrences of hard minerals have been discovered on the sea floor. Most of these discoveries were made by pure chance during academic surveys that were not designed for mineral prospecting. Some of these occurrences have been prospected, mostly during the nineteen sixties, but with inappropriate methods and equipments.

IFREMER, or its predecessor CNEOX<sup>1</sup>, participated in some of these surveys through a joint venture named GERMINAL<sup>2</sup> grouping a dozen organisations: research institutions, bureau of mines, dredging and mining companies and banks. The aim was to collect all available information on marine minerals. An immense set of documentation was assembled year after year and two international seminars were organised in France on this topic : 1977 in Orléans and 1984 in Brest.

Considering the technological improvements in made during recent years in positioning (D-GPS), sea floor mapping (swath mapping with multibeam echosounder and side-scan sonar), sub-bottom exploration (digitised high resolution seismic), dredging (deep-water dredge head), it seemed valuable to reconsider these prospects.

In 1993, IFREMER started to build a data base of marine mineral occurrences from the documentation collected by GERMINAL over several decades and from other sources. The information was stored in a computerised data base, from which descriptive summary records are now edited.

Aware of the deficiency of this information, due to the fact that for the past twenty years, mining companies involved in offshore exploration have been in tight competition and did not release information on their research pool, we tried to complete the data through an exchange process with organisations in charge of the offshore mining management of all maritime countries.

Several organisations responded favorably by sending additional data. Many others were interested, but asserted the lack of valuable knowledge on mineral assessment of their exclusive economic zone (EEZ).

A similar enquiry was held with the companies that were involved in hard mineral offshore exploration. Most companies did not reply, probably because they had shifted their activity and were no longer interested. Many had moved or disappeared. Some still considered their knowledge as proprietary.

In order to promote future offshore mineral development, IFREMER decided, at the end of 1994, to publish all the data available to them in printed form.

The present edition is the up-dated version as at the end of 1994. Additional information continues to be poured in the computerised data base.

We are presently considering the edition of a compact disk readable by various computer platforms. A "Mozaic" file could also be placed on the Internet network.

The mineral occurrences file lists all known occurrences and deposits.

- An occurrence is defined as a quoted presence of minerals in a determined location with insufficient information to designate it as a deposit.
- A deposit is a well documented mineral occurrence that could be considered as a future objective for mining. An ore deposit is a well known deposit that can be mined in the present technical and economic conditions.

To facilitate access to the data, the records are presented by sequential numbers. Four indexes, ordered by geographic location (country, continent, ocean) or by commodities, help to find the sequential number of the corresponding mineral occurrence. The geographic indexes are completed by maps.

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<sup>1</sup> CNEOX, the "centre national pour l'exploitation des océans", merged in 1984 with the French "institut scientifique et technique des pêches maritimes" (ISTPM) to form IFREMER, institut français de recherche pour l'exploitation de la mer.

<sup>2</sup> GERMINAL : groupement pour l'étude et la recherche des minéralisations au large

## DESCRIPTION OF THE "OCCURRENCE" FILE

1. **Sequential n°:** Sequential number in the file.
2. **Deposit Name:** Name of the deposit or occurrence, generally name of the locality.
3. **Occurrence, Deposit, Deposit/file:** Type of occurrence: simple occurrence or well documented deposit. Existence of a special file for the deposit.
4. **Commodities:** List of contained commodities or substances (chemical symbol for metals).
5. **Type of deposit:** Deposit type determined from the information summarised in the "Typology" section and established following a check list that is still open and must be revised.
6. **Country:** Neighbouring country. 6 bis. Country Code according to UN standard abbreviations.
7. **District:** Geographic or administrative area in the country.
8. **Administration:** Legal status following the division of the Law of the Sea Convention: Territorial sea, Continental shelf, Exclusive Economic Zone (EEZ), or International Area.
9. **Marine area:** ocean, sea, bay, etc.
10. **Typology:** Key words describing succinctly the deposit according to proposed standards.
  - 10.1. Zone type: Present geographic situation relative to the shoreline (See following pages).
  - 10.2. Morpho. 1 and Morpho. 2: First and second descriptors of the morphology of the sedimentary unit containing the ore, if the sedimentary unit is fossilised a prefix "paleo" is added. A tentative list of descriptors is used as a guide-line (See following pages).
  - 10.3. Petrography: Petrography of the rocks surrounding the ore.
  - 10.4. Mineralogy: Minerals of the ore.
11. **Coordinates:** Geographic latitudes and longitudes in decimal degrees of the parallels and meridians delimiting the ore deposit. The negative sign corresponds to Southern latitudes and Eastern longitudes. The cardinal directions (N, S, E, W) are automatically computed depending on the sign of the entered data.
  - 11.1 Latitude 1: northern-most parallel
  - 11.2 Latitude 2: southern-most parallel
  - 11.3 Longitude 1: eastern-most meridian
  - 11.4 Longitude 2: western-most meridian
  - 11.5 Z: The elevation Z, given in metres, is the average (positive) altitude or average (negative) depth.
12. **Up dated:** Date of up-dating: day/month/year
13. **Mining rights:** (Status of mining rights): Free, Under control, Unknown.
14. **Stage:** (Status of the works): exploration, mining, processing. Several stages can coexist.
15. **Company:** Company holding or mining the deposit.
16. **Resources:** Table showing estimation of resources or reserves, expressed in tonnage and grade of (1) ore, (2) Heavy minerals, (3) Commodities.
  - 16.1 Ore grade of one or several substances contained in the ore
  - 16.2 Tonnage of the ore
  - 16.3 Heavy Minerals grade: grade of one or several substances contained in the heavy minerals
  - 16.4 Heavy Minerals tonnage: tonnage of heavy minerals
  - 16.5 Commodity grade: grade of one or several substances contained in the concentrates or final products (commodities)
  - 16.6 Commodity tonnage: tonnage of concentrates or final products (commodities)
17. **Description:** Literal description of the occurrence or deposit. Normally subdivided into 5 items:
  - 1) Geographic situation.
  - 2) Climate: climatic zone, rain, dominant winds, air temperatures.
  - 3) Hydrography: sea states, water temperatures, waves and swell, storms, tides, currents.
  - 4) Works performed: bathymetric and geophysical surveys, sampling, mining processing.
  - 5) Characteristics of the deposit: regional geology, nature of embedding formations, tectonic structures, shapes and dimensions of the ore bodies, minerals of the ore and the gangue, grades, tonnage, etc..
18. **References:** Bibliographic references.

**IFREMER MARINE MINERAL OCCURRENCE**

Sequential n°: [ ]

Occurrence:  Deposit:  Deposit/File:

NAME: [ ]

Commodities: [ ] Type of deposit: [ ]

Country: [ ] District: [ ]

Marine area: [ ]

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Zone

**COORDINATES**

Latitude (Decimal °): [ ]

Longitude: [ ]

Z (in m): [ ]

**STAGE**

Exploration:  Mining:  Processing:

**MINING**

Free:  Under control:  Unknown:

Up-dated on: [ ]

Company: [ ]

	Ore	Heavy minerals	Commodities
Grades	[ ]	[ ]	[ ]
Tonnage	[ ]	[ ]	[ ]

**Description:**

[ ]

**Reference**

[ ]

## GLOSSARY

<b>Main geomorphologic units</b>		<b>Morphology of the sedimentary body enclosing the minerals</b> <i>If fossilised, the prefix "paleo" is added.</i>	
<b>on land, (on shore)</b>	<b>à terre</b>	<b>mound</b>	<b>en relief</b>
continental margin (from shore to slope bottom)	marge continentale	bank (general term)	banc
continental <b>shelf</b> (from shore to slope edge)	<b>plateau</b> continental	megaripple	mégaride
shore	rivage	aeolian dune	dune éolienne
beach	plage	sand bar, barrier island	cordon littoral
backshore	haut de plage	hydraulic dune	dune hydraulique
<b>foreshore</b> (tidal flat)	<b>estran</b>	submarine ridge	ride sous-marine
upper shoreface (down to 1 m)	<b>plateau interne</b>  plateau interne supérieur  plateau interne inférieur	<b>spreading</b>	<b>épan dage</b>
lower shoreface (from 1 to 2 m)		spreading	épan dage
<b>inner shelf</b> (down to 70 m)		beach	plage
upper offshore (from 2 to 10 m)		colluvial (weathering without transport)	colluvion
lower offshore (from 10 to 70 m)	<b>plateau externe</b>	coral table	platier
<b>outer shelf</b> (from 70 m to 200 m)		<b>hollow</b>	<b>en creux</b>
<b>shelf edge</b>	<b>rebord du plateau</b>	channel	chenal
outer edge (isobath 150 to 500 m)	rebord externe	alluvial channel, stream channel	chenal alluvial, fluviatil
<b>continental slope</b>	<b>pente continentale</b>	submarine channel	chenal sous-marin
<b>continental rise</b>	<b>glacis</b>	levee	levée
laguna	lagune	gullies	goulottes
<b>lagoon</b>	<b>lagon</b>	valley	vallée
estuary	estuaire	canyon	canyon
delta	delta	cracks or fractures of the bed rock	fissures ou cavités du substratum
fan	éventail	lenticular	lenticulaire
flood plain	plaine alluviale		
supratidal	zone de hautes eaux		
subtidal	zone de basses eaux		
<b>seamount</b>	<b>mont sous-marin</b>		

**MAPS AND OCCURRENCE LOCATIONS**

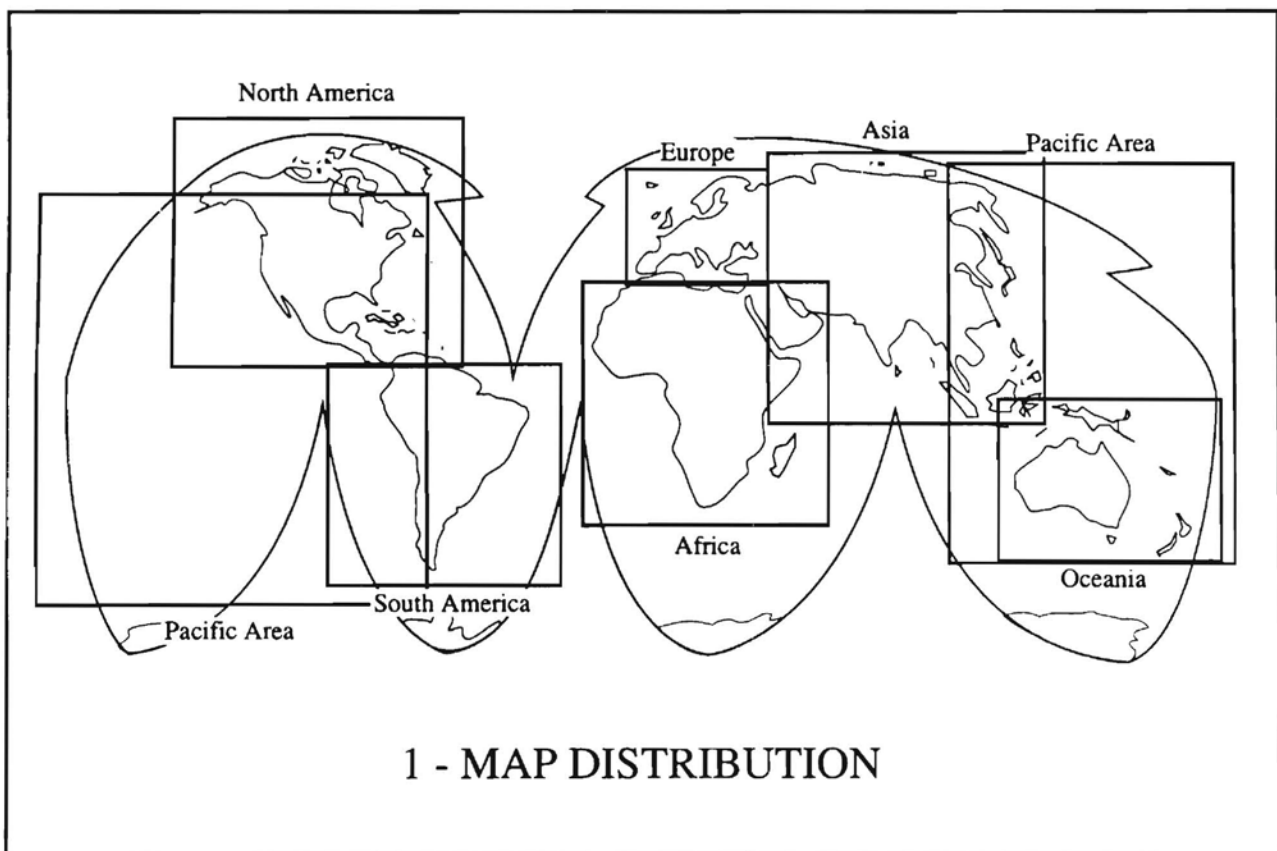


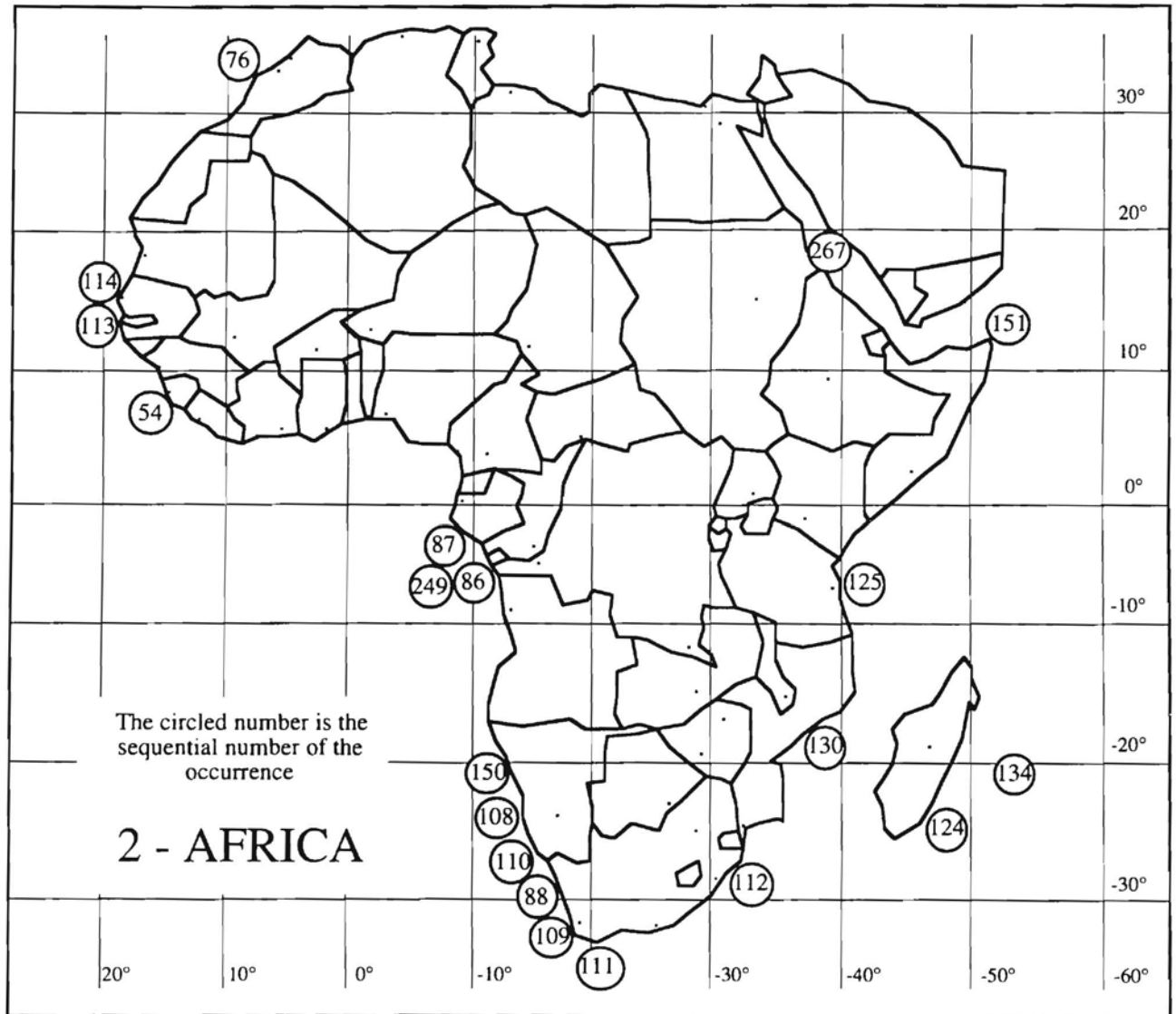
## MAPS AND OCCURRENCE LOCATIONS

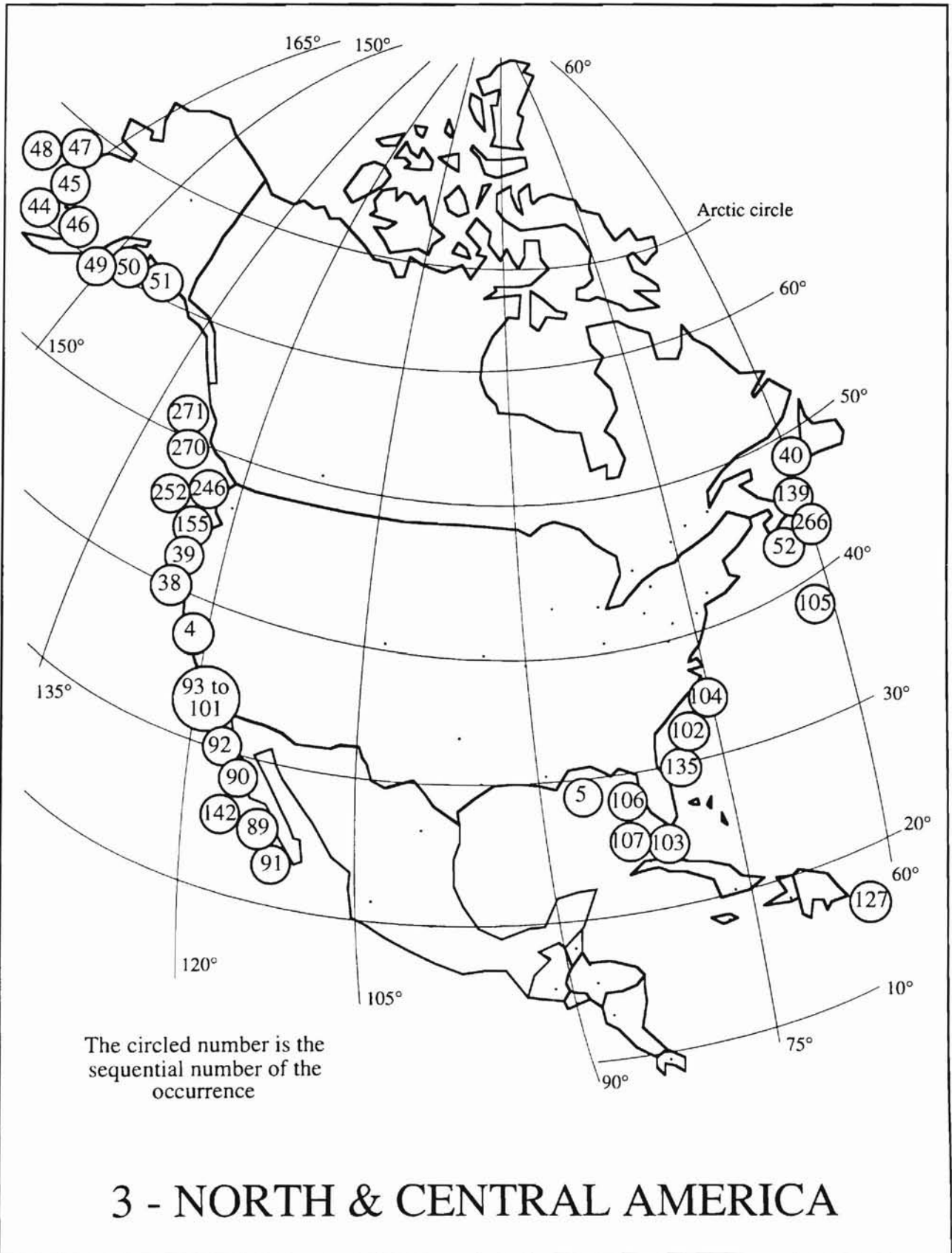
The following maps are sketches established with exotic projection systems and are not geographically accurate.

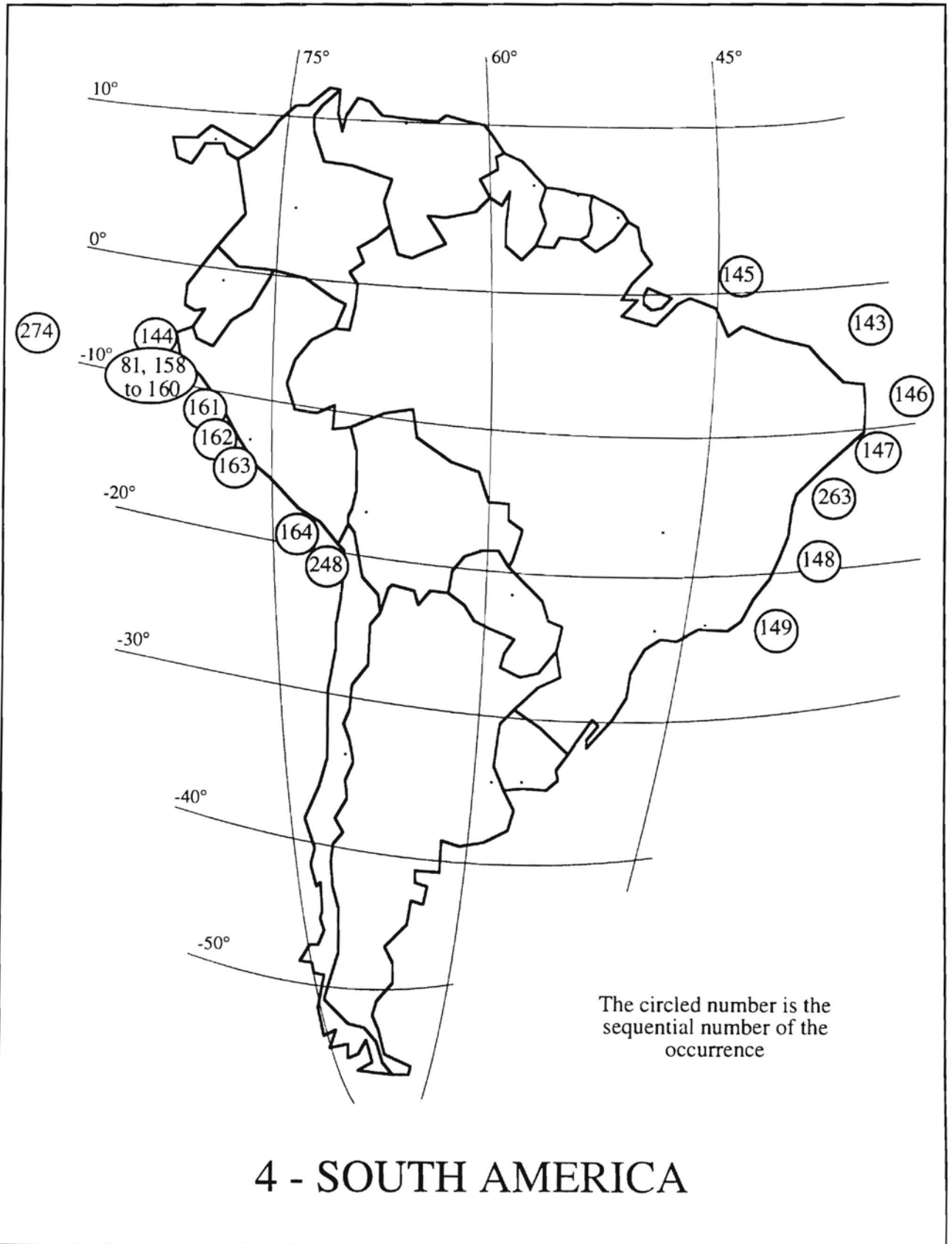
The occurrence locations are approximate and for rapid reference use only.

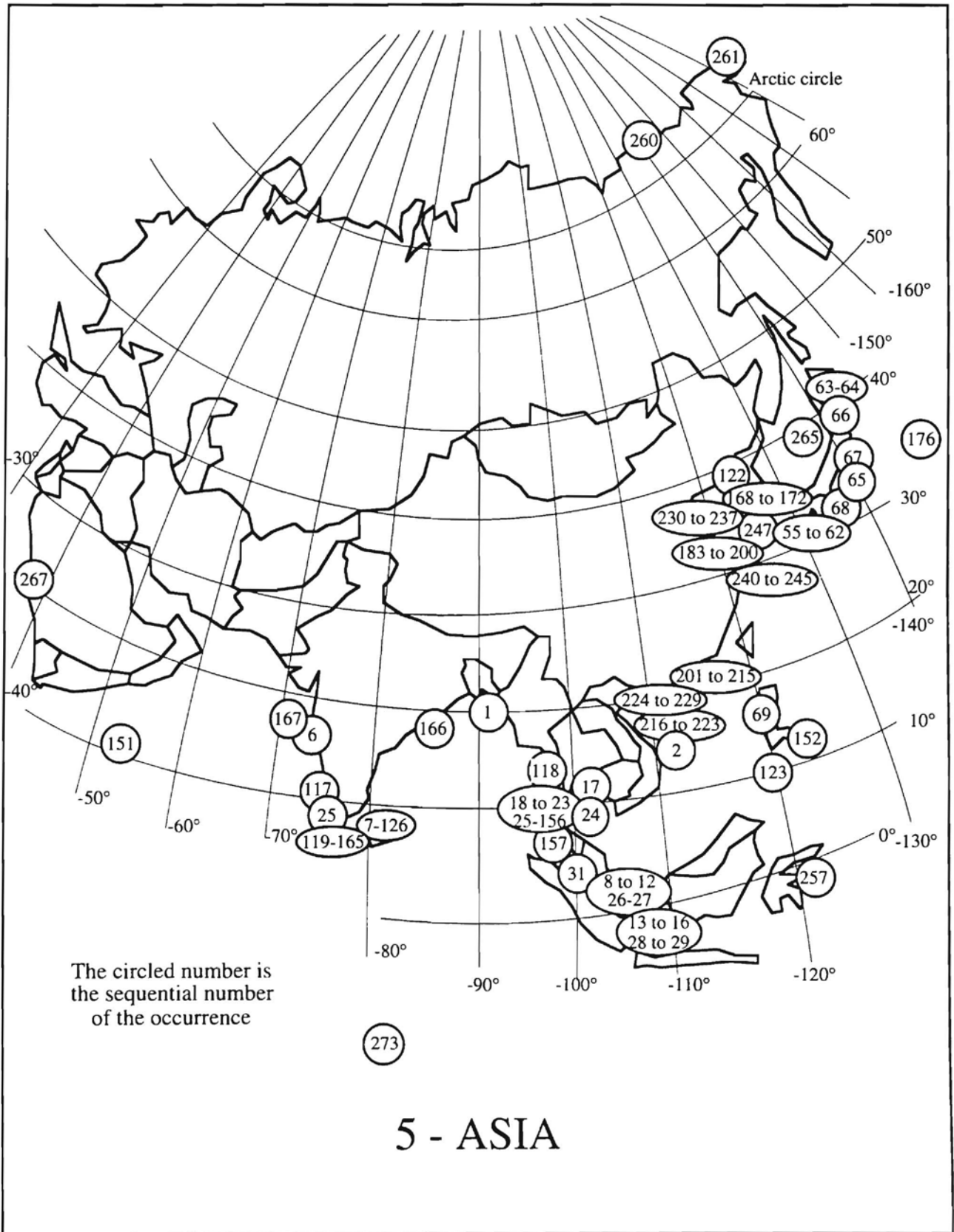
1. Map distribution
2. Africa
3. North and Central America
4. South America
5. Asia
6. Pacific area
7. Australia
8. Europe

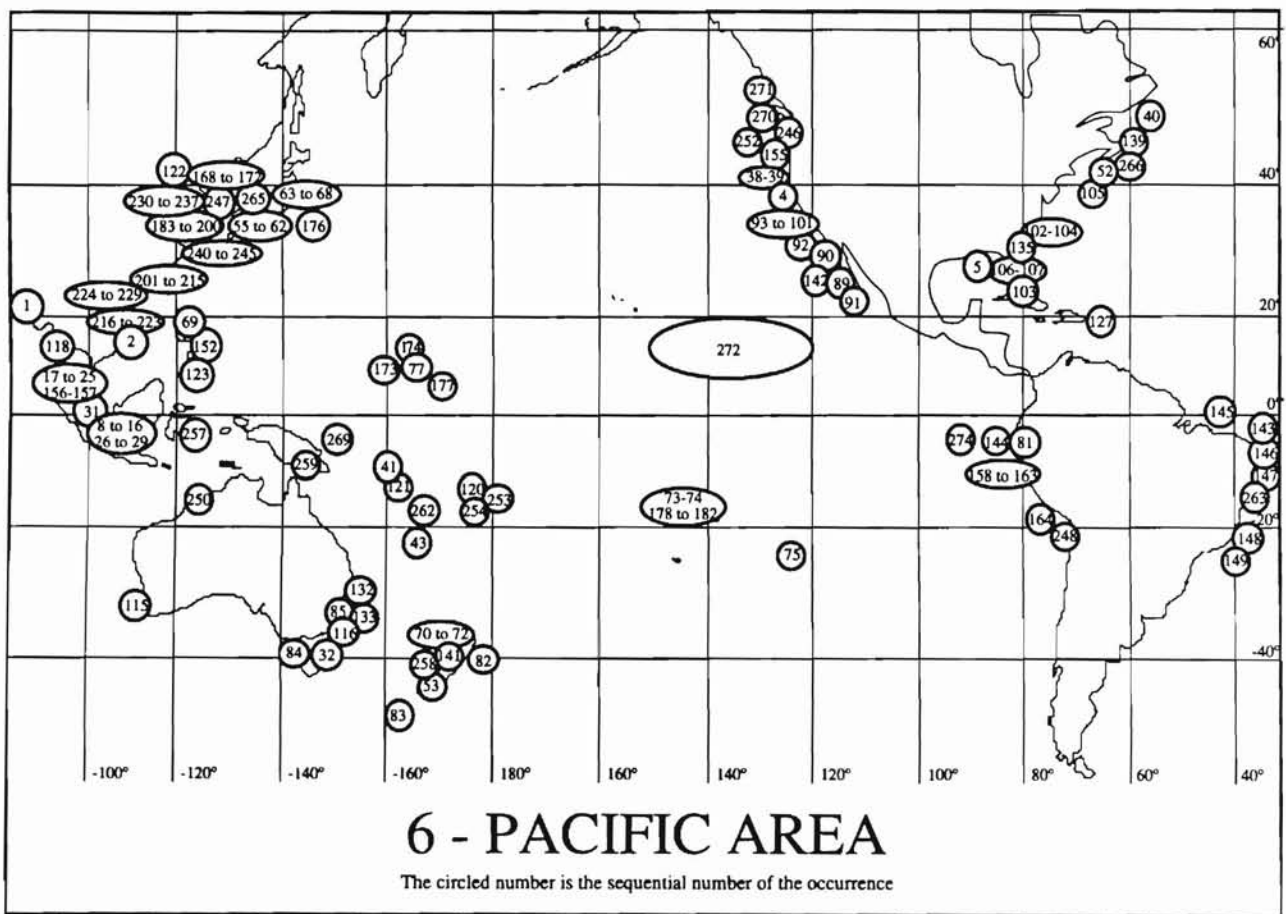


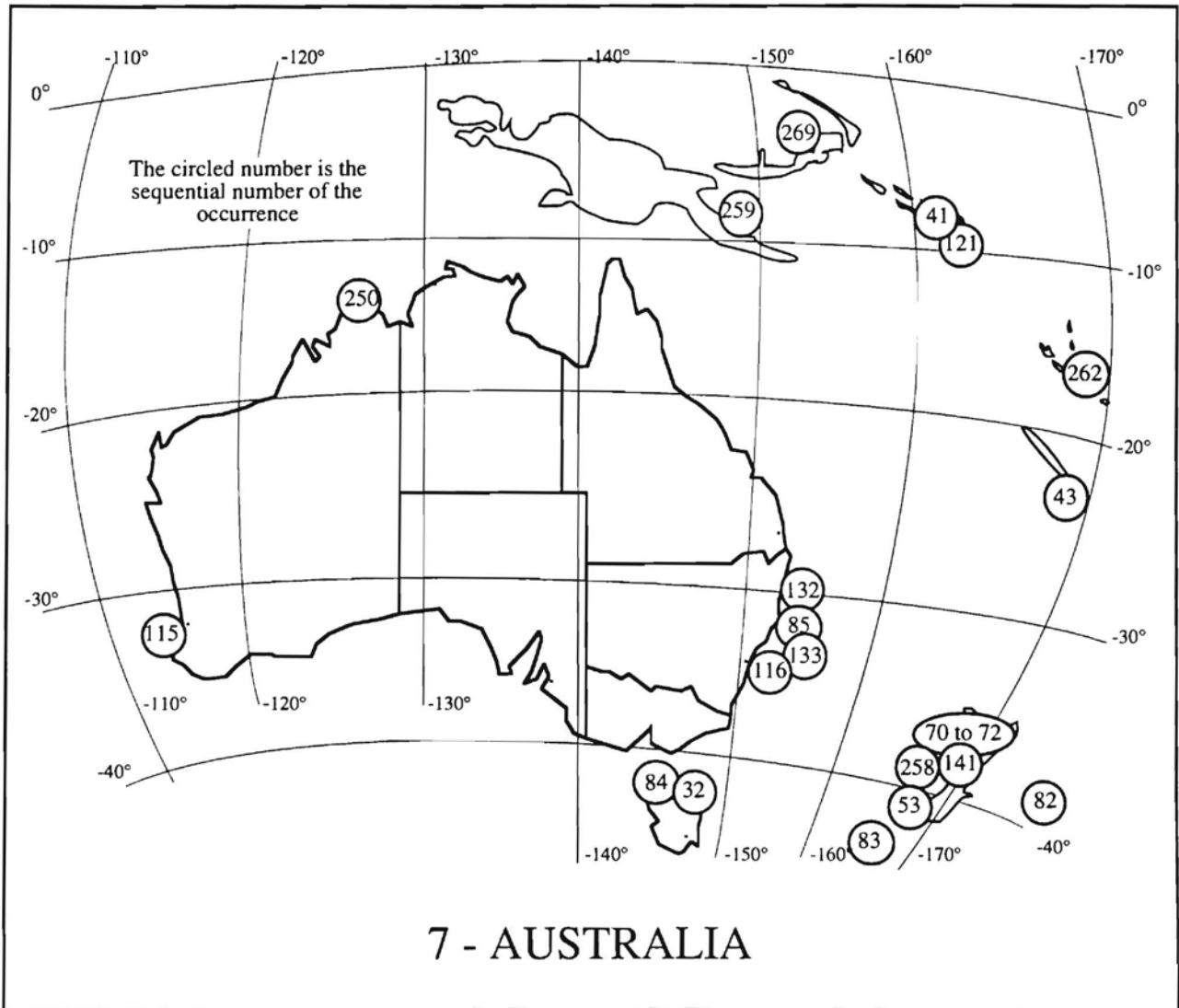
















**COUNTRY INDEX**

## COUNTRY INDEX

Country	Deposit name	Substances	Seq. Number
Australia	AUSTRALIA EAST	phosphate	85
	CASUARINA PROSPECT	diamond	250
	FORSTER	Ti Zr	116
	GOLD COAST	Ti Zr	132
	MINNINUP	Ti	115
	RINGAROOMA BAY	Sn	32
	TASMAN SHELF	phosphate	84
	TWEED HEADS	Ti Zr	133
Bangladesh	MAISKHAL ISLAND	Ti Th Zr	1
Burma, Myanmar	HEINZE BASIN	Sn W	118
Brazil	ARACAJU EAST	phosphate	147
	BAHIA COAST	lime	263
	CARAVELAS EAST	phosphate	148
	CEARA SEAMOUNT	phosphate	143
	NORTH BELEM	phosphate	145
	PERNAMBUCO SHELF	phosphate	146
	SOUTHERN BRAZIL	phosphate	149
	Canada	AXIAL JUAN DE FUCA	Zn Cu Fe
BAIE DE LUNENBERG		Au Sn	52
CAPE BRETON ISLAND		coal	139
DOME COUNTRY HARBOUR		Au	266
ENDEAVOUR SEGMENT		Zn Cu Ag Fe	270
MAGIC MOUNTAIN SITE		Zn Cu Ag Fe	271
PORT AU PORT		Cr	40
Chile		CHILE	phosphate
	PISAGUA	phosphate	164
China	A1	Zr	183
	A2	Zr Si	184
	A3	Zr	185
	A4	Si	186
	A5	Zr Si	187
	A6	Zr Si	188
	A7	Zr TiFe Si	189
	A8	Zr	190
	A9	Zr TiFe Ti Si	191
	A10	TiFe	192
	A12	Zr TiFe Ti Si	193
	A13	Zr	194
	A14	TiFe	195
	A15	TiFe Zr Si	196
	A16	TiFe Si	197
	A17	TiFe Si	198
	A18	TiFe Zr Si	199
	A19	TiFe Zr Ti	200
	A20	Zr Ti	201
	A21	TiFe Zr	202
	A22	Ti TiFe	203

Country	Deposit name	Substances	Seq. Number	
China (continue)	A23	Ce Ti	204	
	A24	Ti Zr	205	
	A26	Ti Zr	206	
	A27	Ti Zr	207	
	A28	Ti TiFe	208	
	A29	Ce	209	
	A30	Ce	210	
	A31	Ce	211	
	A32	Ce Zr	212	
	A33	Ce Zr	213	
	A34	Ce Zr	214	
	A35	Zr	215	
	A36	Zr	216	
	A37	Zr TiFe Ti	217	
	A38	Zr	218	
	A39	Zr	219	
	A40	Ti TiFe	220	
	A41	Ce Ti Zr	221	
	A42	Zr	222	
	A43	Zr	223	
	A44	Zr Ti	224	
	A45	Ti Zr	225	
	A46	Zr Ce	226	
	A47	Zr Ce	227	
	A48	TiFe Zr Ti	228	
	A49	Zr Ti	229	
	B1	TiFe Si	230	
	B2	Zr TiFe Si	231	
	B3	Fe Zr Si TiFe	232	
	B4	Fe Zr Si TiFe	233	
	B5	Au	234	
	B6	TiFe	235	
	B7	Zr	236	
	B8	Zr	237	
	B10	TiFe Si	238	
	B11	Zr	239	
	B12	Zr TiFe Fe	240	
	B13	Zr TiFe Fe	241	
	B14	TiFe Fe	242	
	B15	Zr TiFe Fe	243	
	B16	Zr TiFe Fe	244	
	B17	Zr	245	
	Congo	HAINAN ISLAND	rubis saphir	2
		MAYUMBA Congo	phosphate	249
		POINTE NOIRE	phosphate	86
Danemark	THY	Ti Zr Rare-Earth	3	
Fiji	BA	Cr Au Fe	254	
	LAUCALA BAY	lime	253	
France	SIGATOKO SANDS	Fe Cr	120	
	CORSEN	Sn	36	
	PENARAN	U	136	
	PENESTIN	Sn	37	
	POULDU COVE	Fe Ti	137	
	SAINT QUAY PORTRIEUX	Fe Ti	138	

Country	Deposit name	Substances	Seq. Number	
French Polynesia	ANAA	Co Mn	179	
	HARAIKI	Co Mn	182	
	HENDERSON ISLAND	phosphate	75	
	MATAIVA	phosphate	73	
	MATAIVA N	Co Mn	180	
	MATAIVA NW	Co Mn	181	
	NIAU	phosphate	74	
	NIAU COBALT	Co Mn	178	
Gabon	MAYUMBA	phosphate	87	
Germany	FRISE ISLAND	Ti Zr	131	
Great Britain	PAR	Sn	33	
	ST AGNES	Sn	35	
	ST IVES	Sn	34	
	SUNDERLAND	coal	140	
Greece	LARIMNA	Cr Ni Fe	251	
Iceland	FAXA BAY	lime	255	
India	CALICUT BEYPORE RIVER	Au	117	
	CHATRAPUR	Ti Zr Th	166	
	INDIAN ARABIAN SEA	phosphate	167	
	KANNIYAKUMARI			
	MANAVALAKURICHI	Ti Zr Th	165	
	QUILON TRAVANCORE	Ti	119	
	RATNAGIRI	Ti	6	
	SEMBANAD	lime	256	
	Indonesia	BELITUNG	Sn	30
		COPAT KELABAT BAY	Sn	28
		PAYA KUNDUR	Sn Ti	8
		KARIMUN EAST	Sn	26
		KARIMUN EAST A1	Sn	10
KARIMUN EAST A2		Sn	11	
KARIMUN EAST A3		Sn	12	
KEBIANG LAUT / PENGA		Sn	15	
KOBIL VALLEY		Sn	9	
LAUT TEMPILANG		Sn	29	
SINGKEP		Sn	16	
SULAWESI		Cr	257	
TEMPILANG		Sn	13	
TIMUN VALLEY		Sn	27	
TOBOALI		Sn	14	
Italy		CAPO LINARO		
		& MONTE ARGENTARIO	Fe	129
	ILE D'ELBE	Fe	128	
	TORRE DEL GRECO	coral	268	
Japan	AKUNE	Fe Ti	57	
	ARIAKE BAY	TiFe	55	
	BEPPU	Fe Ti	56	
	EI IRINO-BEPPU	Fe Ti	59	
	ISUBUKI	Fe Ti	61	
	NAGASAKIBANA	Fe Ti	60	
	NAUKI-KUSHIMOTO	Fe Ti	68	
	OHATA	Fe Ti	66	
	SABISHIRO-HACHINOBE	Fe Ti	64	
	SENDAI	Fe Ti	58	
	TAKUYOU 5th SEAMOUNT	Co Mn	176	

Country	Deposit name	Substances	Seq. Number	
Japan (continue)	TARUMIZU-ONEZIME	TiFe	62	
	TIOKA	Fe Ti	65	
	TOKYO BAY	Fe Ti	67	
	VOLCANO BAY	TiFe	63	
	YAMATO RISE	phosphate	265	
Korea	ASAN MAN	Au	168	
	CHUNSU	Au	169	
	KANGWHA	Ti	172	
	KOREAN OCCUR	Ti	247	
	MOKPO	Th RE	170	
	WANDO ISLAND	Th RE	171	
	FORT DAUPHIN	Ti Th Rare-Earth Zr	124	
Madagascar	AREA OFF PERAK	Sn	31	
Malaysia	MOROCCO	phosphate	76	
Morocco	JEBRO SEAMOUNT	Co Mn	175	
Marshall Islands	LABIBJET SEAMOUNT	Co Mn	173	
	SYLVANIA SEAMOUNT	phosphate	77	
	SYLVANIA SEAMOUNT 2	Co Mn	174	
	BANCO RANGER	phosphate	90	
	CEDROS ISLAND	phosphate	142	
Mexico	SAN DOMINGO	phosphate	91	
	SAN JOSE BANK	phosphate	92	
	SAN JUANICO	phosphate	89	
	ZAMBEZI ESTUARY	Ti Zr	130	
	CHAMEIS BAY	diamond	108	
Mozambique	CHAMEIS BAY to DIAZ POINT	diamond	110	
	WALVIS BAY	phosphate	150	
Namibia	PLOUM	Cr	43	
New Caledonia	CAMPBELL PLATEAU	phosphate	83	
New Zealand	CHATAM RISE	phosphate	82	
	GILLESPIES BEACH	Au	53	
	HOKITIKA	Au	258	
	MOKAU RIVER	TiFe	71	
	PATEA	TiFe	72	
	WAIKATO RIVER	TiFe	70	
	WHANGAEHU RIVER	TiFe	141	
	SIN'AM-DONG KIBONG-DONG	Th RE	122	
	North Korea	EASTERN MANUS BACK-ARC	Cu Zn Au	269
		LAE	Cr	259
MOROBE		Cr	42	
Papoua New-Guinea	CHICLAYO	phosphate	158	
	CHIMBOTE	phosphate	159	
	HUARMEY	phosphate	160	
	LIMA	phosphate	162	
	PATIVILCA	phosphate	161	
	PAITA	phosphate	144	
	PERU	phosphate	81	
	SAN NICOLAS	phosphate	163	
	Philippines	IMURUAN BAY	Ti Zr U Th RE	123
		LINGAYEN BAY	Fe Ti	69
PILAR DANSOL		Fe	152	
Puerto Rico	NORTH PUERTO RICO	Fe Th	127	
Réunion	LA REUNION ISLAND	TiFe	134	

Country	Deposit name	Substances	Seq. Number
Russia	CHUKOTSKIY	Au	261
	VANKINA BAY	Sn	260
Solomon	BARAVALE	Cr	41
	MATEPANO RIVER	Au	121
Saudi Arabia	ATLANTIS II DEEP	Cu Zn Ag Fe Co Au	267
Senegal	NORTH DAKAR	Ti	113
	SOUTH DAKAR	Ti Cr	114
Sierra Leone	FREETOWN PENINSULA	Pt Ti Au	54
Solomon	SOLOMON ISLAND	coral	264
South Africa	AGULHAS BANK	phosphate	88
	BROADACRES MINING AREA	diamond	111
	GROEN RIVER	diamond	109
	RICHARDS BAY	Ti Zr	112
Spain	PONTEVEDRA	Sn	153
	VIGO	Sn	154
Sri Lanka	BERUWALA	Ti Th Rare-Earth	7
	PULMODDAI	Ti	126
Tanzania	ZANZIBAR	Ti Zr Th Rare-Earth	125
Thailand	AREA A BLOCK I	Sn Ti Zr Rare-Earth	22
	AREA B	Sn	156
	AREA C	Sn	18
	KAMMALA BAY	Sn	19
	RANON	Sn	23
	RAYONG	Sn	17
	SAMET ISLAND	Sn	24
	TAKUA PA	Sn	25
	THAI MUANG	Sn	20
	THAI S COAST	diamond	157
	TONGKAH HARBOUR	Sn	21
USA	BLAKE PLATEAU	phosphate Mn	102
	BLUFF SOLOMAN	Au	45
	CAPE BLANCO	Cr	39
	CAPE JOHNSON SEAMOUNT	phosphate	78
	CAPE PRINCE OF WALES	Sn Au W	48
	CASTLE ISLAND	Ba	51
	FORTY MILE RIDGE	phosphate	95
	CORONADO RIDGE	phosphate	93
	GOOD NEWS BAY	Pt Au Cr	50
	GRANTLEY HARBOR	Au W	47
	HAYWARD SAN LEANDRO	lime	4
	HESS SEAMOUNT	phosphate	80
	HORIZON SEAMOUNT	phosphate	79
	MAIN PASS	S	5
	NINILCHIK	Au	46
	NOME	Au	44
	NORTH CATALINA RIDGE	phosphate	97
	ONSLow BAY	phosphate	104
	OREGON UN	Fe Zr	246
	PALMYRA SEAMOUNT	Co Mn	177
	POURTALES TERRACE	phosphate	103
	ROGUE RIVER	Cr	38
	SAN NICOLAS RIDGE	phosphate	100
	SAN PABLO SEAMOUNT	phosphate Mn	105
	SANTA BARBARA HIGH	phosphate	96

Country	Deposit name	Substances	Seq. Number
USA (continue)	SANTA MONICA BAY	phosphate	98
	SOUTH CATALINA RIDGE	phosphate	99
	TANNER CORTEZ RIDGE	phosphate	101
	TARPOON SPRING	phosphate U	106
	THIRTY MILE BANK	phosphate	94
	UMPQUA	Cr	155
	VENICE ENCLEWOOD	phosphate U	107
	VIRGINIA - GEORGIA	Ti Zr Th Rare-Earth	135
	YAKATAKA YAKUTAT	Au	49
	Vanuatu	PORT PATTESON	Fe
Yemen	SOCOTRA ISLAND	phosphate	151
International Area	CLARION CLIPPERTON	Mn Ni Cu Co	272
	INDIAN CENTRAL BASIN	Mn Ni Cu Co	273
	PERU BASIN	Mn Ni Cu Co	274

**CONTINENT INDEX**



## CONTINENT INDEX

Continent	Country	Seq. Number
<b>AFRICA</b>		
Africa E	Saudi Arabia	267
	Yemen	151
Africa N	Morocco	76
Africa SE	Madagascar	124
	Mozambique	130
	Réunion	134
	Tanzania	125
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	Sri Lanka	7, 126

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		192, 193, 194, 195, 196, 197, 198, 199, 200
		240, 241, 242, 243, 244, 245
	Japan	55, 56, 57, 58, 59, 60, 61, 62, 63
	Korea	168, 169, 170, 172, 247
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	Fiji	120, 254
	France	137, 138
	Greece	251
	Italy	128, 129
	Japan	55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68
	New Zealand	70, 71, 72, 141
	Philippines	69, 152
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	Chile	164, 248
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	Korea	170, 171	
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	Philippines	123	
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	Thailand	22	
	USA	135	
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Great Britain		33, 34, 35	
Indonesia		8, 9, 10, 11, 12, 13, 14, 15, 16, 26, 27, 28, 29, 30	
Malaysia		31	
Myanmar, Birmania		118	
Russia		260	
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Thailand		17, 18, 19, 20, 21, 22, 23, 24, 25, 156	
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<b>Titanium, Ti</b>		Australia	115, 116, 132, 133
		Bangladesh	1
	China	201, 204, 205, 206, 207, 221, 224, 225, 229	
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	Madagascar	124
	Mozambique	130
	Philippines	69, 123
	Senegal	113, 114
	Sierra Leone	54
	South Africa	112
	Sri Lanka	7, 126
	Tanzania	125
	Thailand	22
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	Philippines	123
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	Canada	252, 270, 271
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	Saudi Arabia	267
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	China	183, 184, 185, 187, 188, 189, 190, 191, 193, 194, 196, 199 200, 201, 202, 205, 206, 207, 212, 213, 214, 215, 216, 217 218, 219, 221, 222, 223, 224, 225, 226, 227, 228, 229, 231 232, 233, 236, 237, 239, 240, 241, 243, 244, 245
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	Philippines	123
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<b>NOTES AND OBSERVATIONS</b>
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Please find hereafter a sheet on which may be noted :

- any corrections or modifications,
- any new non-listed occurrences.

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<b>IFREMER</b>		<b>MARINE MINERAL OCCURRENCE</b>		Sequential n°:
Occurrence <input type="checkbox"/>	Deposit <input type="checkbox"/>	NAME:		
Deposit/File <input type="checkbox"/>				
Commodities:		Type of deposit:		
Country:		District:		
Marine area:				
<b>ADMINISTRATION</b>			<b>TYOLOGY</b>	
<input type="checkbox"/> Territorial			Zone type	
<input type="checkbox"/> Continental Shelf			Morpho. 1	
<input type="checkbox"/> Exclusive Economic Zone			Morpho. 2	
<input type="checkbox"/> International Zone			Petrography	
<b>COORDINATES</b>			Mineralogy	
Latitude	<input type="text"/>	<input type="text"/>		
(Decimal °)	<input type="text"/>	<input type="text"/>		
Longitude	<input type="text"/>	<input type="text"/>		
Z (in m)	<input type="text"/>	<input type="text"/>		
<b>STAGE</b>			<b>MINING RIGHTS</b>	
Exploration:	<input type="checkbox"/>	Free:	<input type="checkbox"/>	
Mining:	<input type="checkbox"/>	Under control:	<input type="checkbox"/>	
Processing:	<input type="checkbox"/>	Unknown:	<input type="checkbox"/>	
Company:			Up-dated on:	
		Ore	Heavy minerals	Commodities
Grades	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Tonnage	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Description:				
References:				

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**OCCURRENCES**

Occurrence   
 Deposit   
 Deposit/File

**NAME: MAISKHAL ISLAND**

<b>Commodities:</b> Ti Th Zr		<b>Type of deposit:</b> placer beach	
<b>Country:</b> Bangladesh		BD	<b>District:</b> Cox's Bazar
<b>Marine area:</b> Indian N, Bengal bay			

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	foreshore
<b>Morpho. 1</b>	beach
<b>Morpho. 2</b>	
<b>Petrography</b>	
<b>Mineralogy</b>	ilmenite monazite zircon

**COORDINATES**

Latitude	N	21.600
(Decimal °)		0.000
Longitude	E	-91.900
		0.000
Z (in m)		0

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

1) East Pakistan, south of Chittagong.  
 2) Climate: Tropical rain forest. Average annual rainfall 4000-5000 mm; maxi. during summer. Prevailing surface winds, NE trades in January and SW monsoon in July. Tropical storm tracks from SW from May to November and S, SE from November to May.  
 3) Hydro: From November to May North equatorial currents from east to west are dominant; these currents turn clockwise in the Bengal Bay and follow the Bangladesh coast from north to south. From May to September the dominant currents are from the west.  
 4) Works performed: Geology along the coast and sampling.  
 5) Characteristics of the deposit: Beach placers extend 185 km south-eastward along the Bay of Bengal from Chittagong to the Burma border. Mineral concentrations occur in lenticular strips which in certain areas stretch from some hundred to several thousand metres long and 30 to 300 m in width along both the mainland and the offshore beach. The major concentration of HM was located on Moiskhal Island. The average HM content at the mainland beaches ranges between 10-30% of the sand whereas it showed more than 25% at some places in the Island. The HM values for Moiskhal Island are as follows: rutile 1.4%, zircon 10.3%, ilmenite 57.4%, magnetite 1%, leucocoxene 0.3%, monazite 1.78%. The grain size of individual minerals varies from locality to locality. In Moiskhal Island the distribution of non magnetic minerals is as follow: >100 to 150 mesh zircon 10.22%, rutile 2.68%, leucocoxene 10.10%. The HM are in layers that are most commonly about 30 cm thick, but layers as thick as 75 cm have been measured. The rich placer layers on the open beach are probably formed almost entirely by wave action, perhaps during a period of erosion of the beach. The placer on the higher beach appears to have been formed by a combination of wave action, perhaps mostly by storm waves and wind sorting (Schmidt R. & al., 1962). An exploitation with an annual production of 5 Mt could be considered (M.J. 1989).

**References:**

1) Aslam M., 1974. An appraisal of beach sands of Bangladesh, Geonews Pakistan, 4, 79-85. 2) M.J., 305 (7841), 415, Sept. 1989. 3) Schmidt R. & al., 1962.

Occurrence   
 Deposit   
 Deposit/File

**NAME: HAINAN ISLAND**

**Commodities:** gems rubis saphir      **Type of deposit:** placer paleobeach  
**Country:** China      CN      **District:** Hainan Island

**Marine area:** Pacific W, China S sea, Nanhai

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**TYOLOGY**

<b>Zone type</b>	inner shelf
<b>Morpho. 1</b>	paleobeach
<b>Morpho. 2</b>	
<b>Petrography</b>	
<b>Mineralogy</b>	rubis saphir

**COORDINATES**

Latitude	N	18.380
(Decimal °)		0.000
Longitude	E	-110.000
		0.000
Z (in m)		0

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

- 1) South-East part of Hainan Island.
- 2) Climate: Tropical rain forest. Mean annual precipitation 2000 mm. Prevailing winds from NE in January and from SW in July.
- 5) Characteristics of the deposit: 50% of the mineralised sand reserves are located in shallow water. A very well adapted dredge would permit an increase in production from 43 to 56% and a drop in exploitation costs from 53 to 60 %.

**References:**

I.M., 257, 1989.

Occurrence   
 Deposit   
 Deposit/File

NAME: **THY**

<b>Commodities:</b> Ti Zr Rare-Earth		<b>Type of deposit:</b> placer beach	
<b>Country:</b> Danemark		DK	<b>District:</b> Jutland
<b>Marine area:</b> Atlantic NE, North sea			

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**COORDINATES**

Latitude	N	57.000
(Decimal °)		0.000
Longitude	E	-8.400
		0.000
Z (in m)		0 to -20

**TYOLOGY**

<b>Zone type</b>	beach foreshore inner shelf
<b>Morpho. 1</b>	paleobeach
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	ilmenite zircon monazite

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

- 1) NW part of Jutland peninsula.
- 2) Climate: Marine west coast. Mean annual precipitation 800 mm.
- 5) Characteristics of the deposit: The Danish geological survey found mineralised sands which extend over 20 km<sup>2</sup> and to a depth of 20 m. The thickness is around 20 m on the beach following the coast nearby Thy.

**References:**

Anonymous, 1989. Mining journal, 313 (8046), Sept. 1989.



Occurrence   
 Deposit   
 Deposit/File

**NAME: HAYWARD SAN LEANDRO**

**Commodities:** lime **Type of deposit:** beach  
**Country:** USA **US** **District:** California, Alameda City

**Marine area:** Pacific NE, San Francisco bay

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	bay
<b>Morpho. 1</b>	lenticular
<b>Morpho. 2</b>	
<b>Petrography</b>	shelly & muddy sand & gravel
<b>Mineralogy</b>	calcareous shell

**COORDINATES**

Latitude	N	37.660
(Decimal °)		0.000
Longitude	W	122.060
		0.000
Z (in m)		0

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

- San Francisco Bay.
- Climate: Mediterranean, dry summer. Mean annual rainfall 367 mm, maxi. during winter. Winds to S (Jan.), E-NE (Apr., Jul.-Oct.).
- Hydro: Mixed tide (maxi. 2-4 m). Cold surface currents in summer N to S (California current) 0-4 knots; warm surface currents in winter S to N (Davidson current) 0-3 knots.
- Characteristics of the deposit: The deposit is formed by the break up of marine shells and their concentration into shell banks by hydrodynamic processes. The Oysters shell bed is overlaid by 0.3 to 1.5 m of mud.

**References:**

Occurrence   
 Deposit   
 Deposit/File

**NAME: MAIN PASS**

**Commodities:** sulphur      **Type of deposit:** diapir  
**Country:** USA      US      **District:** Louisiane

**Marine area:** Atlantic NW, Mexico gulf

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	shelf
<b>Morpho. 1</b>	diapir
<b>Morpho. 2</b>	dome
<b>Petrography</b>	
<b>Mineralogy</b>	salt

**COORDINATES**

Latitude	N	29.500
(Decimal °)		0.000
Longitude	W	89.000
		0.000
Z (in m)		0

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:** Freeport Mc Moran

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>	68 Mt		

**Description:**

1) Located 20 miles East of the Mississippi river mouth under an oil and gas deposit. The sulphur deposit will be exploited with a rythm of 2 Mt/year.

**References:**

Anonymous, 1991. Sulphur, G.B.R., 217, 21-23.

Occurrence   
 Deposit   
 Deposit/File

**NAME: RATNAGIRI**

**Commodities:** Ti **Type of deposit:** placer paleobeach paleochannel  
**Country:** India **IN** **District:** Maharastra, Konkan

**Marine area:** Indian N, Arabian sea

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**TYOLOGY**

<b>Zone type</b>	shelf
<b>Morpho. 1</b>	channel paleobeach dune
<b>Morpho. 2</b>	
<b>Petrography</b>	siliceous sand
<b>Mineralogy</b>	ilmenite magnetite

**COORDINATES**

Latitude	N	17.000
(Decimal °)		0.000
Longitude	E	-73.250
		0.000
Z (in m)		-10 to -13

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>	5 to 30%		
<b>Tonnage</b>			2 Mt ilmenite

**Description:**

1) The Konkan coast, S Bombay, is marked by many arcuated bays, rocky promontories and cliffs of Deccan Plateau basalts.  
 2) Climate: Tropical equatorial forest. Annual average rainfall 2500-3000 mm, maxi. from SW monsoon, June to September. In January, NE monsoon.  
 3) Hydro: Tide (1-2 m). SW monsoon coincides with maxi. sea turbulence. Main wave direction is from SW, W-SW, W, W-NW, with periods 5-14 s. For SW waves, sediment transport is mostly NE and for W-SW and W waves, several directions. For W-NW, the transport is towards S.  
 4) Works performed: 2-phase surveys in Kalbadavi, Mirya and Ratnagiri Bays. 1) echosounding (Seafarer), magnetism (spacing 200 m), bottom sampling (spacing about 200 m, Van Veen grab). 2) shallow seismic and sampling by vibrocorers, surface covered 7.4 km<sup>2</sup>, 397 samples collected, 75.1 km echosounding.  
 5) Characteristics of the deposit: depth in the 3 bays 10-13 m. Sediments: sand (8-99%), silts (1-69%). HM 1-91% (ilmenite 1-52%, magnetite, augite, diopside and hornblende). Proximity of Western Ghats suggests that sediments derived from Deccan Traps. During SW monsoon sediment discharge and sea turbulence facilitate transport, sorting and concentration of HM. Distribution of sand, silt and HM (magnetic, non magnetic and ilmenite) shows that HM are concentrated with sand at stream entrances and with silts and silty sands in the centre of bays or offshore. HM concentrations do not appear related to larger sediment input and catchment areas, but to direct entry of stream into the bay (higher) or through a swamp or bar (lower). Non magnetic minerals are associated with ilmenite, and not with magnetite (guide for exploration). Due to the arcuated shape of the Bays, the northern parts are subjected to W-SW and W monsoon waves, favouring sorting and concentrations of HM in the north. Thus, the sandy material is deposited along the shore and the silts rich in HM are deposited in the centre of the bay or in offshore areas. The sediments with over 5% ilmenite cover an area of 15 km<sup>2</sup>. Based on 1 m probable thickness, reserves are 2 Mt; increased to 12 Mt on 96 km<sup>2</sup>, 57% TiO<sub>2</sub> in ilmenite.

**References:**

- 1) Siddiquie H.N. & al., 1979. Offshore ilmenite placers of Ratnagiri, Konkan Coast, Maharashtra, India, Marine Mining, 2 (1-2).
- 2) Gujar A.R. & al., 1985. Marine Mining, 7, 317-350.

Occurrence   
 Deposit   
 Deposit/File

**NAME: BERUWALA**

**Commodities:** Ti Th Rare-Earth      **Type of deposit:** placer paleobeach  
**Country:** Sri Lanka      LK      **District:** Sri Lanka S

**Marine area:** Indian N

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	shelf
<b>Morpho. 1</b>	paleobeach
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	monazite ilmenite zircon garnet

**COORDINATES**

Latitude	N	6.500
(Decimal °)		0.000
Longitude	E	-80.000
		0.000
Z (in m)		0

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 2/17/95

**Company:** National aquatic resources agency (NARA)

	Ore	Heavy minerals	Commodities
<b>Grades</b>			0.3 to 2.8 %
<b>Tonnage</b>			

**Description:**

1) South-western Sri Lanka, offshore in front of Beruwala.  
 2) Climate: Tropical rain forest. Mean annual precipitation 2200 mm, two maxi. periods: May and October. Winds: NE Monsoon (Jan.) SW Monsoon (Jul.).  
 3) Hydro: North equatorial current from E (Nov.-Mar). Monsoon current from W to E and NE (May-Sept.).  
 4) Works performed: 1985: 41 samples (Van Veen grab). 1989: Research realised with the help of UNDP (360,000 US\$).  
 5) Characteristics of the deposit: The heavy minerals content in the sediments range from 4 to 13% and monazite from 0.3 to 2.8%. The bottom sediments are predominantly fine to very fine sand and coarse silt that are poorly sorted and negatively skewed. The poor sediment exhibits a bimodal distribution probably due to the presence of fine organic debris. The sediments of the offshore areas have H.M compositions similar to those found in beach deposits and the heavy assemblages are representative of the metamorphic and intrusive rocks of the adjacent hinterland. High concentrations of monazite are associated with sandy silts. The fine grain size and rounded shape of monazite from offshore sediments indicate a distant source for monazite compared to the predominantly localised source of monazite for beach placers. Placer deposits onshore have been worked for many years in that area. HM occur on present day beaches bordering barrier bars, near the mouth of rivers, in isolated bays and in raised beaches. Deposits of monazite also occur beneath inter-barrier swamps that lie close to the coastline. The monazite rich concentrates of HM occur in irregular bands either on the surface or under a layer of light-coloured barren sand. The deposit at Beruwala is formed over a 1 km stretch of the beach; The deposit at Kaikawala is 1 km long, 10 m wide. These deposits average 4-20% of monazite. Works performed offshore, with the help of UNDP in 1989 have delineated sub-economic deposits with a commercial value of 300 M US\$.

**References:**

1) Shanti Wickremeratne W., 1985. Preliminary studies on the offshore occurrences of monazite-bearing heavy mineral placers south-western Sri Lanka, Marine Geology 72 (1986) 1-9. 2) Anonymous, 1989. Mining Journal, 312 (8003), 44, 1989.

Occurrence   
 Deposit   
 Deposit/File

**NAME: PAYA KUNDUR**

**Commodities:** Sn Ti      **Type of deposit:** placer paleovalley

**Country:** Indonesia      ID      **District:** Kundur Island W

**Marine area:** Indonesia, Malacca strait

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**COORDINATES**

Latitude	N	0.850
(Decimal °)		0.000
Longitude	E	-103.360
		0.000
Z (in m)		-17

**TYOPOLOGY**

<b>Zone type</b>	shelf
<b>Morpho. 1</b>	paleovalley
<b>Morpho. 2</b>	
<b>Petrography</b>	coarse siliceous sand
<b>Mineralogy</b>	cassiterite, ilmenite

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:** P.T. Timah

	Ore	Heavy minerals	Commodities
<b>Grades</b>	250kg/1000m3		
<b>Tonnage</b>	130 M m3		

**Description:**

1) The deposit is localised on the west part of Kundur Island, 7 km offshore.  
 2) Climate: Tropical, humid, equatorial forest type. Annual average precipitation 2830 mm; maxi. May to October. Winds direction: East (April to October), West from November to March. Temperature 23-30° C.  
 3) Hydro: The sea is calm from November to April then rough from May to October. The tides are slight, semidiurnal, average 2.9 m. The current direction and velocity are linked to the predominant winds. Swell is variable, Nov.-Apr., magnitude 6 m: frequency 10%; magnitude 1 m, frequency 90%.  
 5) Characteristics of the deposit: The cassiterite is found in deep hollows at the bottom of the alluvial valley. The mineralization mixed with coarse sands and quartz fragments forms the lower part of a sedimentary bed which lies on the basement (Kaksa type). The "Mincan" type, where the mineralization is disseminated or forms lenses in the middle of a sedimentary unit, is rare, although mineralization found in the last 4 m of the sedimentary unit could be of that type. Cassiterite (+48 to +100 mesh) represents 50 to 74% of the concentrates. Geometry: length 6,500 m, width 250 m, thickness 16.5 m. The primary deposits were formed during the hydrothermal pneumatolithic phase associated with the set up of plutonic rocks. The mineralization is disseminated, segregated or in veins inside the granite and the adjacent metamorphosed sedimentary rocks. Then, deep alteration of the granite by humid tropical climate (more than 250 m observed in Penali), transport by the different hydraulic systems and concentration by the mechanical action of marine and fluvial waters, allow the formation of placers.

**References:**

Sujitno S. & Simatupang, 1981. Review of discoveries of new tin deposits in Indonesia, S. World conference on Tin, Kuala Lumpur 19-23 Oct. 1981.

Occurrence   
 Deposit   
 Deposit/File

**NAME: KOBIL VALLEY**

**Commodities:** Sn **Type of deposit:** placer paleovalley  
**Country:** Indonesia **ID** **District:** Kundur Island W

**Marine area:** Indonesia, Malacca strait

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**TYOLOGY**

<b>Zone type</b>	inner shelf
<b>Morpho. 1</b>	paleovalley
<b>Morpho. 2</b>	
<b>Petrography</b>	coarse siliceous sand
<b>Mineralogy</b>	cassiterite

**COORDINATES**

Latitude	N	0.840
(Decimal °)		0.000
Longitude	E	-103.360
		0.000
Z (in m)		-10

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 3/2/95

**Company:** P.T. Timah

	Ore	Heavy minerals	Commodities
<b>Grades</b>	200 kg/1000 m3		
<b>Tonnage</b>	30 M m3		

**Description:**

1) The deposit is localised on the west part of Kundur Island, 7 km offshore.  
 2) Climate: Tropical, humid, equatorial forest type. Annual average precipitation 2830 mm, maxi. May to October. Winds direction: East (April to October), West from November to March. Temperature 23-30° C.  
 3) Hydro: The sea is calm from November to April then rough from May to October. The tides are slight, semidiurnal, average 2.9 m. The current direction and velocity are linked to the predominant winds. Swell is variable, Nov.-April, magnitude 6 m: frequency 10%, magnitude 1 m: frequency 90%.  
 4) Works performed: drilling.  
 5) Characteristics of the deposit: The cassiterite is found in deep hollows at the bottom of the alluvial valley. The mineralization mixed with coarse sands and quartz fragments form the lower part of a sedimentary bed which lies on the basement (Kaksa type). Some pebble of cassiterite are also found. The "Mincan" type, where the mineralization is disseminated or forms lenses in the middle of a sedimentary unit, is not very well expressed here, although mineralization found in the last 4 m of the sedimentary unit could be of that type. Cassiterite (+48 to +100 mesh) represents 50 to 74% of the concentrates. Geometry: length 2 500 m, width 150m, thickness 8 m. The primary deposits formed during the hydrothermal pneumatolitic phase associated with the set up of plutonic rocks. The mineralization is disseminated, segregated or in veins inside the granite and the adjacent metamorphosed sedimentary rocks. Then, deep alteration of the granite by humid tropical climate (more than 250 m observed in Penali), transport by the different hydraulic systems and concentration by the mechanical action of marine and fluvial waters, allow the formation of placers.

**References:**

Sujitno S. & Simatupang, 1981. Review of discoveries of new tin deposits in Indonesia, S. World conference on Tin, Kuala Lumpur 19-23 Oct. 1981.

Occurrence   
 Deposit   
 Deposit/File

**NAME: KARIMUN EAST A1**

<b>Commodities:</b> Sn	<b>Type of deposit:</b> placer paleovalley	
<b>Country:</b> Indonesia	ID	<b>District:</b> Karimun E

**Marine area:** Indonesia, Malacca strait

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	shelf
<b>Morpho. 1</b>	paleovalley
<b>Morpho. 2</b>	
<b>Petrography</b>	coarse siliceous sand
<b>Mineralogy</b>	cassiterite

**COORDINATES**

Latitude	N	1.090
(Decimal °)		0.000
Longitude	E	-103.400
		0.000
Z (in m)		-30

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:** P.T. Timah

	Ore	Heavy minerals	Commodities
<b>Grades</b>	151 kg/1000 m3		
<b>Tonnage</b>	1.5 M m3		224 t Sn

**Description:**

1) The occurrence is localised 7.5 km offshore from the east coast of Karimun Island.  
 2) Climate: Tropical, humid, equatorial forest. Rain fall 2400 mm/y. T= 19-39°, humid season (May-Oct.), hot season (Mar- Apr.), cold season (Nov.-Feb.). Winds from E (Nov.-Apr.) and from W (May-Oct.).  
 3) Hydro: The sea is calm from November to April then rough from May to October. The tides are slight, semidiurnal, average 2.9 m. The current direction and velocity are linked to the predominant winds. Swell is variable, Nov.-April, magnitude 6 m: frequency 10%, magnitude 1 m: frequency 90%.  
 4) Works performed: geophysical survey (acoustic profiling survey), drilling.  
 5) Characteristics of the deposit: The bedrock consists of 1) extension of the tin-bearing granite found on land and 2) sedimentary formations older than Pleistocene. This bedrock is covered by two Pleistocene to Recent unconsolidated sediments series: 1) alluvium worked by sea current and filling depression or valley; 2) stratified marine sediment formed in calm water. Two sedimentary cycles due to Pleistocene eustatic sea level variations are detectable in large valleys such as that found at 60 m depth in NE Karimun Island: young marine, young alluvial, old marine, old alluvial. The cassiterite occurs in deep hollows at the bottom of the valley, mixed with coarse sands and quartz fragments at the lower part of a bed lying on the basement (Kaksa type). The "Mincan" type, where the mineralisation is disseminated or forms lenses in the middle of a sedimentary unit, is rare, although mineralisation found in the last 4 m of the sedimentary unit could be of that type. Tin is evenly distributed over the valley's basin and was not encountered outside. It is regularly deposited from a point in the valley approximately 1 km off the coast, whereas, closer to the shore, tin was present but unevenly distributed at poorer grade. Geometry of the deposit: surface: 68,750 m2, thickness 21-54 m. Tonnage: 224 t Sn. The primary deposits were formed during the hydrothermal pneumatolitic phase associated with the plutonic rocks. The mineralisation is disseminated, segregated or in veins inside the granite and the adjacent metamorphosed sedimentary rocks. Deep alteration of the granite (> 250 m in Penali), transport by the different hydraulic systems and concentration by the mechanical action of marine and fluvial waters allow the formation of placers.

**References:**

Sujitno S. & Simatupang, 1981. Review of discoveries of new tin deposits in Indonesia, S. World conference on Tin, Kuala Lumpur 19-23 Oct. 1981.

Occurrence   
 Deposit   
 Deposit/File

**NAME: KARIMUN EAST A2**

**Commodities:** Sn      **Type of deposit:** placer paleovalley  
**Country:** Indonesia      ID      **District:** Karimun E

**Marine area:** Indonesia, Malacca strait

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOPOLOGY**

<b>Zone type</b>	shelf
<b>Morpho. 1</b>	paleovalley
<b>Morpho. 2</b>	kaksa
<b>Petrography</b>	coarse siliceous sand
<b>Mineralogy</b>	cassiterite

**COORDINATES**

Latitude	N	1.090
(Decimal °)		0.000
Longitude	E	-103.400
		0.000
Z (in m)		-30

**STAGE**

**MINING RIGHTS**

Exploration:       Free:   
 Mining:       Under control:   
 Processing:       Unknown:

Up-dated on: 3/2/95

**Company:** P.T. Timah

	Ore	Heavy minerals	Commodities
<b>Grades</b>	144 kg/1000 m3		
<b>Tonnage</b>	1.5 M m3		216 t Sn

**Description:**

1) The occurrence is localised 10 km offshore from the east coast of Karimun Island.  
 2) Climate: Tropical humid, equatorial forest type. Annual average precipitation 2400 mm. T= 19-39°, humid season (May-Oct.), hot season (Mar- Apr.), cold season (Nov.-Feb.). Winds E (Nov.-Apr.) and W (May- Oct.).  
 3) Hydro: The sea is calm from November to April then rough from May to October. The tides are slight, semidiurnal, average 2.9 m. The current direction and velocity are linked to the predominant winds. Swell is variable, Nov.-April, magnitude 6m: frequency 10%, magnitude 1m: frequency 90%.  
 5) Characteristics of the deposit: The bedrock consists of 1) extension of the tin-bearing granite found on land and 2) sedimentary formations older than Pleistocene. It is covered by two Pleistocene to Recent unconsolidated sediments: 1) alluvium sedimented by sea current, filling up depression; 2) stratified marine sediment formed under calm water conditions. Due to Pleistocene eustatic sea level variations, two sedimentary cycles took place: young marine, young alluvial, old marine, old alluvial. This is clearly detectable in large valleys as that found at 60 m depth in NE of Karimun Island. The cassiterite occurs in deep hollows at the bottom of the valley mixed with coarse sands and quartz fragments at the lower part of a bed lying on the basement (Kaksa type). The "Mincan" type, where the mineralisation is disseminated or forms lenses in the middle of a sedimentary unit, is rare, although mineralisation found in the last 4 m could be of that type. Tin is evenly distributed over the valley's basin and was not encountered outside. It was regularly deposited from a point in the valley approximately 1 km off the coast, whereas, closer to the shore, tin is present but unevenly distributed at a much lower average grade. The primary mineralisation was formed during the hydrothermal pneumatolitic phase associated with plutonic rocks and is disseminated, segregated or in veins inside the granite and the adjacent metamorphosed sedimentary rocks. Then, deep weathering by humid tropical climate (>250 m observed in Penali), transport by the different hydraulic systems and concentration by the mechanical action of marine and fluvial waters allow the formation of placers. Geometry of the deposit: surface 505,000 m<sup>2</sup>, sediment thickness 29.7 m, tonnage: 216 t Sn.

**References:**

Sujitno S. & Simatupang, 1981. Review of discoveries of new tin deposits in Indonesia, S. World conference on Tin, Kuala Lumpur 19-23 Oct. 1981.



Occurrence   
 Deposit   
 Deposit/File

**NAME: KARIMUN EAST A3**

**Commodities:** Sn **Type of deposit:** placer paleovalley  
**Country:** Indonesia **ID** **District:** Karimun E

**Marine area:** Indonesia, Malacca strait

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYPOLGY**

<b>Zone type</b>	shelf
<b>Morpho. 1</b>	paleovalley
<b>Morpho. 2</b>	kaksa
<b>Petrography</b>	coarse siliceous sand
<b>Mineralogy</b>	cassiterite

**COORDINATES**

Latitude	N	1.090
(Decimal °)		0.000
Longitude	E	-103.400
		0.000
Z (in m)		-30

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:** P.T. Timah

	Ore	Heavy minerals	Commodities
<b>Grades</b>	115 kg/1000 m3		
<b>Tonnage</b>	3.37 M m3		387 t Sn

**Description:**

1) Distance from the coast 10 km.  
 2) Climate: Tropical, humid, equatorial forest type. Annual average precipitation 2830 mm. Maxi. May to October. Winds direction: East (March to Sept.), West (Sept. to March). Temperature 23-30° C.  
 3) Hydro: The sea is calm from September to April then rough from April to September. The tides are slight, semidiurnal, average 2.9 m. The direction and velocity of the sea currents are linked to the predominant winds but also to the double tide. Swell is variable.  
 4) Works performed: geophysical survey (acoustic profiling survey), drilling.  
 5) Characteristics of the deposit: The bedrock consists of 1) extension of the tin-bearing granite found on land and 2) sedimentary formations older than Pleistocene. It is covered by two Pleistocene to Recent unconsolidated sediments: 1) alluvium sedimented by sea current, filling up depression; 2) stratified marine sediment formed under calm water conditions. Due to Pleistocene eustatic sea level variations, two sedimentary cycles took place: young marine, young alluvial, old marine, old alluvial clearly detectable in large valleys as that found at 60m depth in NE Karimun Island. The cassiterite is found in deep hollows at the bottom of the valley mixed with coarse sands and quartz fragments at the lower part of a bed lying on the basement (Kaksa type). The "Mincan" type, where mineralisation is disseminated or forms lenses in the middle of a sedimentary unit, is rare, although mineralisation found in the last 4 m of the sedimentary unit could be of that type. Tin is evenly distributed over the valley's basin and was not encountered outside. Tin was regularly deposited from a point in the valley approximately 1 km off the coast, whereas, closer to the shore, tin is present but unevenly distributed at a much lower average grade. The primary mineralisation was formed during the hydrothermal pneumatolitic phase associated with the plutonic rocks and is disseminated, segregated or in veins inside the granite and the adjacent metamorphosed sedimentary rocks. Then, deep weathering by humid tropical climate (>250 m observed in Penali), transport by the different hydraulic systems and concentration by the mechanical action of marine and fluvial waters allow the formation of placers. Geometry of the deposit: surface: 130,250 m2, thickness 25-87 m, tonnage: 387.5 t Sn.

**References:**

Sujitno S. & Simatupang, 1981. Review of discoveries of new tin deposits in Indonesia, S. World conference on Tin, Kuala Lumpur 19-23 Oct. 1981.

Occurrence   
 Deposit   
 Deposit/File

**NAME: TEMPILANG**

**Commodities:** Sn **Type of deposit:** placer colluvial  
**Country:** Indonesia **ID** **District:** Bangka

**Marine area:** Indonesia, Java sea

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	on land
<b>Morpho. 1</b>	colluvial
<b>Morpho. 2</b>	periplutonic greisen
<b>Petrography</b>	granitic arena
<b>Mineralogy</b>	cassiterite biotite

**COORDINATES**

Latitude	S	-2.100
(Decimal °)		0.000
Longitude	E	-105.540
		0.000
Z (in m)		50

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:** P.T. Timah

	Ore	Heavy minerals	Commodities
<b>Grades</b>	350 kg/1000 m3		
<b>Tonnage</b>	17 M m3		

**Description:**

1) Tempilang is located in North West Bangka Island, part of the Mentok district, Bangka strait.  
 2) Climate: Tropical, humid, equatorial forest type. Annual average precipitation 2830 mm. Maxi. May to October. Winds direction: SE (March to Sept.), SW (Sept. to March). Wind velocity during this monsoon varies from low (1-6 knots), medium (7-16 knots) to high (17-21 knots). Temperature 23-30° C.  
 3) Hydro: calm sea from September to April then rough from April to September. Tides slight, diurnal, average 1.8 m. Current direction and velocity (0.8 knots maxi) linked to predominant winds and tide. Variable swell.  
 4) Works performed: Geology, geophysical survey and drillings.  
 5) Characteristics of the deposit: The Tempilang onshore area is a nearly flat plain with small hills averaging 50 m high (maxi. 174 m Pandan Hill) covered by bushy growth. The potential area presents 25% marshland and 20% covered by digging remains. Geology: 1) Recent alluvial. 2) Quaternary deposits (conglomerate: gravel, pebble, sand and clay, minerals). 3) Metasediments (quartz sandstone with intercalation of clay) contain a considerable amount of ilmenite and goethite. 3) Biotite granite. The mineralisation is likely the result of pneumatolytic hydrothermal process. At Tempilang, primary cassiterite is found in the granite at the contact zone and in the metasediment, which have undergone strong weathering (50-80 m). The ore body consists of tin-bearing weathered rock on the granite as well as the metasediment. In the weathered granite and greisen, the cassiterite is found disseminated, but more often in the form of pockets (lenses 10-50 cm). Associated minerals: topaz, tourmaline, monazite. In the metasediments, the mineralisation fills fissures or fractures with a N110°E-N120°E trend. Mineralised metasediments are marked by abundant mica and weathered tourmaline which give a violet to reddish colour. Geometry: 2500x1750 m (recognised by drilling); grain size of cassiterite: +10-20 mesh (15%), +20-60 mesh ( 81%), +60-100 mesh (3%). Remark: there is a large marine reserve in the offshore area of Tempilang with high Sn grade. This offshore deposit is undoubtedly the result of erosion and transportation of mineralisation from the Tempilang granite.

**References:**

Sujitno S. & Simatupang, 1981. Review of discoveries of new tin deposits in Indonesia, S. World conference on Tin, Kuala Lumpur 19-23 Oct. 1981.

Occurrence   
 Deposit   
 Deposit/File

**NAME: TOBOALI**

**Commodities:** Sn **Type of deposit:** placer paleovalley  
**Country:** Indonesia **ID** **District:** Bangka S

**Marine area:** Indonesia, Java sea

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYPOLGY**

<b>Zone type</b>	inner shelf
<b>Morpho. 1</b>	paleovalley
<b>Morpho. 2</b>	kaksa
<b>Petrography</b>	siliceous sand
<b>Mineralogy</b>	cassiterite

**COORDINATES**

Latitude	S	-3.040
(Decimal °)		0.000
Longitude	E	-106.450
		0.000
Z (in m)		-10

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:** P.T. Timah

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

- Distance from the shore 0.2 km.
- Climate: Tropical, humid, equatorial forest type. Annual average precipitation 2830 mm. Maxi. May to October. Wind direction: SE (March to Sept.), SW (Sept. to March). Wind velocity during this monsoon varies from low (1-6 knots), medium (7-16 knots) to high (17-21 knots). Temperature 23-30° C.
- Hydro: The sea is calm from September to April then rough from April to September. The tides are slight, diurnal, average 1.8 m. The direction and velocity of the sea currents are linked to the predominant winds but also to the tide, in general low (0,8 knots maxi). Swell is variable.
- Works performed: Geology, geophysical survey (acoustic: 570 km in 1978-79 then in 1980 220 km over 40 km2). Drillings: in 1978 (16 holes, 447 m), in 1979 (587 holes, 5647m).
- Characteristics of the deposit: The extension of the mineralisation could be followed over 2 km but beyond that distance the deposit is divided into small pockets which are perhaps the remains of the interior parts of the valley. The other parts may have most probably been reworked during the transition from a terrestrial to a marine environment.

**References:**

Sujitno S., 1984. Exploration for offshore tin placer in Indonesia, 2nd int. seminar on the offshore mineral resources (Brest), Ed. GERMINAL.

Occurrence   
 Deposit   
 Deposit/File

**NAME: KEBIANG LAUT / PENGA**

**Commodities:** Sn **Type of deposit:** placer paleobeach  
**Country:** Indonesia **ID** **District:** Bangka NW

**Marine area:** Indonesia, Java sea

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	inner shelf
<b>Morpho. 1</b>	paleobeach
<b>Morpho. 2</b>	
<b>Petrography</b>	siliceous sand
<b>Mineralogy</b>	cassiterite

**COORDINATES**

Latitude	S	-1.540
(Decimal °)		0.000
Longitude	E	-105.500
		0.000
Z (in m)		-10

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:** P.T. Timah

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

1) NW Bangka.  
 2) Climate: Tropical humid, equatorial forest type. Annual average precipitation 2830 mm. Maxi. May to October. Wind direction: SE (March to Sept.), SW (Sept. to March). Wind velocity during this monsoon varies from low (1-6 knots), medium (7-16 knots) to high (17-21 knots). Temperature 23-30° C.  
 3) Hydro: The sea is calm from September to April then rough from April to September. The tides are slight, diurnal, average 1.8 m. The direction and velocity of the sea currents are linked to the predominant winds but also to the tide, in general low (0.8 knots maxi). Swell is variable.  
 4) Works performed: Geology, geophysical survey (acoustic, profiles and traverses (200 m), 141 km in 1978); then in 1979 drilling of 560 holes 2151 m.  
 5) Characteristics of the deposit: The old and recent alluvial formations lie over the granite. In Penganak Laut where the deposit is relatively thin (3 to 5 cm ) the tin mineralisation is redistributed either in the direction of the sea current or in the direction of wave action.

**References:**

Sujitno S., 1984. Exploration for offshore tin placer in Indonesia, 2nd int. seminar on the offshore mineral resources (Brest), Ed. GERMINAL.

Occurrence   
 Deposit   
 Deposit/File

**NAME: SINGKEP**

**Commodities:** Sn **Type of deposit:** placer paleovalley  
**Country:** Indonesia **ID** **District:** Singkep Island

**Marine area:** Indonesia, Malacca strait

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**TYPOLGY**

<b>Zone type</b>	shelf
<b>Morpho. 1</b>	paleovalley
<b>Morpho. 2</b>	kaksa
<b>Petrography</b>	coarse siliceous sand
<b>Mineralogy</b>	cassiterite

**COORDINATES**

Latitude	S	-0.400
(Decimal °)		0.000
Longitude	E	-104.310
		0.000
Z (in m)		0

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 3/2/95

**Company:** P.T. Timah

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

1) Several occurrences at 5 km and 10 km off the coast in the NW Singkep Island and close to the E shoreline.  
 2) Climate: Tropical humid, equatorial forest type. Annual average precipitation 2830 mm. Maxi. May to October. Wind direction: SE (March to Sept.), SW (Sept. to March. Wind velocity during this monsoon varies from low (1-6 knots), medium (7-16 knots) to high (17-21 knots). Temperature 23-30° C.  
 3) Hydro: The sea is calm from September to April then rough from April to September. The tides are slight, diurnal, average 1.8 m. The direction and velocity of the sea currents are linked to the predominant winds but also to the tide, in general low (0.8 knots maxi.). Swell is variable.  
 4) Works performed: Acoustic profiles in 1956-58 then in 1970-72. Drilling in 1980 6 holes, 117 m.  
 5) Characteristics of the deposit: The tin mineralisation seems to be related specifically to the biotite granites. Cassiterite occurs in small stockworks along the margins of the granite bodies or in veins which penetrated into the older sedimentary series along faults and bedding planes. On the island of Singkep the granite is intrusive in a series of micaschists, which are probably older than the sedimentary bedrock of the islands of Bangka and Billiton. The schistosity of the mica-schists is sub-parallel to the east and west coast of the island. During the Tertiary these bedrock formations were denuded to such an extent that the intrusive igneous bodies became exposed. During the Pleistocene glaciations, the very pronounced sea level changes allowed a chemical weathering process of the rocks and caused the rivers to incise channels and fill them again in several cycles. As a result of the combined chemical and mechanical processes of erosion, eluvials are formed on the watersheds and on the valley terraces. The cassiterite is concentrated by a process of selective removal of minerals of low specific weight.

**References:**

Sujitno S., 1984. Exploration for offshore tin placer in Indonesia, 2nd int. seminar on the offshore mineral resources (Brest), Ed. GERMINAL.

Occurrence   
 Deposit   
 Deposit/File

**NAME: RAYONG**

**Commodities:** Sn **Type of deposit:** placer beach  
**Country:** Thailand **TH** **District:** Thailand E

**Marine area:** Indonesia, Thailand gulf

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**TYOLOGY**

<b>Zone type</b>	beach foreshore
<b>Morpho. 1</b>	beach
<b>Morpho. 2</b>	
<b>Petrography</b>	siliceous sand
<b>Mineralogy</b>	cassiterite

**COORDINATES**

Latitude	N	12.680
(Decimal °)		0.000
Longitude	E	-101.310
		0.000
Z (in m)		0 to -10

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

1) This area is located 200 km east of Bangkok.  
 2) Climate: Tropical. Savannah. Mean annual precipitation 1300 mm (maxi. during Sept.-Oct.). Prevailing surface winds from NE (monsoon) in January and SW (monsoon) in July.  
 3) Hydro: From November to March, the NE trade winds cause the westward-flowing North Equatorial Current, with a complementary eastward Equatorial counter current. From May to September, when the winds blow Southwest, the north flow is reversed, and the North Equatorial Current then flows eastwards.  
 4) Works performed: Geophysical survey and drilling in 1983.  
 5) Characteristics of the deposit: Cassiterite occurs as small disseminated grains in beach sand and as coarse angular fragments under a tidal zone in a region characterised by granitic batholiths and stocks occurring on land and in the sea. In some areas, tin bearing beach sands contain up to 10% ore by weight; tin and heavy minerals occur in alternating bands with sand which may reach 2 feet in thickness. Associated with tin are some other heavy minerals: zircon, monazite, rutile, ilmenite and tourmaline. To verify the possible existence of tin bearing, offshore geophysical and drilling surveys were carried out in 1983. 3 areas were investigated (8-110 km<sup>2</sup>). The results were disappointing, but on the 1E area a strong magnetic anomaly remains to be checked. The possibility to discover gemstones is strong.

**References:**

Anonymous. 1989. CR 26eme session CCOP/AO, 96-97.

Occurrence   
 Deposit   
 Deposit/File

NAME: **AREA C**

**Commodities:** Sn **Type of deposit:** placer paleovalley  
**Country:** Thailand **TH** **District:** Thailand W coast

**Marine area:** Indonesia, Andaman sea

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	inner shelf
<b>Morpho. 1</b>	paleochannel
<b>Morpho. 2</b>	
<b>Petrography</b>	fine sand & sandy clay
<b>Mineralogy</b>	cassiterite

**COORDINATES**

Latitude	N	8.500
(Decimal °)	N	8.100
Longitude	E	-98.100
	E	-98.150
Z (in m)		-30 to -45

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:** Department of mineral resources UNDP

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

- Distance from shore 5-10 km, surface 121 km<sup>2</sup>.
- Climate: this area has a humid tropical climate (equatorial forest type); precipitation 2400 mm/year with a maximum from September to January. NE wind direction from November to April then SW direction.
- Hydro: The sea is calm from November to April then rough from May to October. The tides are slight, average 2.5 m. The current direction and velocity are linked to the predominant winds. Swell is variable from 1 to 6 m.
- Works performed: seismic, sonar, magnetometry along profiles and traverses 1 km apart. Drilling: 232; total length in sediment: 1555 m; average penetration: 6.7 m maxi: 15.7 m; nbr of holes >10 m = 10; range of water depth: 16.5 to 45.6 m; average recovery 69.6%. PNUD offshore project research realised in 1980-1983 over areas where the water depth was between 30-45 m.
- Characteristics of the deposit: The sedimentology defines two separated units, over granitic and metamorphic basement rocks. The upper unit is formed by muddy sand and clean sand, with abundant shell and coral fragments. Glauconite, barite, indicate a marine origin. The lower unit with sandy clay and clayey sand in its upper position. The proportion of clay and rock fragments often increases downwards; thickness is variable. This lower unit seems to have a continental origin. On the C area, fine and well sorted sand overlying bedrock may have aeolian origin. Sampling shows some tin values but not of economic interest.

**References:**

Anonymous, 1987. Offshore exploration for tin and heavy minerals in the Andaman sea, West coast of Thailand, Report UN/DTC THA 78/008 NY.

Occurrence   
 Deposit   
 Deposit/File

**NAME: KAMMALA BAY**

**Commodities:** Sn **Type of deposit:** placer paleochannel  
**Country:** Thailand **TH** **District:** Phuket

**Marine area:** Indonesia, Andaman sea

**ADMINISTRATION**

**TYOLOGY**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

<b>Zone type</b>	inner shelf
<b>Morpho. 1</b>	paleochannel
<b>Morpho. 2</b>	
<b>Petrography</b>	coarse siliceous sand
<b>Mineralogy</b>	cassiterite

**COORDINATES**

Latitude	N	8.000
(Decimal °)		0.000
Longitude	E	-98.220
		0.000
Z (in m)		0

**STAGE**

**MINING RIGHTS**

Exploration:  Free:   
 Mining:  Under control:   
 Processing:  Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			0.09 to 0.24 kg/m3

**Description:**

1) West of the island of Phuket. Distance off the coast 750 to 1000 m.  
 2) Climate: humid tropical, equatorial forest type. Precipitation 2400 mm/year with a maximum from September to January. NE wind direction from November to April then SW direction.  
 3) Hydro: The sea is calm from November to April then rough from May to October. The tides are slight, average 2.5 m. The current direction and velocity are linked to the predominant winds. Swell is variable from 1 to 6 m.  
 4) Works performed: Drilling (3).  
 5) Characteristics of the deposit: colluvial deposits which are frequent in Phuket island. The hill slopes are relatively steep, no large rivers and river valleys exist and the weathering mantle of the granitic hills slides down into a number of relatively small and often more or less rounded, kettle-shaped valleys. Selective transport and outwash is restricted and the cassiterite content is largely determined by that of the local weathering mantle. The deposits of the west coast of Phuket island are comparable and are characterised by successive layers of coarse sandy material, the cassiterite being mostly distributed throughout the whole profile and not only concentrated in a bottom gravel.

**References:**

Aleva G.J., 1978. Exploration for placer tin deposits offshore Thailand, 11 CMMC (Hong Kong), 59-65.



Occurrence   
 Deposit   
 Deposit/File

**NAME: THAI MUANG**

**Commodities:** Sn **Type of deposit:** placer paleobeach  
**Country:** Thailand **TH** **District:** Phang Nga

**Marine area:** Indonesia, Andaman sea

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**TYOLOGY**

<b>Zone type</b>	inner shelf
<b>Morpho. 1</b>	paleobeach
<b>Morpho. 2</b>	residual kulit skin
<b>Petrography</b>	coarse argilosiliceous sand
<b>Mineralogy</b>	cassiterite

**COORDINATES**

Latitude	N	8.450
(Decimal °)		0.000
Longitude	E	-98.180
		0.000
Z (in m)		-10

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 3/2/95

**Company:** Offshore Mining Organisation (OMO)

	Ore	Heavy minerals	Commodities
<b>Grades</b>	0.446 kg/m3		
<b>Tonnage</b>			

**Description:**

1) West coast of Thailand, North of Phuket. Distance from the shore 900 m. The deposit is parallel to the shoreline.  
 2) Climate: Tropical, humid, equatorial forest type. Annual average precipitation 2400 mm with maxi Sept.-Jan.. Winds from NE (Jan.) and from SW (July).  
 3) Hydro: The sea is calm from November to April then rough from May to October. The tides are slight, semidiurnal, average 2.9 m. The current direction and velocity are linked to the predominant winds. Swell is variable, Nov.-April, magnitude 6 m: frequency 10%, magnitude 1 m: frequency 90%.  
 5) Characteristics of the deposit: The cassiterite is associated with an argilaceous coarse sand (Holocene - Pleistocene) lying over a granitic complex. The sedimentary formation is overlaid by a quite plastic argilaceous level, itself overlaid by marine fine sediments. The geomorphology of the sea bed is remarkably flat, without any major valley. The west declivity is 1/1000. The central area of the deposit has very rich mineralised pockets with cassiterite grain size diameter >10mm. The grain size of the mineralization decreases towards the deposit limits. More than 25% of the concentrates have a grain size over 1.7 mm. The percentage of the useful minerals is 0.446 kg/m3= 0.564 katies/cy. Geometry: length 10 km, width 2 km, thickness 2 cm to 2 m. This area would have undergone intensive erosion following a tectonic activity and the collapse of areas along the coast. The erosion would have permitted the partial or complete destruction of the primary deposit. The fluctuation of the sea during glaciation times (alternation between continental alteration/erosion and dynamics of the water) would have allowed the cassiterite liberation and its accumulation. The mineralization arrangement as narrow belts parallel to the coast line gives importance to the swell and marine current actions.

**References:**

Aleva G.J., 1978. Exploration for placer tin deposits offshore Thailand, 11 CMMC (Hong Kong), 59-65.

Occurrence   
 Deposit   
 Deposit/File

**NAME: TONGKAH HARBOUR**

**Commodities:** Sn **Type of deposit:** placer colluvial  
**Country:** Thailand **TH** **District:** Phuket  
**Marine area:** Indonesia, Andaman sea

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	inner shelf
<b>Morpho. 1</b>	colluvial
<b>Morpho. 2</b>	periplutonique
<b>Petrography</b>	coarse siliceous arena
<b>Mineralogy</b>	cassiterite ilmenite zircon

**COORDINATES**

Latitude	N	7.900
(Decimal °)		0.000
Longitude	E	-98.450
		0.000
Z (in m)		-20

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:** Aokhah Thai Co.

	Ore	Heavy minerals	Commodities
<b>Grades</b>	0.4 kg/m3		
<b>Tonnage</b>			

**Description:**

1) West coast of Thailand, SE of the small Phuket island, 4 km offshore from the coast.  
 2) Climate: Tropical, humid, equatorial forest type. Annual average precipitation 2400 mm. T= 19-39°, humid season (May-Oct.), hot season (Mar- Apr.), cold season (Nov.-Feb.). Winds from NE (Nov.-Apr.) and from SW (May-Oct.).  
 3) Hydro: The sea is calm from November to April then rough from May to October. The tides are slight, semidiurnal, average 2.9 m. The current direction and velocity are linked to the predominant winds. Swell is variable, Nov.-April, magnitude 6 m: frequency 10%, magnitude 1 m: frequency 90%.  
 5) Characteristics of the deposit: Host rock is a coarse sand (Holocene-Pleistocene). The sediments overlying the mineralised formation are represented by argillaceous sands and sands. Sometimes, lateritic clays are present between the sand unit and the mineralised level. Granulometry: cassiterite grain size > 100 mesh. Associated at the cassiterite, some heavy minerals, such as ilmenite, monazite, zircon. The gangue is represented by quartz and tourmaline. Geometry: thickness 4-6 m. Onshore the cassiterite showings are associated with pegmatites and quartz veins appearing by the contact between granite and sedimentary formations.

**References:**

Callot F., 1977. Visite à la région de Phuket.

Occurrence   
 Deposit   
 Deposit/File

**NAME: AREA A BLOCK I**

**Commodities:** Sn Ti Zr Rare-Earth      **Type of deposit:** placer paleochannel  
**Country:** Thailand      TH      **District:** Phang Nga

**Marine area:** Indonesia, Andaman sea

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**TYPOLGY**

<b>Zone type</b>	inner shelf
<b>Morpho. 1</b>	paleochannel
<b>Morpho. 2</b>	
<b>Petrography</b>	fine to coarse siliceous sand
<b>Mineralogy</b>	cassiterite ilmenite zircon monazite

**COORDINATES**

Latitude	N	8.850
(Decimal °)	N	9.410
Longitude	E	-98.000
	E	-98.250
Z (in m)		-30 to -40

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 3/2/95

**Company:** D.M.R. Bangkok

	Ore	Heavy minerals	Commodities
<b>Grades</b>	109 g/m3 SnO2		
<b>Tonnage</b>		225 637 t	90 343 t SnO2

**Description:**

- 1) Shore distance: 20 km
- 2) Climate: Humid tropical (equatorial forest type), precipitation 2400 mm/year with a maximum from Sep. to Jan. NE wind direction from Nov. to April then SW direction.
- 3) Hydro: Sea is calm from Nov. to April then rough from May to Oct. The tides are slight, average 2.5 m. The current direction and velocity are linked to the predominant winds. Swell is variable from 1 to 6 m.
- 4) Works performed: include geophysical survey (seismic and bathymetric methods) and drilling survey (2500 m).
- 5) Characteristics of the deposit: The mineralised areas are localised along a prevalent NE-SW tectonic direction (Ranon fault system) associated with paleochannels or paleoripples. The sedimentology defines two separate beds with relatively mellow soil over granitic and metamorphic basement rocks. The lower bed with sandy clay and clayey sand in the upper part seems to have a continental origin; the upper bed with abundant shell and coral fragments have a marine origin. Mineralization is present in the lower and upper beds associated with coarse and fine sand.

**References:**

Anonymous, 1987. Offshore exploration for tin and heavy minerals in the Andaman sea, West coast of Thailand. Report UN/DTC THA 78/008 NY.

Occurrence   
 Deposit   
 Deposit/File

**NAME: RANON**

**Commodities:** Sn **Type of deposit:** placer paleobeach  
**Country:** Thailand **TH** **District:** Ranon province

**Marine area:** Indonesia, Andaman sea

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	inner shelf
<b>Morpho. 1</b>	paleobeach
<b>Morpho. 2</b>	
<b>Petrography</b>	fine to medium siliceous sand
<b>Mineralogy</b>	cassiterite

**COORDINATES**

Latitude	N	9.700
(Decimal °)		0.000
Longitude	E	-98.500
		0.000
Z (in m)		-10

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:** Leighton Mining N.L.

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>		10%	

**Description:**

1) The area is located 620 km south of Bangkok. Ranong mining district.  
 2) Climate: humid, tropical, equatorial forest type. Precipitation 2400 mm/year with a maximum from September to January. NE wind direction from November to April then SW direction.  
 3) Hydro: The sea is calm from November to April then rough from May to October. The tides are slight, average 2.5 m. The current direction and velocity are linked to the predominant winds. Swell variable 1 to 6 m.  
 4) Works performed: Drilling.  
 5) Characteristics of the deposit: Primary and secondary cassiterite deposits occur onshore in basins parallel to NS biotite granite ranges for over 40 km. Primary deposits are in pegmatites, quartz veins, tin bearing aplite and disseminated cassiterite in granite. Alluvial placers 2 to 12 m thick occur in a basin parallel to and W of the granite range; high tin values are reported in several places. The coastal plain, 10 km wide, extends offshore by an intertidal zone covered by mangrove forest followed westward by a gradually deepening sea. The area is flat and is an old peneplain or abrasion plain with a few monadnock-like hills. The basement is Devono-carboniferous sedimentary (Phuket group) intruded by a foliated granite. The tin mineralisation is located along the NE mylonitized and strongly altered contact. Near the fault scarp granite blocks, cobbles and pebbles are mined for rich coarse-grained cassiterite. This deposit thins out towards W, with a decrease in grain size. The cassiterite mine nearest to the shore has a pay-streak, a few decimetres thick, composed of fine gravel with very fine-grained cassiterite in low concentrations. Drilling in mangrove-covered estuaries and in offshore extension, shows 10 mm or less of gravels and only a few flakes of cassiterite. This type of deposit is related to the slide in avalanche of the weathered granite, producing a fan-shaped deposit on the low coastal plain. The fan has later been washed out, probably largely by wave action, which transported the finer material downslope towards the ocean. The finer material was deposited west of the original fan.

**References:**

Aleva G. J., 1978. Exploration for placer tin deposits offshore Thailand, 11th CMMC (Hong Kong).

Occurrence   
 Deposit   
 Deposit/File

**NAME: SAMET ISLAND**

**Commodities:** Sn **Type of deposit:** placer paleovalley  
**Country:** Thailand **TH** **District:** Rayong province

**Marine area:** Indonesia, Thailand gulf

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	inner shelf
<b>Morpho. 1</b>	paleochannel
<b>Morpho. 2</b>	
<b>Petrography</b>	
<b>Mineralogy</b>	cassiterite rutile

**COORDINATES**

Latitude	N	12.500
(Decimal °)		0.000
Longitude	E	-101.500
		0.000
Z (in m)		

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

1) Gulf of Thailand.  
 2) Climate: Tropical. Savannah. Mean annual precipitation 1300 mm (maxi. during Sept.-Oct.). Prevailing surface winds from NE (monsoon) in January and SW (monsoon) in July.  
 3) Hydro: From November to March, the NE trade winds cause the westward-flowing North Equatorial Current, with a complementary eastward Equatorial counter current. From May to September, when the winds blow Southwest, the north flow is reversed, and the North Equatorial Current then flows eastwards.  
 4) Works performed: Geophysical survey (magnetometry) realised by DMR and private companies. Drilling (24).  
 5) Characteristics of the deposit: 3 types of bedrock were found, granites (25-60 m); orthoquartzite (40-80 m); limestone (14-60 m). Four units of sediments were recognised, from top to bottom: 1) lateritic clay showing a hard-ground morphology; 2) sandy clay (5-30 thick); 3) coarse sand with coarse granite pebbles (10-35 m thick), continental deposit; 4) marine mud and sandy clay (2-24 m thick). Some tin mineralisation was found associated with others HM (monazite, zircon).

**References:**

Occurrence   
 Deposit   
 Deposit/File

**NAME: TAKUA PA**

**Commodities:** Sn **Type of deposit:** placer paleobeach  
**Country:** Thailand **TH** **District:** Phang Nga

**Marine area:** Indonesia, Andaman sea

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYPOLGY**

<b>Zone type</b>	inner shelf
<b>Morpho. 1</b>	paleobeach
<b>Morpho. 2</b>	
<b>Petrography</b>	fine to medium sand
<b>Mineralogy</b>	cassiterite

**COORDINATES**

Latitude	N	9.000
(Decimal °)		0.000
Longitude	E	-98.270
		0.000
Z (in m)		0 to -18

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:** Southern Kinta Cons. Ltd

	Ore	Heavy minerals	Commodities
<b>Grades</b>	0.7 to 1.2 kg/m3		
<b>Tonnage</b>			

**Description:**

1) West coast of Thailand, North of Thai Muang. Distance to the coast 100 m.  
 2) Climate: Tropical, humid, equatorial forest type. Annual average precipitation 2400 mm. T= 19°-39°, humid season (May-Oct.), hot season (Mar.-Apr.), cold season (Nov.-Feb.). Winds from NE (Nov.-Apr.) and from SW (May-Oct.).  
 3) Hydro: The sea is calm from November to April then rough from May to October. The tides are slight, semidiurnal, average 2.9 m. The current direction and velocity are linked to the predominant winds. Swell is variable, Nov.-April, magnitude 6 m: frequency 10%, magnitude 1 m: frequency 90%.  
 5) Characteristics of the deposit: The mineralised formations (Holocene) are represented by sand and clay lying over the basement (altered shales). The recent detritic formations are not very thick and are composed of quartz, shales, reef fragments. When the alluvium formations are not very thick, the basement appears sheared and holds some tin values along cracks and deep fissures. The source of the mineralization is localised inside the cassiterite rich veins appearing in the upper part of the granitic roof or the contact between shales and granite. The transport is in a practical way, null. The mineralization concentration is due to recovery by the swell and the currents of the light minerals.  
 Geometry: surface 81 km<sup>2</sup>, thickness 0.30-0.60 m, overburden 0-1.5 m. The is parallel to the shoreline. NB: The tin values calculated from suction dredging samples are overestimated, poor sediment recovery.

**References:**

Mc Donald, 1978. Exploration and development of shallow coastal deposit by suction dredging of Takua Pa, Oceanology International 78 (Brighton).

Occurrence   
 Deposit   
 Deposit/File

**NAME: KARIMUN EAST**

**Commodities:** Sn **Type of deposit:** placer paleovalley  
**Country:** Indonesia **ID** **District:** Karimun Island

**Marine area:** Indonesia, Malacca strait

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**TYOLOGY**

<b>Zone type</b>	inner shelf
<b>Morpho. 1</b>	paleochannel
<b>Morpho. 2</b>	kaska
<b>Petrography</b>	coarse sand
<b>Mineralogy</b>	cassiterite

**COORDINATES**

Latitude	N	1.090
(Decimal °)		0.000
Longitude	E	-103.410
		0.000
Z (in m)		-15

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 3/2/95

**Company:** P.T. Timah

	Ore	Heavy minerals	Commodities
<b>Grades</b>	319 kg/1000 m3		
<b>Tonnage</b>	6,5 M m3		

**Description:**

1) Distance from the shore of Karimun island 25 km.  
 2) Climate: Tropical humid, equatorial forest type. Annual average precipitation 2830 mm. Maxi. May to October. Winds direction: East (March to Sept.), West (Sept. to March). Temperature 23-30° C.  
 3) Hydro: The sea is calm from September to April then rough from April to September. The tides are slight, semidiurnal, average 2.9 m. Direction and velocity of the sea currents are linked to the predominant winds but also to the double tide. Swell is variable.  
 4) Works performed: geophysical survey (acoustic profiling survey), drilling.  
 5) Characteristics of the deposit: The bedrock consists of 1) extension of the tin-bearing granite found on land and 2) sedimentary formations older than Pleistocene. It is covered by two Pleistocene to Recent unconsolidated sediments: 1) an alluvial sediment sedimented by sea current, filling up depression; 2) a stratified marine sediment sedimented under calm water conditions. Due to Pleistocene eustatic sea level variations, two sedimentary cycles have taken place: young marine, young alluvial, old marine, old alluvial clearly detectable in large valleys as that found at 60m depth in NE Karimun Island. From close grid drilling in this deep "offshore reserve" the presence of a tin layer in the form of Kaksa, with a uniform distribution approximately 500m wide, shows a tendency of widening seawards. Geometry of the deposit: surface: 197,500 m2, thickness 32 m, volume 6.5 Mm3, grade: 319 kg/1000 m3, grain size +60 to 100 mesh. The primary deposits were formed during the hydrothermal pneumatolitic phase associated with plutonic rocks. The mineralisation is disseminated, segregated or in veins inside the granite and the adjacent metamorphosed sedimentary rocks. Then, deep alteration of the granite by humid tropical climate (>250 m observed in Penali), transportation by the different hydraulic systems and concentration by the mechanical action of marine and fluvial waters allows the formation of placers. The tin in this valley-like depression originates from extended transportation from tin-bearing valleys of east Karimun, or from the north-eastern contact zone at the strait of Karimun Anak.

**References:**

Sujitno S. & Simatupang, 1981. Review of discoveries of new tin deposits in Indonesia, S.World conference on Tin, Kuala Lumpur 19-23 Oct. 1981.

Occurrence   
 Deposit   
 Deposit/File

**NAME: TIMUN VALLEY**

**Commodities:** Sn **Type of deposit:** placer paleovalley  
**Country:** Indonesia **ID** **District:** Kundur Island W

**Marine area:** Indonesia, Malacca strait

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**TYOLOGY**

<b>Zone type</b>	on land
<b>Morpho. 1</b>	paleochannel
<b>Morpho. 2</b>	kaksa
<b>Petrography</b>	coarse sand
<b>Mineralogy</b>	cassiterite

**COORDINATES**

Latitude	N	0.860
(Decimal °)		0.000
Longitude	E	-103.360
		0.000
Z (in m)		0 to 40

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 3/2/95

**Company:** P.T. Timah

	Ore	Heavy minerals	Commodities
<b>Grades</b>	0.23kg/m3		
<b>Tonnage</b>			

**Description:**

1) The deposit is localised on the west part of Kundur Island, 7 km offshore.  
 2) Climate: Tropical humid, type equatorial forest. Annual average precipitation 2830 mm, maxi. May to October. Winds direction: East (Apr. to Oct.), West (Nov. to March). Temperature 23-30° C.  
 3) Hydro: The sea is calm from November to April then rough from May to October. The tides are slight, semidiurnal, average 2.9 m. The current direction and velocity are linked to the predominant winds. Swell is variable, Nov.-April: magnitude 6 m: frequency 10%, magnitude 1 m: 90%.  
 5) Characteristics of the deposit: The cassiterite is found in deep hollows at the bottom of the alluvial valley. The mineralisation mixed with coarse sands and quartz fragments forms the lower part of a sedimentary bed which lies on the basement (Kaksa type). The "Mincan" type, where the mineralization is disseminated or forms lenses in the middle of a sedimentary unit, is not very well expressed here. However, some showing of mineralisation found in the last 4 m of a sedimentary unit could be associated to that type. Cassiterite (+48 to +100 mesh) represents 50 to 74% of the concentrates. Geometry: length 7000 m, width 250 m, thickness 2-15 m. The primary deposits are formed during the hydrothermal pneumatolitic phase which is associated with the set up of plutonic rocks. The mineralization appears disseminated, segregated or in veins inside the granite and the adjacent metamorphosed sedimentary rocks. Then, deep alteration of the granite by humid tropical climate (more than 250 m observed in Penali), transported by the different hydraulic systems and concentration by the mechanic action of marine and fluvial waters allow the formation of placers.

**References:**

Sujitno S. & Simatupang, 1981. Review of discoveries of new tin deposits in Indonesia, S.World conference on Tin, Kuala Lumpur 19-23 Oct. 1981.



Occurrence   
 Deposit   
 Deposit/File

**NAME: COPAT KELABAT BAY**

**Commodities:** Sn **Type of deposit:** placer colluvial paleovalley  
**Country:** Indonesia **ID** **District:** Bangka N  
**Marine area:** Indonesia, Java sea

**ADMINISTRATION**  
 Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	inner shelf
<b>Morpho. 1</b>	paleovalley
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	cassiterite

**COORDINATES**

Latitude	S	-1.600
(Decimal °)		0.000
Longitude	E	-105.680
		0.000
Z (in m)		0 to -1

**STAGE** **MINING RIGHTS** Up-dated on: 3/2/95

Exploration:  Free:   
 Mining:  Under control:   
 Processing:  Unknown:   
**Company:** P.T. Timah

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

1) North of Bangka Island.  
 2)) Climate: Tropical humid, type equatorial forest. Annual average precipitation 2830 mm. Maxi. May to October. Winds direction: SE (March to Sept.), SW (Sep. to March). Wind velocity during the monsoon varies from low (1-6 knots), medium (7-16 knots) to high (17-21 knots). Temperature 23-30° C.  
 3) Hydro: The sea is calm from September to April then rough from April to September. The tides are slight, diurnal, average 1.8 m. The direction and velocity of the sea currents are linked to the predominant winds but also to the tide, in general low (0.8 knots maxi). Swell is variable.  
 4) Works performed: Geology, geophysical survey and drillings.  
 5) Characteristics of the deposit: Lithology: Recent alluvia; Quaternary deposits (conglomerate: gravel, pebble, sand and clay, minerals); metasedimentary rocks (quartz sandstone with intercalation of clay; contains a considerable amount of ilmenite and goethite); biotite granite. The mineralisation is supposed to be the result of pneumatolytic hydrothermal process. The bearing rocks have undergone a strong weathering (50-80m). The orebody consists of tin-bearing weathered rock in the granite as well as the metasediment. Exploitation by gravel pumps "Kolong method" in-the foreshore area ended in 1958 at 3 km offshore. The exploitation was done in 1966 by dredging with the BANGKA 1 dredge (bucket: 9-20 cu/feet working 9-45 m under water. Production 32 Mm3).

**References:**

Sujitno S., 1984. Exploration for offshore tin placer in Indonesia, 2nd int. seminar on the offshore mineral resources (Brest), Ed. GERMINAL.

Occurrence   
 Deposit   
 Deposit/File

**NAME: LAUT TEMPILANG**

<b>Commodities:</b> Sn		<b>Type of deposit:</b> placer paleovalley	
<b>Country:</b> Indonesia	<b>ID</b>	<b>District:</b> Bangka S	

**Marine area:** Indonesia, Java sea

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOPOLOGY**

<b>Zone type</b>	inner shelf
<b>Morpho. 1</b>	paleochannel
<b>Morpho. 2</b>	kaska
<b>Petrography</b>	coarse sand
<b>Mineralogy</b>	cassiterite

**COORDINATES**

Latitude	S	-2.180
(Decimal °)		0.000
Longitude	E	-105.680
		0.000
Z (in m)		-10

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:** P.T. Timah

	<b>Ore</b>	<b>Heavy minerals</b>	<b>Commodities</b>
<b>Grades</b>	0.35 kg/m3		
<b>Tonnage</b>	17 106 m3		

**Description:**

1) The placer is located on the south west coast of the Bangka island, 3 km from the shoreline, and constitutes the prolongation in the sea of a deposit located on the continent.  
 2) Climate: Tropical humid, rain forest type. Winds: East direction from April to October 3-5 km/h; West direction from November to March. Rainy season from October to February; mean annual precipitation: 2830 mm/an. Temperature: 23°- 30° C.  
 3) Hydro: Sea calm or rough depending on the monsoon. Tides are slight, semidiurnal, maxi. 2.9 m. Current direction and velocity are linked to the predominant winds.  
 4) Works performed: Seismic profiles 141 km, grid 200 m, drilling 660 (1249 m).  
 5) Characteristics of the mineralised zone: Mineralization is associated with cenozoic to quaternary argillaceous sand and gravel in a paleovalley fill up. The sedimentary detritic formation is overlying biotite granite and metasediments (sandstone with argillite bed intercalations). The cassiterite mineralization granulometry is 10-20 mesh (16%), 20-60 mesh (81%), 60-100 mesh (3%). The source of the mineralization is the Tempilang granite which is well mineralised on the Island. Granite (Cretaceous to Jurassic) has intruded Triassic sedimentary rocks constituted of sandstone and argillite. Strong hydrothermal alteration (kaolinization) facilitated the erosion process and cassiterite preconcentration. The Bangka primary mineralization is characterised by cassiterite in quartz veins, wolframite quartz veins, arsenopyrite, pyrite, chalcopyrite, and galena.

**References:**

Sujitno S., 1984. Exploration for offshore tin placer in Indonesia, 2nd int. seminar on the offshore mineral resources (Brest), Ed. GERMINAL.

Occurrence   
 Deposit   
 Deposit/File

**NAME: BELITUNG**

<b>Commodities:</b> Sn	<b>Type of deposit:</b> placer paleovalley paleobeach	
<b>Country:</b> Indonesia	<b>ID</b>	<b>District:</b> Belitung E

**Marine area:** Indonesia, Java sea

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**TYOLOGY**

<b>Zone type</b>	inner shelf
<b>Morpho. 1</b>	paleochannel paleoterrane
<b>Morpho. 2</b>	paleobeach
<b>Petrography</b>	coarse sand
<b>Mineralogy</b>	cassiterite

**COORDINATES**

Latitude	S	-3.000
(Decimal °)		0.000
Longitude	E	-108.220
		0.000
Z (in m)		-10 to -20

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 3/2/95

**Company:** P.T. Timah

	<b>Ore</b>	<b>Heavy minerals</b>	<b>Commodities</b>
<b>Grades</b>		5 % by volume.	
<b>Tonnage</b>	239 400 Mt		

**Description:**

- 1) East side of the Belitung island, 10 km from shoreline.
- 2) Climate: Tropical humid, rain forest type. Winds: SE direction from April to September, 13-30 km/h - NW direction from October to April, 31-39 km/h. Temperature: 26°.
- 3) Hydro: Sea calm or rough depending on the monsoon. Tides are slight, diurnal, maxi. 1.8 m. The current direction and velocity are linked to the predominant winds.
- 4) Works performed: 1979 acoustic profiles 850 km, grid 200x200 m.
- 5) Characteristics of the mineralised zone: The Holocene sedimentation is characterized by unconsolidated sands and argillaceous formations containing corals. The mineralization is associated with quaternary valley fill, natural levee, paleobackshores (-8, -10, -13, -18, -20, -30, -45, -50, -60, -67 and -90 m). Mineral concentrations are parallel to the paleoshoreline. Heavy mineral sample shows the following mineral composition: cassiterite 20-150 mesh (67,8%), monazite 48-150 mesh (2%), pyrite 65-150 mesh (11%), ilmenite 65-150 mesh (7%), zircon 100-200 mesh (5%), tourmaline 65-150 mesh (4%), topaz 100-150 mesh (1%). The tin mineralization comes from the granitic peribatholithic halo. These Permo-triassic granites were deeply weathered during the Miocene period. Preconcentration and partial transport have been initiated by the mechanic action of meteoric and marine water (gravity process).

**References:**

Sujitno S., 1984. Exploration for offshore tin placer in Indonesia, 2nd int. seminar on the offshore mineral resources (Brest), Ed. GERMINAL.

Occurrence   
 Deposit   
 Deposit/File

**NAME: AREA OFF PERAK**

**Commodities:** Sn **Type of deposit:** placer paleovalley paleobeach  
**Country:** Malaysia **MY** **District:** Perak

**Marine area:** Indonesia, Andaman sea

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	inner shelf
<b>Morpho. 1</b>	paleovalley
<b>Morpho. 2</b>	paleobeach
<b>Petrography</b>	siliceous sand
<b>Mineralogy</b>	cassiterite

**COORDINATES**

Latitude	N	4.250
(Decimal °)		0.000
Longitude	E	-100.500
		0.000
Z (in m)		0

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:** Pernas Mining Co. Ltd

	<b>Ore</b>	<b>Heavy minerals</b>	<b>Commodities</b>
<b>Grades</b>	8 to 46 K/sqy		
<b>Tonnage</b>			

**Description:**

- 1) The area of interest covers 9 km<sup>2</sup>, 1,5 km offshore Perak.
- 2) Climate: Tropical, humid, rain forest type; Winds: East direction from April to October and west from November to March. Rainy season, November to February. Mean annual precipitation 2830 mm/an. Mean annual temperature: 23 to 30 ° C.
- 3) Hydro: Sea calm to rough depending on the monsoon. Water temperature: 26 to 29°C. Tide are slight, semidiurnal. Tide magnitude 2.9 m. Currents to W 2-3 ms and to E.
- 4) Works performed: 1975 seismic profiles 27 miles, Bangka drill (100).
- 5) Characteristics of the mineralised zone: The mineralization is associated with siliceous sand along a narrow strip parallel to the outcropping granite and in paleovalleys appearing in front of 3 small streams. Grain size: 60 mesh. Grade values changing from the source to the different geomorphologic systems: northern valley 12-27 Katies/cubic yard (9.5-21 g/m<sup>3</sup>), central valley 8.5-23 K/cy (7.7-18.2 g/m<sup>3</sup>), southern valley 8-46 K/cy (6.3-35.4 g/m<sup>3</sup>). The area nearby the granite is L: 900 m, l: 100 m. The dipping is 7-27°. Erosion, and transport are the factors which allowed tin reconcentration in paleovalleys. The wave mechanical actions have redistributed part of the mineralization along some areas parallel to the shoreline.

**References:**

Arman M., 1978. Cassiterite distribution pattern in a nearshore area off Perak, Malaysia Peninsula, CCOP technical report 12.

Occurrence   
 Deposit   
 Deposit/File

**NAME: RINGAROOMA BAY**

**Commodities:** Sn **Type of deposit:** placer paleovalley  
**Country:** Australia **AU** **District:** Tasmania, Lottah

**Marine area:** Pacific SW, Tasman sea, Bass strait

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	inner shelf
<b>Morpho. 1</b>	paleovalley
<b>Morpho. 2</b>	
<b>Petrography</b>	coarse siliceous sand
<b>Mineralogy</b>	cassiterite

**COORDINATES**

Latitude	S	-40.800
(Decimal °)		0.000
Longitude	E	-147.880
		0.000
Z (in m)		-40

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/17/95

**Company:** Ocean Mining A.G.

	Ore	Heavy minerals	Commodities
<b>Grades</b>	130 gSn/m <sup>3</sup>		
<b>Tonnage</b>	20 Mt		

**Description:**

- 1) North coast of Tasmania, 5 km from the backshore.
- 2) Climate: Marine, west coast type - Mean annual precipitation 1000 mm, maxi. June, July, August.
- 4) Works performed: drilling (1x1.5 km grid).
- 5) Characteristics of the deposit: The mineralization is erratically distributed inside unsorted coarse gravel and argillaceous sand. The fluvial formation (thickness <13 m) represents on the continental platform and under 40 m of water, the Ringarooma river prolongation. The source of the mineralization is Devonian-carboniferous granites intruding Precambrian and Cambrian volcanic and sedimentary formations. Cassiterite is localised in the apical part of the granitic complexes along sheet structures parallel to the granitic roof associated with pegmatitic formation.

**References:**

Tixeron M. & Babot J., 1972. Géologie prévisionnelle pour la recherche des placers des plateaux continentaux, BRGM 72 SGN 109 MAR, 193, unpublished.

Occurrence   
 Deposit   
 Deposit/File

**NAME: PAR**

**Commodities:** Sn **Type of deposit:** placer paleovalley  
**Country:** Great Britain **GB** **District:** Cornwall

**Marine area:** Atlantic NE, Channel

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**TYOLOGY**

<b>Zone type</b>	foreshore inner shelf
<b>Morpho. 1</b>	paleovalley
<b>Morpho. 2</b>	
<b>Petrography</b>	coarse siliceous sand
<b>Mineralogy</b>	cassiterite

**COORDINATES**

Latitude	N	50.350
(Decimal °)		0.000
Longitude	W	4.700
		0.000
Z (in m)		0 to -2

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 2/20/95

**Company:** English China Clay

	Ore	Heavy minerals	Commodities
<b>Grades</b>	1.7 kg/m3		
<b>Tonnage</b>			>500 t

**Description:**

1) South Cornwall. St Austell Bay. St Blazey paleochannel.  
 2) Climate: Marine west coast. Mean annual precipitation 1500 mm. Prevailing winds coming from SW during the winter and West in the summer.  
 4) Works performed: Drilling (13) on the St Blazey river paleochannel in front of Par Harbour.  
 5) Characteristics of the deposit: Most of the drill holes (12/13) found the tin mineralised bed. The thickness ranges from 0.60 to 3.4 m. Four of them gave grade values lower than 100 g/m3 and three grade values higher than 1.4 kg/m3. The highest value is 7.5 kg/m3 of cassiterite. The richest part of the deposit is represented by 500 t of cassiterite with 1.7 kg/m3 with a bed thickness greater than 2 m. The last three drillings did not give as good results (593 g/m3, 836 g/m3 and 42 g/m3). English China Clay Company decided to stop the exploration survey of this area.

**References:**

Babot J., 1973. Possibilités d'existence de placers de cassitérite sur le plateau continental de Cornouailles, BRGM 73 SGN 296 MAR, unpublished.

Occurrence   
 Deposit   
 Deposit/File

**NAME: ST IVES**

**Commodities:** Sn **Type of deposit:** placer beach  
**Country:** Great Britain **GB** **District:** Cornwall

**Marine area:** Atlantic NE, Celtic sea

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**TYOLOGY**

<b>Zone type</b>	beach foreshore inner shelf
<b>Morpho. 1</b>	beach paleobeach
<b>Morpho. 2</b>	
<b>Petrography</b>	fine siliceous sand
<b>Mineralogy</b>	cassiterite

**COORDINATES**

Latitude	N	50.200
(Decimal °)		0.000
Longitude	W	5.400
		0.000
Z (in m)		0 to -10

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 2/20/95

**Company:** Union Corporation Ltd

	Ore	Heavy minerals	Commodities
<b>Grades</b>	0.2%		
<b>Tonnage</b>			3000 t

**Description:**

1) Mineralization known on the beach to 1.5 km offshore in front of the Red river mouth.  
 2) Climate: Marine type west coast. Mean average precipitation 612 mm.  
 4) Works performed: Sparkler profiles. Drilling (1962-1965). Vibracore sampling (1966).  
 5) Characteristics of the deposit: The mineralization is localised in a 2-3 m sand formation covering the beach with a concentration of tin higher at the limit of backshore and foreshore. Cassiterite is frequently associated with tourmaline and quartz or chlorite and quartz. The mineralization origin is remnants from the old mining exploitation in a Camborne area. Tin was found everywhere inside the bay sediments but the higher grade values were discovered at the Red river mouth. As on the beach, the tin is distributed essentially in the upper part of the sand bed, but the lower part also contains some mineralization. The potential tonnage of the deposit is 3000 t of cassiterite distributed on the sediment's first 1.5 m.

**References:**

Tixeron M. & Babot J., 1972. Géologie prévisionnelle pour la recherche des placers des plateaux continentaux, BRGM 72 SGN 109 MAR, 193, unpublished.

Occurrence   
 Deposit   
 Deposit/File

**NAME: ST AGNES**

**Commodities:** Sn **Type of deposit:** placer beach channel  
**Country:** Great Britain **GB** **District:** Cornwall

**Marine area:** Atlantic NE, Celtic sea

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	foreshore inner shelf
<b>Morpho. 1</b>	spreading
<b>Morpho. 2</b>	beach top
<b>Petrography</b>	fine to medium siliceous sand
<b>Mineralogy</b>	cassiterite

**COORDINATES**

Latitude	N	50.200
(Decimal °)		0.000
Longitude	W	5.250
		0.000
Z (in m)		0 to -10

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 2/20/95

**Company:** Marine Mining Co.

	Ore	Heavy minerals	Commodities
<b>Grades</b>	2 kg/m3		
<b>Tonnage</b>	13 M m3		

**Description:**

1) West Cornwall. St Agnes Head area. 1500 m off the coast.  
 2) Climate: Marine W coast. Rain 1500 mm/y. Winds coming from SW during winter and W in summer.  
 3) Hydro: High water mark is above the cliff base along much of the coast, except at the river mouths. Near high tide, with a prevailing westerly wind, waves strike the cliff orthogonally or at steep angles, induce turbulence and cause sediment entrainment, transported offshore along with the reflected ground swell rebounding off the cliff.  
 4) Works performed: 1965-69 offshore exploration by Marine Mining (Cornwall) Ltd. Sampling by Shipek grab sampler, vibrocore. Geochemistry and sedimentology.  
 5) Characteristics of the deposit: Between St Agnes Head and Portreath an offshore extensive sheet of medium to fine grained sand is enriched in tin at the top. The offshore geology of the area is based largely on Sparker records and vibrocores. The Devonian-Carboniferous rocks are similar to their counterparts on the hinterland and have been intruded by granite plutons. Except for a few places close inshore, there is no sediment cover on St Agnes Head or Portreath points. Towards the open sea, the thickness varies from 0 to 6 m. The tin concentrations, in the coarsest size fractions of the superficial sediment, are generally insignificant in comparison with the finest fractions, although the percentage of tin in the finest fractions is small compared to the entire sample. The higher concentration in the coarsest size fraction from the traverses nearest to shore may be taken as an indication of an onshore source for tin. Since however, the area along the present day low water mark shows consistently high tin concentration in the 60-85 mesh size fraction away from the tin mining onshore activity, there is probably a reworking of tin by selective sorting and concentration processes related to high energy level of the surf zone environment. Another possible source is the contamination from the land mines. However some bedrock mineralisation may be possible. Grade values are good (average 1.7 kg/m3) and reserves around 27,000 t metal. Mining is difficult because of strong swell and milling because of the type of ore.

**References:**

Babot J., 1973. Possibilités d'existence de placers de cassitérite sur le plateau continental de Cornouailles, BRGM 73 SGN 296 MAR, unpublished.



Occurrence   
 Deposit   
 Deposit/File

**NAME: CORSEN**

**Commodities:** Sn      **Type of deposit:** placer beach  
**Country:** France      FR      **District:** Finistère

**Marine area:** Atlantic NE

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	beach foreshore
<b>Morpho. 1</b>	beach
<b>Morpho. 2</b>	
<b>Petrography</b>	siliceous sand
<b>Mineralogy</b>	cassiterite

**COORDINATES**

Latitude	N	48.450
(Decimal °)		0.000
Longitude	W	4.810
		0.000
Z (in m)		0

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 2/16/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>		1.3%	
<b>Tonnage</b>			

**Description:**

1) Pays de Léon (Nord Finistère). Pointe de Corsen en Plouarzel.  
 2) Climate: Marine west coast. Mean annual precipitation 500 mm. Prevailing winds from the west (Westerlies).  
 3) Hydro: Swell and tide currents control the repartition of the sediments.  
 4) Works performed: Sampling.  
 5) Characteristics of the deposit: Cassiterite from Corsen Beach heavy sands is associated with tourmaline (predominant), ilmenite and garnet (subordinate), staurotide and apatite (accessory). The other heavy minerals are rare and with a few exceptions <1%. Here, cassiterite has a proximal origin (essentially the destruction of the weathered coastal cliffs from Saint-Renan stanniferous granite). These stanniferous micro-placers have been probably worked, on a small scale, in a remote period.

**References:**

Chauris L., 1990. Sables lourds à cassitérite sur les grèves de Corsen en bordure du granite stannifère de Saint-Renan, Bull. Soc. Sc. Nat. Ouest de la France, nouvelle série, tome 12, (3).

Occurrence   
 Deposit   
 Deposit/File

**NAME: PENESTIN**

**Commodities:** Sn **Type of deposit:** placer beach paleobeach  
**Country:** France **FR** **District:** Loire Atlantique

**Marine area:** Atlantic NE

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	beach foreshore
<b>Morpho. 1</b>	paleobeach
<b>Morpho. 2</b>	
<b>Petrography</b>	fine siliceous sand
<b>Mineralogy</b>	cassiterite

**COORDINATES**

Latitude	N	47.480
(Decimal °)		0.000
Longitude	W	2.490
		0.000
Z (in m)		0

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 2/20/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>	7.2 to 0.75 kg/m <sup>3</sup>		
<b>Tonnage</b>			1.225 to 7.9 t Sn

**Description:**

1) Southern Brittany, Vilaine river mouth.  
 2) Climate: Marine west coast. Mean annual precipitation 500 mm. Prevailing winds from the W or WSW (Westerlies).  
 3) Hydro: Swell associated with the prevailing winds. Tide currents.  
 4) Works performed: Geophysics (seismic), dredging and drilling (Kullenberg coring, 5 vibro-coring). Along the shore, detailed prospecting with a Banka drill (1963) (grid 200 x 20 m then 100 x 20 m).  
 5) Characteristics of the deposit: The sedimentary cover of Recent or Actual age is generally thin. Cassiterite was found in two drillings. The thickness of the sand over the argillaceous bedrock is 1.2 m. The cassiterite, showing rounded shapes and sometimes angular shapes, is associated with the fine fraction of the sediment (less than 1 mm). 58% of the sediment particle-size is lower than 1.6 mm. The mineralisation distribution shows a strong concentration at the foot of the cliff near the bedrock contact (1.3 m deep); the other part of the beach is weakly mineralised (1 to 10 g of tin/m<sup>3</sup>). The source of the cassiterite is veinlets inside the micaschistes, pegmatite, or Pliocene alluvial formations which have reworked primary mineralisation.

**References:**

Tixeron M. & Babot J., 1972. Géologie prévisionnelle pour la recherche des placers des plateaux continentaux, BRGM 72 SGN 109 MAR, 193, unpublished.

Occurrence   
 Deposit   
 Deposit/File

**NAME: ROGUE RIVER**

<b>Commodities:</b> Cr		<b>Type of deposit:</b> placer paleobeach	
<b>Country:</b> USA		US	<b>District:</b> Oregon
<b>Marine area:</b> Pacific NE			

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	shelf
<b>Morpho. 1</b>	paleobeach
<b>Morpho. 2</b>	
<b>Petrography</b>	medium siliceous sand
<b>Mineralogy</b>	chromite

**COORDINATES**

Latitude	N	42.450
(Decimal °)		0.000
Longitude	W	124.580
		0.000
Z (in m)		-100

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>	530 Mst		

**Description:**

1) West coast of USA, Oregon State, Curry county, mouth of the Rogue River.  
 2) Climate: Marine, West Coast. Annual average rainfall 243 mm; maxi. from Oct. to Feb. Prevailing surface winds: NW, 48 km/h from April to June; SW, 78 km/h Oct.; SE direction, 70 km/h Jan. T= 5-20°C.  
 3) Hydro: Sea calm in summer, rough in winter (tempest 16%). Water T= 10-15°. Tide slight, maxi. 1.8 m. Currents: South California (0.25-1 m/s) in summer; North Davidson in winter (0.25-1 m/s) and up-welling in summer 0.01 m/s. Swell magnitude 3-6 m in winter, 5 m (16%) Nov. to March, 0.90 m in summer.  
 4) Works performed: Bathymetry 10 m interval. Low resolution seismic 675 km; high resolution: 300 km sparker, 250 km sparker and 50 km uniboom. Magnetism 60 km (Proton precession). Sampling 173 grabs and 73 box and piston cores.  
 5) Characteristics of the deposit: platform 10-20 miles wide. Outer edge water depth 165-183 m. Submerged terraces (probably wave-cut benches) identified near Rogue river at 35, 60, 70, 85, 100, 120 and 145 m deep. Some terraces may correlate with brief sea level still-stands during Holocene transgression and acted as barriers to landward move of HM. Three sediments facies: 1) transgressive sand facies of well-sorted fine sand; 2) a modern mud facies of silt and clay; and 3) a mixed facies of sand and mud. The sand was deposited during Holocene transgression, and the modern muds derived from coastal rivers. The mixed facies results from reworking of modern muds by benthic organisms into the underlying basal transgressive sands. Distribution of sediments subparallel to the shoreline is patchy; thickness changes from a few to >33 m. Well-defined HM concentrations in the unconsolidated surface and near-surface sediments. The Rogue River accumulation is 37 km long, 19 km N and 18 km S of river mouth, from shoreline to 90 m depth; average thickness of sediment: 20 m; HM concentration 10-30% (maxi 43%). Tonnage: (LaVerne D.K. & al., 1990) 29 Mt magnetite, 32 Mt ilmenite, 14.5 Mt chromite, 3.6 Mt garnets and 7.3 Mt zircon, gold (5-150 ppb). Placers result from interaction between fluvial transport, tectonic uplift, rise and fall of sea level during Pleistocene and Holocene (Bowman 1972, 1973).

**References:**

1) Kulm L.D. and Peterson C.D., 1990. Preliminary evaluation of heavy-mineral content of continental shelf placer deposits off Cape Blanco, Rogue River and Umpqua River, Open File report 0-89-12. 2) Kulm L.D., 1988. Potential heavy mineral and metal placers on the southern Oregon continental shelf, Marine Mining, 7, 361-395.

Occurrence   
 Deposit   
 Deposit/File

**NAME: CAPE BLANCO**

**Commodities:** Cr **Type of deposit:** placer paleobeach  
**Country:** USA **US** **District:** Oregon

**Marine area:** Pacific NE

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	shelf
<b>Morpho. 1</b>	paleobeach
<b>Morpho. 2</b>	
<b>Petrography</b>	medium siliceous sand
<b>Mineralogy</b>	chromite

**COORDINATES**

Latitude	N	42.830
(Decimal °)		0.000
Longitude	W	124.580
		0.000
Z (in m)		-18 to -50

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>	165 Mst		

**Description:**

1) West coast of USA, Oregon State, Curry county. Distance from the coast 35 miles.  
 2) Climate: Marine, West Coast. Annual average rainfall 243 mm; maxi. Oct. to Feb. Prevailing surface winds: NW 48 km/h from Apr. to June; SW 78 km/h Oct.; SE 70 km/h Jan.. T= 5-20°C.  
 3) Hydro: Sea calm in summer and rough in winter (tempest 16%). Water T: 10-15°. Tide slight, maxi 1.8 m. Currents: South California (0.25-1 m/s) in summer ; North Davidson in winter (0.25-1 m/s) and upwelling in summer 0.01 m/s. Swell magnitude 3-6 m in winter, 5 m (16%) Nov. to March, 0.90 m in summer.  
 4) Works performed: Bathymetry 10 m interval. Low resolution seismic 675 km; high resolution seismic include 300 km sparker, 250 km sparker and 50 km uniboom. Magnetism 60 km (Proton precession). Sampling 173 grabs and 73 box and piston cores.  
 5) Characteristics of the deposit: Continental platform 10-20 miles wide. Outer edge water depth 165-183m. Submerged terraces (probably wave-cut benches) identified that may correlate with brief sea level still-stands during Holocene transgression. Such features were barriers to landward move of HM. Unconsolidated sediments can be classified into three facies: 1) transgressive sand facies, well-sorted fine sand; 2) a modern mud facies of silt and clay; and 3) a mixed facies of sand and mud. The sand deposited during Holocene transgression, and the modern muds derived from coastal rivers. The mixed sediment facies results from reworking of modern muds by benthic organisms into the underlying basal transgressive sands. Distribution of sediments, sub-parallel to the shoreline, are very patchy and thickness varies from few meters to >33 m. Well-defined HM concentrations in the unconsolidated surface and near-surface sediments. Cape Blanco HM accumulation 13 km long on 6 km wide in water depths between 18 and 55 m. The HM concentration 10-33%. Evaluation of tonnage: (LaVerne D.K. & al. 1990) 4.3 Mt magnetite, 9.2 Mt ilmenite, 1.3 Mt chromite, 5.5 Mt garnets and 0.89 Mt zircon, gold 5-150 ppb. Placer result from interaction between fluvial transport, tectonic uplift, rise and fall of sea level during Pleistocene and Holocene (Bowman 1972, 1973).

**References:**

1) Kulm L.D. and Peterson C.D., 1990. Preliminary evaluation of heavy-mineral content of continental shelf placer deposits off Cape Blanco, Rogue River and Umpqua River, Open File report 0-89-12. 2) Kulm L.D., 1988. Potential heavy mineral and metal placers on the southern Oregon continental shelf, Marine Mining, 7, 361-395.

Occurrence   
 Deposit   
 Deposit/File

**NAME: PORT AU PORT**

**Commodities:** Cr **Type of deposit:** placer paleobeach paleochannel  
**Country:** Canada **CA** **District:** New-Foundland

**Marine area:** Atlantic NW, St Laurent gulf

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	inner shelf
<b>Morpho. 1</b>	channel paleobeach
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	chromite rutile zircon

**COORDINATES**

Latitude	N	48.520
(Decimal °)		0.000
Longitude	W	59.230
		0.000
Z (in m)		-9 to -50

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

1) West part of Newfoundland.  
 2) Climate: Subarctic. Mean annual precipitation 500 mm. Prevailing winds from the SE (Westerlies).  
 4) Works performed: 1970, sampling (13 samples) with a dredge.  
 5) Characteristics of the deposit: The chromite occurrence inside the bay has been known for many years. The study of the samples collected showed interesting chromite values, the presence of rutile and zircon associated with the granulometric fraction of 350-125 µm. Onshore, chromite occurrences are also known north of Port au Port, in the deformed serpentinite belts of central Newfoundland. Thin layers and bands of chromite are found in the relatively undeformed, stratiform Bay of Islands complex. The chromite is concentrated in the upper horizons of the ultrabasic rocks immediately below the overlying gabbro (Smith 1958).

**References:**

Anonymous, 1981. Economic geology, 96 (4), 961-970.

Occurrence   
 Deposit   
 Deposit/File

**NAME: BARAVALE**

**Commodities:** Cr **Type of deposit:** placer paleobeach  
**Country:** Solomon **SB** **District:** San Isabel, San Jorg

**Marine area:** Pacific W

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	shelf
<b>Morpho. 1</b>	paleobeach channel
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	chromite

**COORDINATES**

Latitude	S	-8.360
(Decimal °)		0.000
Longitude	E	-159.680
		0.000
Z (in m)		

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>	<1%		
<b>Tonnage</b>			

**Description:**

1) Solomon Island. Passage between San Isabel Island and San Jorge Island.  
 4) Works performed: A marine geophysical and sea bed sampling survey was undertaken in July 1982 around San Jorge Island, Santa Isabel Province, Solomon Islands, by UNDP staff and Ministry of Land Energy & Natural Resources of Honiara. Continuous seismic reflection profiling, echo sounding (Raytheon DE-719) and grab sampling (Shipek and Van Veen grab samples and sampling winch)  
 5) Characteristics of the deposit: Ultrabasic rocks occur on San Jorge Island and on the southern part of the adjacent Santa Isabel Island. Chrome rich sands have been identified in the alluvial and beach sands along the shores of San Jorge. Heavy mineral sands might also have been brought down by the Kaipito river, which discharges on the Santa Isabel Island coast opposite the northern side of the San Jorge Island, and concentrated on the sea bed by wave and tidal action. The exploration surveys on the Baravale area show a sea bed surface sediment formed largely of sand of medium grain size. Sorting is rather variable and poorly sorted samples occur in which the grain size ranges from very fine to coarse. Very fine sand/silt occurs adjacent to the shore along the south side of Baravale passage. A large sand wave occurs in the middle of the passage; it varies in width from about 100 m at the eastern end to 400 m near the western end. The maximum height of sand wave observed here is about 1.6 m. The upper sedimentary formation can be distinguished from a lower formation on the basis of the seismic structure, the two formations being separated by a reflector. The lower formation exhibits channelling in places and may have been deposited in a higher energy environment than that existing at the sea bed here today. Sediment samples were collected on the upper sedimentary formations and analysed by AAS. Average values in the Baravale passage were: 4459 ppm Cr<sub>2</sub>O<sub>3</sub> and 7.6 % Fe. Mineralogical study of the samples shows few fresh euhedral chromite crystals and abraded grains <250-300 µm associated with magnetite, goethite. micas, amphiboles, pyroxenes, feldspars, chrysoprase.

**References:**

Anonymous, 1983. San Jorge Heavy Mineral sands survey, Solomon Islands, UNDP cruise report n°66.

Occurrence   
 Deposit   
 Deposit/File

**NAME: MOROBE**

**Commodities:** Cr **Type of deposit:** placer paleobeach  
**Country:** Papua New-Guinea **PG** **District:**

**Marine area:** Pacific W, Solomon sea

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	foreshore inner shelf
<b>Morpho. 1</b>	beach paleobeach
<b>Morpho. 2</b>	
<b>Petrography</b>	siliceous sand
<b>Mineralogy</b>	chromite

**COORDINATES**

Latitude	S	-7.680
(Decimal °)		0.000
Longitude	E	-147.680
		0.000
Z (in m)		

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:** CRA Exploration Pty

	Ore	Heavy minerals	Commodities
<b>Grades</b>	0.8 to 1.8 %		
<b>Tonnage</b>	4,5 Mt		

**Description:**

1) New Guinea eastern coast.  
 2) Climate: Tropical humid. Annual rainfall 2.5 to 5 m.  
 3) Hydro: Tide only 1 m. Little wave action on the beach. Prevailing winds from SE (trade winds) during summer and also from SE (monsoon winds) during winter.  
 4) Works performed: sampling (more than 100 grab samples taken from the surface of the sand both offshore and onshore). From these, 26 had a mineralogical and chemical analysis. Several mining companies carried exploration surveys on these areas: CSIRO, AMAX Explo. Australia etc..  
 5) Characteristics of the deposit: Beach sands on the Morobe coast of N.G. contain significant amounts of chromite associated with olivine, enstatite, tremolite, antigorite and feldspar. They were transported to the beaches by three rivers: Paiawa, Saia and Sesimbai from the Papuan ultramafic belt (Bowutu Mt), which is a peridotite gabbro basalt complex extending over 400 km (NW-SE) and 40 km wide on the NE side of the Owen Stanley Range (Davies 1971). From top to bottom the complex consists of a basalt zone 4 to 6 km thick, a gabbro zone 4 km and an ultramafic zone 4 to 8 km and is likely an overthrust sheet of oceanic crust and mantle with tonalite intrusions. Local topography is typical of a drowned coast line with locally prograding deltas. Deltaic swamps and old beach ridges are common on-shore with coral reefs around peninsulas and offshore islands. Much of the coastal sand is detrital produced from vigorous weathering and erosion of the mountains. The sand forms beaches 5 to 10 m wide that rapidly shelveto to depth of 50 m at 0.5 to 0.7 km from the coast. Sand size varies from sand to silt to mud when going offshore. Highest chromite concentrations are on the shore line near river mouths with rapid drop-off with distance off-shore and less rapid along the shore. Natural concentrates formed by wave are found near the water's edge. The depth of chromite sands are only some 10 m. C.R.A. estimated chromite tonnage at 4.5 Mt. Amax indicated average chromite grade of 1.8% onshore and 0.8% offshore. The offshore and beach chromite are not currently economic due to low Cr/Fe ratio (3:1) and granular nature when lump is preferred.

**References:**

Stephens J.F., 1973. Chromite and other ultramafic detrital minerals from the Morobe Coast, New Guinea.

Occurrence   
 Deposit   
 Deposit/File

**NAME: PLOUM**

**Commodities:** Cr **Type of deposit:** placer paleovalley paleobeach  
**Country:** New Caledonia **FR** **District:** New Caledonia SW

**Marine area:** Pacific SW

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	estuary beach
<b>Morpho. 1</b>	paleochannel
<b>Morpho. 2</b>	paleobeach
<b>Petrography</b>	medium siliceous & shelly sand
<b>Mineralogy</b>	chromite

**COORDINATES**

Latitude	S	-22.330
(Decimal °)		0.000
Longitude	E	-166.330
		0.000
Z (in m)		-20

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:** G.I.E. Austral Mine

	Ore	Heavy minerals	Commodities
<b>Grades</b>	3.7%		
<b>Tonnage</b>	46 M m3		

**Description:**

1) The mining project is located in the southern part of New Caledonia.  
 2) Climate: Tropical savannah type. Dry season April to November; wet season Dec-March. Mean average precipitation 3000 mm/y. Temperature 20-26°C. SE Trade winds.  
 3) Hydro: The basin is well protected from the swell and oceanic currents by the reef barrier located 30 km on the SW.  
 4) Works performed: 1984-87 Seismic survey; 1985-86 Vibracore drilling, (195) 250 m grid.  
 5) Characteristics of the deposit: High grade mineralization is associated with quaternary alluvial coarse sediments deposited in shallow water along four different bays localised 30 km south of Noumea. The fine sediments are poor in chromite and the mineralization is very difficult to recover. The sedimentation inside the bay shows deltaic and marine formations represented by pieces of ultrabasic rocks, red mud and carbonate shelly materials, carbonate mud. The chromite presents different granulometric sizes from 500 to 30. Three zones (-5), (-10), (-15) corresponding to paleoshore lines present high grade mineralization. The Cr2O3 content fluctuates from 3.7% to 5.3%. The chemical composition is FeO: 21.4%, Cr2O3: 51%, Al2O3: 18.7%, MgO: 8.9%. The sediments come from weathered and eroded ultramafic rocks which are outcropping in the south of New Caledonia.

**References:**

Anonymous. Plum chromite project, preliminary feasibility study, Australmin report.



Occurrence   
 Deposit   
 Deposit/File

**NAME: NOME**

**Commodities:** Au **Type of deposit:** placer paleomoraine paleobeach  
**Country:** USA **US** **District:** Alaska

**Marine area:** Pacific N, Bering sea

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**TYOLOGY**

<b>Zone type</b>	inner shelf
<b>Morpho. 1</b>	paleomoraine
<b>Morpho. 2</b>	paleobeach
<b>Petrography</b>	coarse siliceous sand
<b>Mineralogy</b>	gold

**COORDINATES**

Latitude	N	64.500
(Decimal °)		0.000
Longitude	W	165.400
		0.000
Z (in m)		-18 to -20

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 3/2/95

**Company:** Westgold

	Ore	Heavy minerals	Commodities
<b>Grades</b>	0.55 to 0.89 g/m3 Au		
<b>Tonnage</b>	>25 Mm3		

**Description:**

1) Along the coast NE from Nome  
 2) Climate: Polar (Tundra Type) with winds coming from SW to W from June to August and NNE to E from September to May.  
 3) Hydro: Sea frequently rough (wave size from 3 to 5 meters) Ice build-up begins at the end of October to December and the break-up begins in April to the end of June.  
 4) Works performed: The gold rush workings at the beginning of the century were localised over the backshore or along recent hydrographic channels. Around 1903, the upper shoreface was worked with a bucket dredger from the shore. The 1986-1990 mining works were realised with the big BIMA dredge (45 m sling, 127 buckets of 0,9 m3, 26 buckets/min = 700 m3/h). Scrubbing was done by two trommels of 3-4 m diameter. The dredge was always assisted by 50 m long boat. Gold particle sizes were over 100 µm. Production was 1120 kg in 1987, 1104 kg in 1988 and 953 kg in 1989. An attempt was also made to mine the near shore deposit using a submarine shovel on caterpillar tracks dumping in a barge (Alluvial Dredging).  
 5) Characteristics of the deposit: The Palaeozoic formations (gneiss, crystalline limestone, schists) have been intruded during Mesozoic times by an important dioritic and granitic stocks frequently associated with hydrothermal alteration (gold origin). These formations have been modified by plio-quaternary successive glaciations. The most important gold accumulations are localised around areas where glacial formations have been reworked by the sea (wave and current actions), but also, near shore, at the lower part of paleobanks. The mineralization is associated with the coarsest sediment fraction.

**References:**

Oulès L., 1989. Compte rendu de visite.

Occurrence   
 Deposit   
 Deposit/File

**NAME: BLUFF SOLOMAN**

**Commodities:** Au **Type of deposit:** placer paleobeach  
**Country:** USA **US** **District:** Alaska

**Marine area:** Pacific N, Bering sea

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	inner shelf
<b>Morpho. 1</b>	paleobeach
<b>Morpho. 2</b>	high energy beach
<b>Petrography</b>	coarse sand
<b>Mineralogy</b>	gold

**COORDINATES**

Latitude	N	64.560
(Decimal °)		0.000
Longitude	W	164.430
		0.000
Z (in m)		0 to -10

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

- 1) 40 Miles east of Nome.
- 2) Climate: Polar, Tundra type with winds coming from SW to W from June to August and NNE to E from September to May.
- 3) Hydro: Sea frequently rough (wave size from 3 to 5 meters). Ice build-up begins at the end of October to December and the break-up begins in April to the end of June.
- 4) Works performed: Between 1939-1941 Auric Resources worked during the winter, one offshore placer using a small dredge. In 1983, Phoenix Marine Inc. tried to develop the offshore potential using a small barge. but the bad weather destroyed it and the operation was cancelled.
- 5) Characteristics of the deposit: The gold origin was found in the mountains near the beach. The detritic formation which holds the gold increases in thickness on approaching the sea. Coarse gold appears in high energy beach and near-shore placers.

**References:**

- 1) Cobb, 1981. Placer deposits of Alaska, USGS, 625-C. 2) Barker J. C., Marine placer development and opportunities in Alaska, OTC.

Occurrence   
 Deposit   
 Deposit/File

**NAME: NINILCHIK**

**Commodities:** Au **Type of deposit:** placer paleovalley  
**Country:** USA **US** **District:** Alaska

**Marine area:** Pacific N, Cook inlet

**ADMINISTRATION**

**TYOLOGY**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

<b>Zone type</b>	shelf
<b>Morpho. 1</b>	paleovalley
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	gold

**COORDINATES**

Latitude	N	60.500
(Decimal °)		0.000
Longitude	W	151.670
		0.000
Z (in m)		

**STAGE**

**MINING RIGHTS**

Exploration:  Free:   
 Mining:  Under control:   
 Processing:  Unknown:

Up-dated on: 3/2/95

**Company:** Aspen exploration

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

- 1) Cook Inlet area.
- 2) Climate: Polar, Tundra type with winds coming from SW to W from June to August and NNE to E from September to May.
- 3) Hydro: Sea frequently rough (wave size from 3 to 5 meters). Ice build-up begins at the end of October to December and the break-up begins in April to the end of June.
- 4) Works performed: In 1980 Aspen exploration Inc. did some sampling.
- 5) Characteristics of the deposit: Some interesting concentrations of gold were found. Prospecting licence of 38,000 acres (154 km<sup>2</sup>) covering the Kenai peninsula by Ninichick were requested but rejected by the BLM of Alaska due to possible conflicts with fishermen.

**References:**

Occurrence   
 Deposit   
 Deposit/File

**NAME: GRANTLEY HARBOR**

**Commodities:** Au W      **Type of deposit:** placer beach  
**Country:** USA      US      **District:** Alaska

**Marine area:** Pacific N, Bering sea

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	beach foreshore
<b>Morpho. 1</b>	beach
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	gold

**COORDINATES**

Latitude	N	65.180
(Decimal °)		0.000
Longitude	W	166.000
		0.000
Z (in m)		

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>	6.25 to 16.25 g/t		
<b>Tonnage</b>			

**Description:**

- 1) NW of Nome by Port Clarence and Grantley Harbor.
- 2) Climate: Polar, Tundra type with winds coming from SW to W from June to August and NNE to E from September to May.
- 3) Hydro: Sea frequently rough (wave size from 3 to 5 meters). Ice build-up begins at the end of October to December and the break-up begins in April to the end of June.
- 4) Works performed: 1974 sampling in the Tuksuk strait by the Dept of Marine Sciences of Wisconsin.
- 5) Characteristics of the deposit: Fine gold is associated with high energy shallow water placer. Sampling realised offshore shows some gold value between 0.3 \$/t and 83.2 \$/t (base 160 \$ gold/oz= 0.05 to 15 g/t) (Moore and Welkie, 1976).

**References:**

Anonymous, 1987. An economic reconnaissance of selected heavy mineral placer deposits in the US EEZ, Bureau of Mines OFR 4-87.

Occurrence   
 Deposit   
 Deposit/File

**NAME: CAPE PRINCE OF WALES**

**Commodities:** Sn Au W      **Type of deposit:** placer paleobeach  
**Country:** USA      US      **District:** Alaska

**Marine area:** Pacific N, Bering sea

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	foreshore inner shelf
<b>Morpho. 1</b>	paleobeach
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	cassiterite gold wolfram

**COORDINATES**

Latitude	N	65.610
(Decimal °)		0.000
Longitude	W	168.080
		0.000
Z (in m)		

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

2) Climate: Polar, Tundra type with winds coming from SW to W from June to August and NNE to E from September to May.  
 3) Hydro: Sea frequently rough (wave size from 3 to 5 meters). Ice build-up begins at the end of October up to December and the break-up begins in April to the end of June.  
 4) Works performed: Sampling. Recent studies of a reconnaissance nature have been undertaken through combined efforts of the USBM and the USGS.  
 5) Characteristics of the deposit: Consists of high placers along a north trending shallow water reef and coastal beach placers. Mineral concentrations probably extend further offshore. Total tin production, restricted to onshore lode and placer production near coast between Wales and Teller mission is approximately 4,166 Mlb (1890 t, 1902-1967). From the regional geology and oceanographic factors, deposition of marine placers in the vicinity seems probable. An extensive EW belt of tin granites trend across the western Seaward Peninsula and the massif of Cape Prince of Wales is part of this belt. Occurrences of HM containing cassiterite, wolframite, xenotime, ilmenite, zircon, scheelite, monazite and others minerals were identified; however no concentrations of economic value have yet been delineated.

**References:**

Barker J. C., Marine placer development and opportunities in Alaska, OTC.

Occurrence   
 Deposit   
 Deposit/File

**NAME: YAKATAGA YAKUTAT**

<b>Commodities:</b> Au		<b>Type of deposit:</b> placer beach	
<b>Country:</b> USA		US	<b>District:</b> Alaska
<b>Marine area:</b> Pacific N			

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	beach foreshore
<b>Morpho. 1</b>	beach
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	gold ilmenite grenat

**COORDINATES**

Latitude	N	59.550
(Decimal °)		0.000
Longitude	W	139.730
		0.000
Z (in m)		

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:** Cusac Resources, Alaska gold mines Inc.

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

2) Climate: Polar, Tundra type with winds coming from SW to W from June to August and NNE to E from September to May.  
 3) Hydro: Sea frequently rough (wave size from 3 to 5 m). Ice build-up begins at the end of October up to December and the break-up begins in April to the end of June.  
 4) Works performed: small-scale hand mining has occurred along the beach since the beginning of the century. During the 1980's there was further exploration of the Yakataga-Yakutat gold-bearing beach sands, both by industrial and government groups. During 1986-1987, Cusac Resources operated a 500 yd/day twin Richert Spiral concentrator on a onshore Yakataga strand line about 80 miles east of Coroova.  
 5) Characteristics of the deposit: Fine gold, ilmenite and abundant garnet were recovered from high and low energy placers. The garnet was thought to have equal value to fine gold. Production history: beach placer gold production of 15,000 to 16,000 oz (440 kg, Yakataga) and >3700 oz (>105 kg, Yakutat).

**References:**

Anonymous, 1987. An economic reconnaissance of selected heavy mineral placer deposits in the U.S. EEZ, Bureau of Mines OFR 4-87.

Occurrence   
 Deposit   
 Deposit/File

**NAME: GOOD NEWS BAY**

**Commodities:** Pt Au Cr      **Type of deposit:** placer paleovalley paleobeach  
**Country:** USA      US      **District:** Alaska

**Marine area:** Pacific N, Bering sea

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	shelf
<b>Morpho. 1</b>	paleochannel
<b>Morpho. 2</b>	paleobeach
<b>Petrography</b>	sand
<b>Mineralogy</b>	platine gold chromite

**COORDINATES**

Latitude	N	59.120
(Decimal °)		0.000
Longitude	W	161.580
		0.000
Z (in m)		-15

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:** R. Hanson

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

1) Around Goodnews and Chagvan Bays.  
 2) Climate: Polar, Tundra type with winds coming from SW to W from June to August and NNE to E from September to May.  
 3) Hydro: Sea frequently rough (wave size from 3 to 5 meters). Ice build-up begins at the end of October up to December and the break-up begins in April to the end of June.  
 4) Works performed: Onshore fluvial platinum-gold placers worked from 1926-1981. Platinum extraction restricted to fluvial channels draining ultrabasic massifs from Red Mountain. From 1927 to 1934 only small companies were working on the river channel; from 1934 to 1975, Goodnews Bay Mining Co. extracted 534, 000 oz of platinum (83% Pt); Mine stoped in 1976; in 1980 R. Hanson re-opens the mine and makes a joint venture with Ahston Mining Ltd.. Sampling and magnetic surveys were carried out by USBM.  
 5) Characteristics of the deposit: Possible economic concentrations of platinum and gold in offshore sands. Favourable environment for platinum, gold and chromite enrichment include: covered paleofluvial channels; younger paleofluvial channels with less marine sediment overburden; beach deposits, particularly in the upper wash zone and near back beach; paleo-strand lines; inside the mouths of Goodnews and Chagvan Bays; and the base of far offshore tidal ridges. Reserve evaluation: 500,000 oz. (14 t) grade 0.8 to 1 g/m<sup>3</sup> Pt. Hypothetical sub-economic resources in offshore placers are estimated to be 5 million oz (142 t).

**References:**

Anonymous, 1987. An economic reconnaissance of selected heavy mineral placer deposits in the U.S. EEZ, Bureau of Mines OFR 4-87.

Occurrence   
 Deposit   
 Deposit/File

**NAME: CASTLE ISLAND**

**Commodities:** Ba **Type of deposit:** stratiform  
**Country:** USA **US** **District:** Alaska

**Marine area:** Pacific N

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	inner shelf
<b>Morpho. 1</b>	stratiform
<b>Morpho. 2</b>	
<b>Petrography</b>	rock
<b>Mineralogy</b>	barytine limestone

**COORDINATES**

Latitude	N	56.800
(Decimal °)		0.000
Longitude	W	132.960
		0.000
Z (in m)		0 to -5

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

- 1) Near Petersburg. Alaska.
- 2) Climate: subarctic with winds coming from SW to W from June to August and NNE to E from September to May.
- 3) Hydro: Sea frequently rough (wave size from 3 to 5 meters).
- 4) Works performed: between 1967 and 1979, barite was mined offshore in Castle island. The ore was drilled and blasted underwater; the broken ore was then recovered by a clam shell and loaded onto a bottom-dump barge, which was towed close to shore and opened; the rock was then pulled ashore with a drag line, crushed and stockpiled. Originally the barite was loaded directly onto an ocean vessel in batches of 20,000 tons or more. Later a heavy media cleaning circuit and bagging plant was added. About 100,000 tons of barite were mined each year.
- 5) Characteristics of the deposit: stratiform.

**References:**

Conwell, 1976. Progress and prospects in Marine mining in Alaska, Alaska Div. of Geol. & Geop. Survey, IC 22.



Occurrence   
 Deposit   
 Deposit/File

**NAME: BAIE DE LUNENBERG**

<b>Commodities:</b> Au Sn		<b>Type of deposit:</b> placer paleomoraine	
<b>Country:</b> Canada		CA	<b>District:</b> Nova Scotia

**Marine area:** Atlantic NW

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**COORDINATES**

Latitude	N	44.340
(Decimal °)		0.000
Longitude	W	64.280
		0.000
Z (in m)		

**TYOLOGY**

<b>Zone type</b>	shelf
<b>Morpho. 1</b>	paleomoraine
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	gold cassiterite

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

- 1) Distance from the coast 1 mile.
- 2) Climate: Humid continental. Mean annual precipitation 1000 mm. Prevailing winds from NW (January) and SW (July).
- 3) Hydro: NE Prevailing current direction (cold Labrador current extension), and SW warm Gulf stream current. Semidiurnal tide (1.8 m maxi).
- 5) Characteristic of the deposit: Gold is associated with morainic glacial formations reworked by the sea. (4 \$/cuyard)

**References:**

Manheim F.T., 1971. Mineral resources of North East Coast of United States, Proceedings of the conference on World Ocean Resources, 20 Nov. 1971.

Occurrence   
 Deposit   
 Deposit/File

**NAME: GILLESPIES BEACH**

**Commodities:** Au **Type of deposit:** placer beach paleobeach  
**Country:** New Zealand **NZ** **District:** South Island

**Marine area:** Pacific SW, Tasman sea

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	on land foreshore inner shelf
<b>Morpho. 1</b>	beach paleobeach
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	gold

**COORDINATES**

Latitude	S	-43.430
(Decimal °)		0.000
Longitude	E	-169.840
		0.000
Z (in m)		0, -9 et -15

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:** CRA Exploration Pty

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**  
 1) South Island.  
 2) Climate: Marine, West coast, hot and humid. Mean annual rainfall 1221 mm, maxi. during June, July and August. Winds: North to East 18-147 km/h.  
 3) Hydro: Westland Current from the North-East 0.5 m/s. Urville current from East to Southeast 0,01-0,13 m/s. Swell W-SW.  
 4) Works performed: Exploitation of beach placers.  
 5) Characteristics of the deposit: Primary deposits (gold veins) are located in Precambrian formations and volcanic tertiary rocks. At Gillespies beach, gold is disseminated in Alpine schists which are outcropping in the area. Gold has been transported to the coast or nearby, over several periods of time and through different host rocks, like "Old man gravels" and Pleistocene glacial formations. The present beaches are not the only ones to be exploited; old shoreline located 150 m and 50-60 m above sea level has also been worked to profit. Lagoon, located not far away from the actual shoreline, have been dredged to recover sediments located 9 and 15 m below sea level and corresponding to old shorelines. Gold is difficult to recover as it is too fine.

**References:**

Occurrence   
 Deposit   
 Deposit/File

**NAME: FREETOWN PENINSULA**

**Commodities:** Pt Ti Au      **Type of deposit:** placer paleovalley  
**Country:** Sierra Leone      SL      **District:**

**Marine area:** Atlantic E, Guinea gulf

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**TYOLOGY**

<b>Zone type</b>	inner shelf
<b>Morpho. 1</b>	paleochannel
<b>Morpho. 2</b>	ultrabasic
<b>Petrography</b>	coarse sand
<b>Mineralogy</b>	platinum gold ilmenite

**COORDINATES**

Latitude	N	8.250
(Decimal °)		0.000
Longitude	W	18.330
		0.000
Z (in m)		-10 to -30

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 2/15/95

**Company:** Cominco

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

- 1) The most immediate potential area is located from backshore to 5 km offshore.
- 2) Climate: Tropical humid, wet season from March to November. Mean annual rainfall 3640 mm.
- 3) Hydro: Sea clear. Tide slight. Dominant swell from the north. Slight currents.
- 4) Works performed: Geophysical survey (seismic and Magnetism), sampling (100x500 grid).
- 5) Characteristics of the deposit: The Freetown complex is a layered lopolith with a radius of + 30 km, largely submerged in the Atlantic Ocean. The eastern rim form the Freetown peninsula which is composed of gabbros, troctolites and anorthosites. The latter host the ilmenite and platinum. Between 1930 and 1950, 5000 oz (142 kg) of platinum were recovered from small onshore alluvial placers. The lopolith has been dated to 180 My, which correlates with the opening up of the Atlantic ocean. The marine seismic survey has indicated multiple channels several hundreds of meters wide, 6 to 8 m and possibly even 12 m deep which represent a drowned paleo drainage.

**References:**

Anonymous. The offshore Pt/Ti potential of the Freetown complex, Sierra Leone.

Occurrence   
 Deposit   
 Deposit/File

**NAME: ARIAKE BAY**

**Commodities:** TiFe **Type of deposit:** placer paleobeach  
**Country:** Japan **JP** **District:** Kyushu

**Marine area:** Pacific NW, China E Yellow sea Huanghai

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**COORDINATES**

Latitude	N	32.890
(Decimal °)		0.000
Longitude	E	-130.110
		0.000
Z (in m)		-20

**TYOLOGY**

<b>Zone type</b>	shelf
<b>Morpho. 1</b>	paleobeach
<b>Morpho. 2</b>	
<b>Petrography</b>	medium siliceous sand
<b>Mineralogy</b>	titanomagnetite

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 3/2/95

**Company:** Ariake Steel Co.

	<b>Ore</b>	<b>Heavy minerals</b>	<b>Commodities</b>
<b>Grades</b>	3.74%(1.81 to 6.34)		concentrate 56% F
<b>Tonnage</b>			36.4 Mt

**Description:**

1) Located on the west part of Kyushu island. The area of interest is offshore 2 km from backshore.  
 2) Climate: Subtropical humid. Wet season September, October. Mean annual rainfall 1700 mm. Wind direction: N in January and S in July.  
 3) Hydro: water temperature 2-24° C.  
 4) Works performed: Geophysical survey (sonoprobe, sparker, mag), drilling.  
 5) Characteristics of the deposit: discovered in the 1960's by the Ariake Steel Cy. The mineralization is located on paleobeaches (-10 m), (-20 m) roughly parallel to the shore or in paleochannels. The quaternary lithologic succession could be defined from top to bottom as follows: 1) sands and ooze with shell fragments; 2) sands and limy seaweed; 3) gravels; 4) old alluviums (clay). The regional geology is represented by tertiary and quaternary volcanic rocks (basaltic, andesitic, rhyolitic compositions). The origin of magnetic minerals is Aso and Hunzer volcano lavas. Erosion during glacial cycle and transgression during interglacial periods allowed freeing, transport and reconcentration of magnetite. Surface covered: rich deposit 79 km<sup>2</sup>, low grade one 97 km<sup>2</sup>., thickness 2.7-3 m. The average grade is 3,74% of titano-magnetite (6,34%-1,81%). Chemical analysis: Fe++ 55.6%, TiO<sub>2</sub> 11.64%, SiO<sub>2</sub> 3.80%, Al<sub>2</sub>O<sub>3</sub> 1.98%, S 0.29%, P 0.261%, Cu 0.002%, Ni traces, Cr 0.03%, V 0.20%. No exploitation due to environmental conflict with fishermen syndicate.

**References:**

BRGM, 1973. Mission d'information en Australie et au Japon, BRGM 73 SGN 019 MAR, unpublished.

Occurrence   
 Deposit   
 Deposit/File

NAME: **BEPPU**

**Commodities:** Fe Ti      **Type of deposit:** placer paleobeach  
**Country:** Japan      JP      **District:** Kyushu

**Marine area:** Pacific NW, China E Yellow sea Huanghai

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	on land backshore foreshore
<b>Morpho. 1</b>	beach paleobeach
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	magnetite ilmenite

**COORDINATES**

Latitude	N	33.290
(Decimal °)		0.000
Longitude	E	-131.550
		0.000
Z (in m)		

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

- 1) NE of Kyushu island, Hayasui Seto.
- 2) Climate: Subtropical humid. Average annual rainfall 1700 mm; maxi. during September-October. Prevailing surface winds from NW to S or SE (January), from SE (July). Tropical storm tracks from the SW to NE and S to N (May-November).
- 3) Hydro: Clockwise North Pacific current circulations, Kuroshio current flowing NE.
- 4) Works performed: Geophysical prospecting (magnetic and sonic methods); sampling gridding 1000x1000 m; ore dressing test.
- 5) Characteristics of the deposit: The geological formations existing around the area are represented by tertiary and quaternary volcanic rocks. Magnetite and ilmenite are the predominant HM. Known onshore placer deposits: 1) Oita deposit (plain diluvium, upland terrace); grades: low Fe 7.62% medium 31.44% wt% TiO2 low 2.02% medium 13.38% wt%; Ore tonnage reserves: 279,415 t. 2) Kunisaki deposit: (beach, backshore) grades: low 11.54% medium 31.29% high 50.44% wt%, TiO2 low 3.40%, 12.16% wt%. Ore tonnage reserves 66,773 t.

**References:**

- 1) Okano T., 1968. Offshore detrital heavy minerals in Japan, BGSJ, 19 (6).
- 2) BRGM, 1973. Mission d'information en Australie et au Japon, BRGM 73 SGN 019 MAR, unpublished.

Occurrence   
 Deposit   
 Deposit/File

**NAME: AKUNE**

**Commodities:** Fe Ti      **Type of deposit:** placer beach  
**Country:** Japan      JP      **District:** Kyushu

**Marine area:** Pacific NW, China E Yellow sea Huanghai

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	beach foreshore
<b>Morpho. 1</b>	beach
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	magnetite ilmenite

**COORDINATES**

Latitude	N	32.040
(Decimal °)		0.000
Longitude	E	-130.160
		0.000
Z (in m)		

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

- 1) South east of Kyushu island.
- 2) Climate: Subtropical humid. Average annual rainfall 1700 mm; maxi. during September-October. Prevailing surface winds from NW to S or SE (January), from SE (July). Tropical storm tracks from the SW to NE and S to N (May-November).
- 3) Hydro: Clockwise North Pacific current circulations, Kuroshio current flowing NE.
- 4) Works performed: Geophysical prospecting (magnetic and sonic methods); sampling gridding 500x500 m dredging.
- 5) Characteristics of the deposit: The geological formations existing around the area are represented by basalts and tertiary rhyolites. Magnetite and ilmenite are the predominant HM. Known onshore placer deposit: Akune beach deposit (beach, backshore); grades: low Fe 40.11% medium 54.05% wt% TiO2 low 15.82% medium 18.54 % wt%. Ore tonnage reserves: 330 t.

**References:**

- 1) Okano T., 1968. Offshore detrital heavy minerals in Japan, BGSJ, 19 (6).
- 2) BRGM, 1973. Mission d'information en Australie et au Japon, BRGM 73 SGN 019 MAR, unpublished.

Occurrence   
 Deposit   
 Deposit/File

**NAME: SENDAI**

**Commodities:** Fe Ti      **Type of deposit:** placer beach  
**Country:** Japan      **JP**      **District:** Kyushu

**Marine area:** Pacific NW, China E Yellow sea Huanghai

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	beach foreshore backshore
<b>Morpho. 1</b>	beach
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	magnetite ilmenite

**COORDINATES**

Latitude	N	31.860
(Decimal °)		0.000
Longitude	E	-130.160
		0.000
Z (in m)		

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			1 760 t

**Description:**

1) South east of the Kyushu island.  
 2) Climate: Subtropical humid. Average annual rainfall 1700 mm; maxi. during September-October. Prevailing surface winds from NW to S or SE (January), from SE (July). Tropical storm tracks from the SW to NE and S to N (May-November).  
 3) Hydro: Clockwise North Pacific current circulations, Kuroshio current flowing NE.  
 4) Works performed: Geophysical prospecting (magnetic and sonic methods); sampling gridding 500x500 m dredging.  
 5) Characteristics of the deposit: The geological formations existing around the area are represented by basalts and andesites Neogene. Magnetite and ilmenite are the predominant HM. Waste: quartz, pyroxene, hornblende. Known onshore placer deposits: Sendai beach deposit (beach, backshore); grades: low Fe 30.23% high 53.95% wt% TiO2 low 9.64% high 16.06 % wt%. Ore tonnage reserves: 1,760 t.

**References:**

1) Okano T., 1968. Offshore detrital heavy minerals in Japan, BGSJ, 19 (6). 2) BRGM, 1973. Mission d'information en Australie et au Japon, BRGM 73 SGN 019 MAR, unpublished.

Occurrence   
 Deposit   
 Deposit/File

**NAME: EI IRINO-BEPPU**

**Commodities:** Fe Ti      **Type of deposit:** placer beach  
**Country:** Japan      JP      **District:** Kyushu

**Marine area:** Pacific NW, China E Yellow sea Huanghai

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	beach foreshore backshore
<b>Morpho. 1</b>	beach
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	magnetite ilmenite

**COORDINATES**

Latitude	N	31.250
(Decimal °)		0.000
Longitude	E	-130.410
		0.000
Z (in m)		

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			186 000 + 100 000 t

**Description:**

1) South of Kyushu island.  
 2) Climate: Subtropical humid. Average annual rainfall 1700 mm; maxi. during September-October. Prevailing surface winds from NW to S or SE (January), from SE (July). Tropical storm tracks from the SW to NE and S to N (May-November).  
 3) Hydro: Clockwise North Pacific current circulations, Kuroshio current flowing NE.  
 4) Works performed: Geophysical prospecting (magnetic and sonic methods); sampling gridding 500x500 m dredging.  
 5) Characteristics of the deposit: The geological formations existing around the area are represented by basalts and tertiary volcanic rocks. Magnetite and ilmenite are the predominant HM. Waste: quartz, pyroxene, hornblende, olivine. Known onshore placer deposit: EI beach deposit (beach, backshore); grades: low Fe 20.95% high 52.06% wt% TiO2 low 6.92% high 11.76 % wt%. Ore tonnage reserves: 186,000 t + 100,000 t (probable).

**References:**

1) Okano T., 1968. Offshore detrital heavy minerals in Japan, BGSJ, 19 (6). 2) BRGM, 1973. Mission d'information en Australie et au Japon, BRGM 73 SGN 019 MAR, unpublished.



Occurrence   
 Deposit   
 Deposit/File

**NAME: NAGASAKIBANA**

<b>Commodities:</b> Fe Ti	<b>Type of deposit:</b> placer beach	
<b>Country:</b> Japan	JP	<b>District:</b> Kyushu

**Marine area:** Pacific NW, China E Yellow sea Huanghai

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	foreshore backshore
<b>Morpho. 1</b>	beach
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	magnetite ilmenite

**COORDINATES**

Latitude	N	31.150
(Decimal °)		0.000
Longitude	E	-130.570
		0.000
Z (in m)		

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			753 000 + 156 000 t

**Description:**

1) South Kyushu island.  
 2) Climate: Subtropical humid. Average annual rainfall 1700 mm; maxi. during September-October. Prevailing surface winds from NW to S or SE (January), from SE (July). Tropical storm tracks from the SW to NE and S to N (May-November).  
 3) Hydro: Clockwise North Pacific current circulations, Kuroshio current flowing NE.  
 4) Works performed: Geophysical prospecting (magnetic and sonic methods); sampling gridding 500x500 m dredging.  
 5) Characteristics of the deposit: The geological formations existing around the area are represented by basalts and tertiary volcanic rocks. Magnetite and ilmenite are the predominant HM. Waste: quartz, pyroxene, hornblende, olivine. Known onshore placer deposit: Nagasakibana beach deposit (beach, backshore); grades: low Fe 16.70% high 58.40% wt% TiO2 low 2.74% high 10.40 % wt%. Ore tonnage reserves: 53,000t + 156,000 t (probable).

**References:**

Okano T., 1968. Offshore detrital heavy minerals in Japan, BGSJ, 19 (6).

Occurrence   
 Deposit   
 Deposit/File

**NAME: ISUBUKI**

**Commodities:** Fe Ti **Type of deposit:** placer beach  
**Country:** Japan **JP** **District:** Kyushu

**Marine area:** Pacific NW, China E Yellow sea Huanghai

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	foreshore backshore
<b>Morpho. 1</b>	beach
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	magnetite ilmenite

**COORDINATES**

Latitude	N	31.150
(Decimal °)		0.000
Longitude	E	-130.650
		0.000
Z (in m)		

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			5 000 t

**Description:**

- 1) South Kyushu island.
- 2) Climate: Subtropical humid. Average annual rainfall 1700 mm; maxi. during September-October. Prevailing surface winds from NW to S or SE (January), from SE (July). Tropical storm tracks from the SW to NE and S to N (May-November).
- 3) Hydro: Clockwise North Pacific current circulations, Kuroshio current flowing NE.
- 4) Works performed: Geophysical prospecting (magnetic and sonic methods); sampling gridding 500x500 m dredging.
- 5) Characteristics of the deposit: The geological formations existing around the area are represented by basalts and tertiary volcanic rocks. Magnetite and ilmenite are the predominant HM. Waste: quartz, pyroxene, hornblende, olivine, biotite. Known onshore placer deposit: Isubuki beach deposit (beach, backshore); grades: low Fe 19.79% high 55.75% wt% TiO2 low 3.63% high 7.30 % wt%. Ore tonnage reserves: 5,000 t.

**References:**

- 1) Okano T., 1968. Offshore detrital heavy minerals in Japan, BGSJ, 19 (6).
- 2) BRGM, 1973. Mission d'information en Australie et au Japon, BRGM 73 SGN 019 MAR, unpublished.

Occurrence   
 Deposit   
 Deposit/File

**NAME: TARUMIZU-ONEZIME**

**Commodities:** TiFe **Type of deposit:** placer beach  
**Country:** Japan **JP** **District:** Kyushu

**Marine area:** Pacific NW, China E Yellow sea Huanghai

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	foreshore backshore
<b>Morpho. 1</b>	beach
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	titanomagnetite

**COORDINATES**

Latitude	N	31.500
(Decimal °)		0.000
Longitude	E	-130.630
		0.000
Z (in m)		

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			3 000 t + 750 000 t

**Description:**

- 1) South of Kyushu island.
- 2) Climate: Subtropical humid. Average annual rainfall 1700 mm; maxi. during September-October. Prevailing surface winds from NW to S or SE (January), from SE (July). Tropical storm tracks from the SW to NE and S to N (May-November).
- 3) Hydro: Clockwise North Pacific current circulations, Kuroshio current flowing NE.
- 4) Works performed: Geophysical prospecting (magnetic and sonic methods); sampling gridding 500x500 m dredging and drilling; mining.
- 5) Characteristics of the deposit: The geological formations existing around the area are represented by basalts and tertiary volcanic rocks. Magnetite and ilmenite are the predominant HM. Waste: quartz, pyroxene, hornblende, olivine, biotite. Known onshore placer deposit: Tarumizu-Onejime beach deposit (beach, backshore); grades: low Fe 40.32-37.04% high 51.45-50.78%.wt% TiO2 low 5.31-8.05% high 11.22-12.00 % wt%. Ore tonnage reserves: 10,500 t.

**References:**

- 1) Okano T., 1968. Offshore detrital heavy minerals in Japan, BGSJ, 19 (6).
- 2) BRGM, 1973. Mission d'information en Australie et au Japon, BRGM 73 SGN 019 MAR, unpublished.

Occurrence   
 Deposit   
 Deposit/File

**NAME: VOLCANO BAY**

**Commodities:** TiFe **Type of deposit:** placer paleovalley  
**Country:** Japan **JP** **District:** Hokkaido

**Marine area:** Pacific NW, China E Yellow sea Huanghai

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**TYOLOGY**

<b>Zone type</b>	inner shelf
<b>Morpho. 1</b>	paleochannel
<b>Morpho. 2</b>	
<b>Petrography</b>	medium siliceous sand
<b>Mineralogy</b>	titanomagnetite

**COORDINATES**

Latitude	N	42.140
(Decimal °)	N	42.320
Longitude	E	-140.630
	E	-140.280
Z (in m)		-10 to -30

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 3/2/95

**Company:**

	<b>Ore</b>	<b>Heavy minerals</b>	<b>Commodities</b>
<b>Grades</b>	3%		concentrate 60% Fe
<b>Tonnage</b>			5.43 Mt

**Description:**

1) Volcano bay is located at the south-east of Hokkaido island. The area of interest is situated 1 km from the shore and covers an area of 180 km<sup>2</sup>.  
 2) Climate: Continental  
 4) Works performed: 1965-67 Magnetometry 240 km<sup>2</sup>, drilling, vibrocoring (158) lines parallel to shore line or grid (1x0.5 km).  
 5) Characteristics of the deposit: Regional geology shows tertiary and quaternary volcanic formations overlying Mesozoic sedimentary sequence (alternation of detritic, carbonate, volcanic rocks). Volcanics are represented by basalt, andesite and rhyolite. The unconsolidated sediments are constituted by gravels, sands and silts with near the surface numerous pumice fragments. The thickness is variable, 5-30 m, with sometimes along NS and EW directions thickenings which could represent paleochannel from concealed paleovalley. The percentage of useful mineral is around 3%. Magnetite (90%), ilmenite (3%) and hematite (3%) represent the heavy mineral composition. Chemical analysis: Fe 10.83%, FeO 6.75%, Fe<sub>2</sub>O<sub>3</sub> 7.98%, TiO<sub>2</sub> 1.52%, Al<sub>2</sub>O<sub>3</sub> 0.02%, V<sub>2</sub>O<sub>5</sub> 0.14%, P<sub>2</sub>O<sub>5</sub> 0.11%, S 0.08%. The deposit is represented by numerous lenses showing the following characteristics: L 4000-2000 m, l: 1000-2000 m, e: 1.5-10 m.

**References:**

Shuji Maruyama, 1969. Iron sand ore exploration in the Volcano bay, Hokkaido, Japan, C.C.O.P (Bangkok), May 1969.

Occurrence   
 Deposit   
 Deposit/File

**NAME: SABISHIRO-HACHINOBE**

**Commodities:** Fe Ti      **Type of deposit:** placer beach  
**Country:** Japan      JP      **District:** Honshu N

**Marine area:** Pacific NW

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	foreshore backshore
<b>Morpho. 1</b>	beach
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	magnetite ilmenite

**COORDINATES**

Latitude	N	40.620
(Decimal °)		0.000
Longitude	E	-141.520
		0.000
Z (in m)		

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 2/20/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			122 750 t

**Description:**

- 1) South of Kyushu island.
- 2) Climate: Subtropical humid. Average annual rainfall 1700 mm; maxi. during September-October. Prevailing surface winds from NW to S or SE (January), from SE (July). Tropical storm tracks from the SW to NE and S to N (May-November).
- 3) Hydro: Clockwise North Pacific current circulations, Kuroshio current flowing NE.
- 4) Works performed: Geophysical prospecting (magnetic and sonic methods); sampling gridding 500x500 m dredging and drilling; mining.
- 5) Characteristics of the deposit: The geological formations existing around the area are represented by basalts and tertiary volcanic rocks. Magnetite and ilmenite are the predominant HM. Waste: quartz, pyroxene, hornblende, olivine, biotite. Known onshore placer deposit: Tarumizu-Onejime beach deposit (beach, backshore); grades: low Fe 40.32-37.04% high 51.45-50.78%.wt% TiO2 low 5.31-8.05% high 11.22-12.00 % wt%. Ore tonnage reserves: 10,500 t.

**References:**

- 1) Okano T., 1968. Offshore detrital heavy minerals in Japan, BGSJ, 19 (6).
- 2) BRGM, 1973. Mission d'information en Australie et au Japon, BRGM 73 SGN 019 MAR, unpublished.

Occurrence   
 Deposit   
 Deposit/File

**NAME: TIOKA**

**Commodities:** Fe Ti      **Type of deposit:** placer beach  
**Country:** Japan      JP      **District:** Honshu center

**Marine area:** Pacific NW

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	foreshore backshore
<b>Morpho. 1</b>	beach
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	magnetite ilmenite hematite

**COORDINATES**

Latitude	N	34.820
(Decimal °)		0.000
Longitude	E	-139.850
		0.000
Z (in m)		

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 2/20/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			983 729t + 3277208t

**Description:**

- 1) South of Kyushu island.
- 2) Climate: Subtropical humid. Average annual rainfall 1700 mm; maxi. during September-October. Prevailing surface winds from NW to S or SE (January), from SE (July). Tropical storm tracks from the SW to NE and S to N (May-November).
- 3) Hydro: Clockwise North Pacific current circulations, Kuroshio current flowing NE.
- 4) Works performed: Geophysical prospecting (magnetic and sonic methods); sampling gridding 500x500 m dredging and drilling; mining.
- 5) Characteristics of the deposit: The geological formations existing around the area are represented by basalts and tertiary volcanic rocks. Magnetite and ilmenite are the predominant HM. Waste: quartz, pyroxene, hornblende, olivine, biotite. Known onshore placer deposit: Tarumizu-Onejime beach deposit (beach, backshore); grades: low Fe 40.32-37.04% high 51.45-50.78%.wt% TiO2 low 5.31-8.05% high 11.22-12.00 % wt%. Ore tonnage reserves: 10,500 t.

**References:**

- 1) Okano T., 1968. Offshore detrital heavy minerals in Japan, BGSJ, 19 (6).
- 2) BRGM, 1973. Mission d'information en Australie et au Japon, BRGM 73 SGN 019 MAR, unpublished.

Occurrence   
 Deposit   
 Deposit/File

**NAME: OHATA**

**Commodities:** Fe Ti      **Type of deposit:** placer beach  
**Country:** Japan      JP      **District:** Honshu N

**Marine area:** Pacific NW

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	foreshore backshore
<b>Morpho. 1</b>	beach
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	magnetite hematite ilmenite

**COORDINATES**

Latitude	N	41.410
(Decimal °)		0.000
Longitude	E	-141.160
		0.000
Z (in m)		

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 2/20/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			791 000t + 620 000t

**Description:**

- 1) North Honshu. Aomori Pref., close to the Ohata-Noushi beach placers.
- 2) Climate: Subtropical humid. Average annual rainfall 1700 mm; maxi. during September-October. Prevailing surface winds from NW to S or SE (January), from SE (July). Tropical storm tracks from the SW to NE and S to N (May-November).
- 3) Hydro: Clockwise North Pacific current circulations, Kuroshio current flowing NE.
- 4) Works performed: Geophysical prospecting (magnetic and sonic methods). Sampling (sand pump, diver) gridding 200x200 m.
- 5) Characteristics of the deposit: The geological formations existing around the area are represented by basalts and tertiary volcanic rocks. Magnetite, hematite and ilmenite are the predominant HM. Waste: quartz, feldspar, hypersthene. Known onshore placer deposit: Ohata beach deposit (backshore); grades: low Fe 35.18% high 53.58% wt% TiO2 low 3.57% high 9.63 % wt%. Ore tonnage reserves: 0.791 Mt + 0.62 Mt (probable).

**References:**

- 1) Okano T., 1968. Offshore detrital heavy minerals in Japan, BGSJ, 19 (6).
- 2) BRGM, 1973. Mission d'information en Australie et au Japon, BRGM 73 SGN 019 MAR, unpublished.

Occurrence   
 Deposit   
 Deposit/File

**NAME: TOKYO BAY**

**Commodities:** Fe Ti      **Type of deposit:** placer beach  
**Country:** Japan      JP      **District:** Honshu center

**Marine area:** Pacific NW

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**COORDINATES**

Latitude	N	35.530
(Decimal °)		0.000
Longitude	E	-140.000
		0.000
Z (in m)		

**TYOLOGY**

<b>Zone type</b>	foreshore
<b>Morpho. 1</b>	beach
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	magnetite ilmenite

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 2/20/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

- 1) Honshu east side.
- 2) Climate: Subtropical humid. Average annual rainfall 1700 mm; maxi. during September-October. Prevailing surface winds from NW to S or SE (January), from SE (July). Tropical storm tracks from the SW to NE and S to N (May-November).
- 3) Hydro: Clockwise North Pacific current circulations, Kuroshio current flowing NE.
- 4) Works performed: Geophysical prospecting (magnetic and sonic methods). Test mining and prospect . Sampling (sand pump).
- 5) Characteristics of the deposit: The geological formations existing around the area are represented by basalts and tertiary volcanic rocks. Magnetite, hematite and ilmenite are the predominant HM. Grades: low Fe 3.49% high 10.25% wt% TiO2 low 0.48% high 1.61 % wt%.

**References:**

- 1) Okano T., 1968. Offshore detrital heavy minerals in Japan, BGSJ, 19 (6). 2) BRGM, 1973. Mission d'information en Australie et au Japon, BRGM 73 SGN 019 MAR, unpublished.



Occurrence   
 Deposit   
 Deposit/File

**NAME: NAUKI-KUSHIMOTO**

**Commodities:** Fe Ti      **Type of deposit:** placer beach  
**Country:** Japan      JP      **District:** Honshu S

**Marine area:** Pacific NW

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	foreshore backshore
<b>Morpho. 1</b>	beach
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	magnetite ilmenite

**COORDINATES**

Latitude	N	33.450
(Decimal °)		0.000
Longitude	E	-135.830
		0.000
Z (in m)		

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			Possible 1 100 t

**Description:**

1) South Honshu  
 2) Climate: Subtropical humid. Average annual rainfall 1700 mm; maxi. during September-October. Prevailing surface winds from NW to S or SE (January), from SE (July). Tropical storm tracks from the SW to NE and S to N (May-November).  
 3) Hydro: Clockwise North Pacific current circulations, Kuroshio current flowing NE.  
 4) Works performed: Geophysical prospecting (magnetic and sonic methods). Sampling.  
 5) Characteristics of the deposit: The geological formations existing around the area are represented by basalts and tertiary volcanic rocks. Magnetite, and ilmenite are the predominant HM. Waste: quartz, feldspar, pyroxene.  
 Nanki-Kushimoto beach and submarine deposit (backshore, foreshore); grades: low Fe 1.61% high 18.01% wt% TiO2 low 0.66% high 17.52 % wt%. Ore tonnage reserves: 1 100 t.

**References:**

1) Okano T., 1968. Offshore detrital heavy minerals in Japan, BGSJ, 19 (6). 2) BRGM, 1973. Mission d'information en Australie et au Japon, BRGM 73 SGN 019 MAR, unpublished.

Occurrence   
 Deposit   
 Deposit/File

**NAME: LINGAYEN BAY**

**Commodities:** Fe Ti      **Type of deposit:** placer paleobeach  
**Country:** Philippines      PH      **District:** Luzon island

**Marine area:** Pacific W, China S sea, Nanhai

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**TYOLOGY**

<b>Zone type</b>	foreshore inner shelf
<b>Morpho. 1</b>	paleobeach
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	ilmenite chromite titanomagnet

**COORDINATES**

Latitude	N	16.200
(Decimal °)		0.000
Longitude	E	-120.300
		0.000
Z (in m)		-8

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>		Fe 58% TiO2 8%	Fe 60 % TIO2 7.2 %
<b>Tonnage</b>		7.4 Mt	

**Description:**

1) Located in the NW of Luzon island. 5 km from the shore.  
 2) Climate: Tropical, equatorial forest type. Maxi. rainfall: July-August. Mean annual rainfall 2160 mm. Temperature 20-30°C.  
 4) Works performed: Drilling (48) rope boring and pump boring.  
 5) Characteristics of the deposit: The magnetite sand deposit constitutes part of a submerged sand bar 4 km west of Damortis Bay which is underlain by recent gravel and coarse sand mixed with a few shells. These sediments, including the magnetite sand, were brought into Lingayen Gulf by the Bued and Agno rivers, with headwaters near Benguet, and which cut through the volcanic, sedimentary and intrusive rock complexes of the Baguio Mineral district and the sedimentary rocks of the Rosario formation in La Union. The topography of the area consists of a shallow undersea hill or sand bar with an eastern landward side steep. It is believed that the sand bar was developed by along shore currents which are still active in the area. The sand is composed mainly of quartz grains; pyroxene and hornblende are common while andesite and chert fragments are sometimes included. In addition to the magnetite, other heavy minerals included in the sand are ilmenite, chromite and rarely gold. Mineralised zone: parallel to the shore line, 7-8m below sea level, dimensions: L 7-8 km, l: 0.5-3 km, e: average 2.6 m. Grade 9.4% magnetic minerals. The average content of the concentrates is: 59.5-61.2% Fe and 7- 7.5% TiO2. Chemical analysis: Fe 58%, TiO2 8%, Al2O3 3%, SiO2 3%, P 0.2%, H2O 10%, granulometry 100 mesh <30%.

**References:**

Caguat A. & al., 1971. Report on investigation of offshore magnetite sand deposits in Lingayen Gulf, Philippines, Ecate CCOP/AO.

Occurrence   
 Deposit   
 Deposit/File

**NAME: WAIKATO RIVER**

**Commodities:** TiFe **Type of deposit:** placer paleobeach  
**Country:** New Zealand **NZ** **District:** North Island

**Marine area:** Pacific SW, Tasman sea

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	inner shelf
<b>Morpho. 1</b>	paleobeach
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	titanomagnetite

**COORDINATES**

Latitude	S	-37.370
(Decimal °)	S	-36.450
Longitude	E	-174.700
	E	-174.110
Z (in m)		-20 to -40

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>		3-36% of Titanomag.	Fe 55% TiO2 9%
<b>Tonnage</b>			

**Description:**

1) On the North Island west coast, between Kalpara Harbour and Wangachu River.  
 2) Climate: Marine, West coast, hot and humid. Mean annual rainfall 1221 mm, maxi. during June July and August. Winds: North to East 18-147 km/h.  
 3) Hydro: Westland Current from the North-East 0.5 m/s. Urville current from East to Southeast 0.01-0.13 m/s. Swell W-SW.  
 4) Works performed: 1959-60 magnetometry, drilling: vibracores (23), sampling (103).  
 5) Characteristics of the deposit: The regional geology is represented by Tertiary volcanic formations overlying Palaeozoic and Mesozoic graywacke formations. The shelf, 32 km wide in the north and 220 km wide by Cook Straits, dips gently to the sea (0.1-0.5%). The continental slope starts at -170 m. The inner shelf (0-40 m) is covered by recent terrigenous fine sands passing slowly to muddy sands (50-90% sands), sandy mud (10-50% sands) and finally to mud (<10% sands) when on the mid shelf. This granulometric tendency is reversed through the outer shelf, with an increase in coarse elements, biogenic sands and rocks fragments (hydraulic turbulence). The titanomagnetite (55% Fe, 9% TiO2) represents 3-36% of the heavy minerals (average 10%) and appears along 5 paleoshorelines. For the Waikato river area, the mineralised sand forms a narrow belt parallel to the coast running from the Waikato river to Kaipara harbour and lying 20-40 m below sea level. From 39% at the Waikato river estuary, the mineralisation grade decreases slowly to the NW. No mineralisation was found towards the south or on the outer shelf. Paleoshoreline exists 27 m below sea level. The titanomagnetite is derived from Taranaki andesitic rocks.

**References:**

1) Tixeron M. & Babot J., 1972. Géologie prévisionnelle pour la recherche des placers des plateaux continentaux, BRGM 72 SGN 109 MAR, 193, unpublished. 2) Carter L., 1980. Iron sand in continental shelf sediments off western New Zealand, a synopsis, NZ Journal of geology and geophysics, 23, 455-468.

- Occurrence
- Deposit
- Deposit/File

**NAME: MOKAU RIVER**

<b>Commodities:</b> TiFe		<b>Type of deposit:</b> placer paleobeach	
<b>Country:</b> New Zealand		NZ	<b>District:</b> North Island

**Marine area:** Pacific SW, Tasman sea

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**COORDINATES**

Latitude	S	-39.060
(Decimal °)	S	-39.400
Longitude	E	-174.050
	E	-174.000
Z (in m)		-40

**TYOLOGY**

<b>Zone type</b>	inner shelf
<b>Morpho. 1</b>	paleobeach
<b>Morpho. 2</b>	
<b>Petrography</b>	fine to medium sand
<b>Mineralogy</b>	titanomagnetite

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>		3-36% of Titanomag.	Fe 55% TiO2 9%
<b>Tonnage</b>			

**Description:**

1) On the North Island west coast, between Kalpara Harbour and Wangaeahu River.  
 2) Climate: Marine, West coast, hot and humid. Mean annual rainfall 1221 mm, maxi. during June July and August. Winds: North to East 18-147 km/h.  
 3) Hydro: Westland Current from the North-East 0.5 m/s. Urville current from East to Southeast 0.01-0.13 m/s. Swell W-SW.  
 4) Works performed: 1959-60 magnetometry, drilling: vibracores (23), sampling (103).  
 5) Characteristics of the deposit: The regional geology is represented by Tertiary volcanic formations overlying Palaeozoic and Mesozoic graywacke formations. The shelf, 32 km wide in the north and 220 km wide by Cook Straits, dips gently to the sea (0.1-0.5%). The continental slope starts at -170 m. The inner shelf (0-40 m) is covered by recent terrigenous fine sands passing slowly to muddy sands (50-90% sands), sandy mud (10-50% sands) and finally to mud (<10% sands) when on the mid shelf. This granulometric tendency is reversed through the outer shelf, with an increase in coarse elements, biogenic sands and rocks fragments (hydraulic turbulence). The titanomagnetite (55% Fe, 9% TiO2) represents 3-36% of the heavy minerals (average 10%) and appears along 5 paleoshorelines. In the Mokau river area, the mineralised zone forms a belt parallel to the coast, from Cape Egmont to Tirau point. The titanomagnetite concentration is high off the coast of New Plymouth (65% maxi.) and Mokau river (36% maxi.) but decreases towards the north. One paleoshoreline is located 27 m below sea level. A second belt, parallel to the first one (depth 75-100 m) but less mineralised (1-5%) extends from Cape Egmont to Auckland. Paleoshoreline 91 m below sea level. The titanomagnetite is derived from Taranaki andesitic rocks.

**References:**

1) Tixeron M. & Babot J., 1972. Gîtologie prévisionnelle pour la recherche des placers des plateaux continentaux, BRGM 72 SGN 109 MAR, 193, unpublished. 2) Carter L., 1980. Iron sand in continental shelf sediments off western New Zealand, a synopsis, NZ Journal of geology and geophysics, 23, 455-468.

Occurrence   
 Deposit   
 Deposit/File

NAME: **PATEA**

<b>Commodities:</b> TiFe	<b>Type of deposit:</b> placer paleobeach
<b>Country:</b> New Zealand	NZ <b>District:</b> North Island

**Marine area:** Pacific SW, Tasman sea

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	inner shelf
<b>Morpho. 1</b>	paleobeach
<b>Morpho. 2</b>	
<b>Petrography</b>	fine to medium sand
<b>Mineralogy</b>	titanomagnetite

**COORDINATES**

Latitude	S	-39.600
(Decimal °)	S	-40.000
Longitude	E	-174.200
	E	-175.020
Z (in m)		-20 to -40

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>	23 % titanomag.	Fe 55%	
<b>Tonnage</b>	12.25 Mt		

**Description:**

1) On the North Island west coast, between Kalpara Harbour and Wangaehu River.  
 2) Climate: Marine, West coast, hot and humid. Mean annual rainfall 1221 mm, maxi. during June July and August. Winds: North to East 18-147 km/h.  
 3) Hydro: Westland Current from the North-East 0.5 m/s. Urville current from East to Southeast 0.01-0.13 m/s. Swell W-SW.  
 4) Works performed: 1959-60 magnetometry, drilling: vibracores (23), sampling (103).  
 5) Characteristics of the deposit: The regional geology is represented by Tertiary volcanic formations overlying Palaeozoic and Mesozoic graywacke formations. The shelf, 32 km wide in the north and 220 km wide by Cook Straits, dips gently to the sea (0.1-0.5%). The continental slope starts at -170 m. The inner shelf (0-40 m) is covered by recent terrigenous fine sands passing slowly to muddy sands (50-90% sands), sandy mud (10-50% sands) and finally to mud (<10% sands) when on the mid shelf. This granulometric tendency is reversed through the outer shelf, with an increase in coarse elements, biogenic sands and rocks fragments (hydraulic turbulence). The titanomagnetite (55% Fe, 9% TiO2) represents 3-36% of the heavy minerals (average 10%) and appears along 5 paleoshorelines. A concentration (22% max.) occurs off Patea in 20-40 m depth. Contents decrease gradually to the Southeast away from Cape Egmont, but are locally high near Wanganui River. Further to the Southeast, iron sand again decreases, presumably because of dilution by river sands (Finch, 1947). Paleoshoreline is 27 m deep. Numerous black sand ridges (2-4% by weight iron sand) can be observed along that paleostructure. On shore titaniferous iron sand deposits at Patea occur in 3 distinct ways: 1) as water sorted sands on beaches; 2) in the form of terraces along the NW bank of the Patea river, near the mouth of that river; 3) as well-defined dunes running NW from the Patea river. A total tonnage of sand for the area has been evaluated at 12.25 Mt, that can produce a 23% titanomagnetite concentrate (53% Fe). The titanomagnetite is derived from Taranaki andesitic rocks.

**References:**

1) Tixeron M. & Babot J., 1972. Gîtologie prévisionnelle pour la recherche des placers des plateaux continentaux, BRGM 72 SGN 109 MAR, 193, unpublished. 2) Carter L., 1980. Iron sand in continental shelf sediments off western New Zealand, a synopsis, NZ Journal of geology and geophysics, 23, 455-468. 3) Finch, 1947.

Occurrence   
 Deposit   
 Deposit/File

**NAME: MATAIVA**

**Commodities:** phosphate      **Type of deposit:** phosphorite coralian  
**Country:** French Polynesia      **FR**      **District:** Tuamotu archipelago

**Marine area:** Pacific S

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**TYOLOGY**

<b>Zone type</b>	lagoon
<b>Morpho. 1</b>	bed karst
<b>Morpho. 2</b>	
<b>Petrography</b>	sand, ovoid pellets
<b>Mineralogy</b>	phosphate carbonate

**COORDINATES**

Latitude	S	-14.850
(Decimal °)		0.000
Longitude	W	148.700
		0.000
Z (in m)		-2 to -30

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 3/23/95

**Company:** G.I.E. Raro Moana

	Ore	Heavy minerals	Commodities
<b>Grades</b>			37.5 % P2O5
<b>Tonnage</b>			23.5 Mt P2O5

**Description:**

1) Inside the Mataiva lagoon.  
 2) Climate: Tropical (heavy rains, prevalent wind E to SE).  
 3) Hydro: Around the atoll, the sea, sometimes rough (strong swell associated with E to SE trade winds), allows refilling of the lagoon. Inside the lagoon, the current velocity remains weak with a general water movement from the south inlets to the NW outlets.  
 4) Works performed: Several drillings (714) and samplings (11500 ore tons). Feasibility study (Australmin, BRGM, Cominco, Raro Moana) concluded to non economic project due to high cost environmental preservation and construction of a warf outside the reef.  
 5) Characteristics of the deposit: The Mataiva Atoll is built up with coral colonies, set up over a volcanic basement. Geological formations are represented by reef limestones, coquinoid limestones, chalky limestone. The phosphatic beds are on the NW part of the atoll and overlie limy formations showing a karst morphology. The bed roof shape is regular but the wall shape is very irregular. The average thickness of the mineralised bed is around 2.5 m. Unconsolidated limy sediments cover the phosphatic bed (8.3 m average thickness). The phosphatic sandy portion of the mineralization shows a polymorphism, disclosing a very complex origin: very few ovoid, astructured pellets seem to correspond to a premonitory marine environment period; The phosphatic bone remains and bioclastic elements to a concentration mechanism inside the lagoon. The final agglomeration by a concretionary phosphate is a typical continental karstic evolution.

**References:**

BRGM, 1984. Projet d'exploitation des phosphates de Mataiva, BRGM internal report, unpublished.

Occurrence   
 Deposit   
 Deposit/File

**NAME: NIAU**

**Commodities:** phosphate      **Type of deposit:** phosphorite coralian  
**Country:** French Polynesia      FR      **District:** Tuamotu archipelago

**Marine area:** Pacific S

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	lagoon
<b>Morpho. 1</b>	bed karst
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	phosphate carbonates

**COORDINATES**

Latitude	S	-16.160
(Decimal °)		0.000
Longitude	W	146.330
		0.000
Z (in m)		

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

1) Tuamotu archipelago  
 2) Climate: Tropical, heavy rains. Prevalent wind E to SE.  
 3) Hydro: Around the atoll, the sea, sometimes rough (strong swell associated with E to SE trade winds), allows refilling of the lagoon. Inside the lagoon, the current velocity remains weak.  
 4) Characteristics of the deposit: The Niau Atoll is built up with coral colonies, set up over a volcanic basement. Geological formations are: reef limestones, coquinoïd limestones, chalky limestone. Phosphatic sands overlie coral substratum formation. The atoll dimension is 6 km and the maximum altitude 8 m.

**References:**

Germinal, 1984. Inventaire des ressources minérales sous-marines.

Occurrence   
 Deposit   
 Deposit/File

**NAME: HENDERSON ISLAND**

<b>Commodities:</b> phosphate	<b>Type of deposit:</b> phosphorite coralian
<b>Country:</b> Great Britain	<b>GB</b> <b>District:</b> Pitcairn archipelago

**Marine area:** Pacific S

**ADMINISTRATION**

**TYOLOGY**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

<b>Zone type</b>	lagoon
<b>Morpho. 1</b>	bed karst
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	

**COORDINATES**

Latitude	S	-24.370
(Decimal °)		0.000
Longitude	W	128.320
		0.000
Z (in m)		

**STAGE**

**MINING RIGHTS**

Exploration:       Free:   
 Mining:       Under control:   
 Processing:       Unknown:

Up-dated on: 3/16/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

2) Climate: Tropical, heavy rains. Prevalent wind E to SE.  
 3) Hydro: Around the atoll, the sea, sometimes rough (strong swell associated with E to SE trade winds), allows refilling of the lagoon. Inside the lagoon, the current velocity remains weak.  
 4) Characteristics of the deposit: The Henderson island is 8 x 4 km; high >30 m. The basement is coral formation. P2O5 grade is 8-18%.

**References:**

Germinal, 1984. Inventaire des ressources minérales sous-marines.



Occurrence   
 Deposit   
 Deposit/File

**NAME: MOROCCO**

**Commodities:** phosphate      **Type of deposit:** placer paleobeach  
**Country:** Morocco      MA      **District:** Sahara S

**Marine area:** Atlantic NE

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	inner & outer shelf
<b>Morpho. 1</b>	paleobeach
<b>Morpho. 2</b>	
<b>Petrography</b>	massive phosphorite, sand
<b>Mineralogy</b>	phosphorite

**COORDINATES**

Latitude	N	33.150
(Decimal °)		0.000
Longitude	W	8.730
		0.000
Z (in m)		-80

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/23/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

1) Continental shelf from Rabat (Morocco) to the Mauritanian border.  
 2) Climate: Mediterranean, dry summer. Average annual rainfall 250mm. Dominant wind directions to the S and SW.  
 3) Hydro: sea clear. Swell depending on winds. Atlantic currents from North to South.  
 4) Works performed: Tooms and Summerhayes (1968) carried out a reconnaissance survey: 7 sparker and sampling traverses with a combined length of 60 miles; 123 sediment samples were dredged from depths of 28-1300 m.  
 5) Characteristics of the deposits: Limestone, phosphatic limestone and phosphorite were the most prominent lithologies found. Off Morocco, the phosphatic limestones and phosphorites are Upper Cretaceous, Eocene and Miocene in age, whereas off the Spanish Sahara they are Lower Pliocene. The phosphatic superficial sediments are always found adjacent to rock outcrops and the phosphate is commonly concentrated in sand-size detrital grains of phosphorite which forms placer type concentrates. The highest mineralised samples are the ones collected on B and C profiles which are located at the latitude of the large onshore phosphatic deposits. (B profile: grade between 19-26% depth 80-113 m; C profile: grade 11-20% depth 126-500m). Summerhayes refers to the sands as relict sands formed during low Pleistocene sea-stands. The sands have been partially buried off the coast of Morocco, by a later silt blanket. While glauconite is locally being formed within the sediments, much of it is undoubtedly detrital. Off Morocco, phosphate is enriched in an inner to mid-shelf belt. Isolated patches of phosphate enrichment were also recorded on the inner shelf near shore. Within the main phosphate belt there are commonly discontinuous zones of concentrated phosphate values of 1-3% P<sub>2</sub>O<sub>5</sub> and in one case 7.9%. Off Spanish Sahara, on the uppermost slope off Cape Judy, the maximum recorded phosphate levels were 5% P<sub>2</sub>O<sub>5</sub>, while on the outermost shelf off Cape Bojador, the maximum value was 8.3% P<sub>2</sub>O<sub>5</sub>. Summerhayes and others assume a phosphatic sediment grade of greater than 0.5% P<sub>2</sub>O<sub>5</sub>, averaging 1% covering 3300 km<sup>2</sup> with a thickness of 5 m. This would constitute a resource of some 4.3 x 18.8 t of P<sub>2</sub>O<sub>5</sub> ?

**References:**

Tooms J.S., Nutt and Summerhayes C.P., 1968. The distribution and origin of phosphate in sediments off northwest Africa, Sediment Geol., 8, 3-28.

Occurrence   
 Deposit   
 Deposit/File

**NAME: SYLVANIA SEAMOUNT**

**Commodities:** phosphate      **Type of deposit:** phosphorite coralian  
**Country:** Marshall Islands      RM      **District:** Bikini Atoll

**Marine area:** Pacific W

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	seamount
<b>Morpho. 1</b>	bed karst
<b>Morpho. 2</b>	
<b>Petrography</b>	brechia & tuf
<b>Mineralogy</b>	phosphate

**COORDINATES**

Latitude	N	12.000
(Decimal °)		0.000
Longitude	E	-165.000
		0.000
Z (in m)		-1500

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/16/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

1) Bikini Atoll.  
 2) Climate: Tropical, heavy rains. Prevalent wind E to SE.  
 3) Hydro: Around the atoll, the sea, sometimes rough (strong swell associated with E to SE trade winds, allows refilling of the lagoon. Inside the lagoon, the current velocity remains weak.  
 4) Works performed: Expedition of the Scripps Institution of Oceanography in 1950. Dredging (Hamilton and Rex, 1959).  
 5) Characteristics of the deposit: The upper part of the sea-mount is flat and culminates at -1400 m. It is in connection with the Bikini Atoll by a saddle located 1500 m below the water surface. The tuff breccias samples collected show several cracks filled by phosphatic materials which contain a fauna of lower Eocene. A manganese film sometimes covers the collected samples. The seamount has been eroded either at the end of Cretaceous times, or at the beginning of the Eocene (flat top). The Bikini Atoll was at that time higher; a quick subsidence drowned the sea-mount and allowed the set up of corals over the Bikini Atoll and the deposit of sediments with plankton foraminifera over the sea-mount.

**References:**

Le Lann F., 1972. Les phosphorites sous marines, BRGM 72 SGN 267 MAR, unpublished.

Occurrence   
 Deposit   
 Deposit/File

**NAME: CAPE JOHNSON SEAMOUNT**

**Commodities:** phosphate      **Type of deposit:** phosphorite coralian  
**Country:** USA      US      **District:** Mid Pacific Mountains

**Marine area:** Pacific central

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	seamount
<b>Morpho. 1</b>	bank
<b>Morpho. 2</b>	
<b>Petrography</b>	phosphatic limestone
<b>Mineralogy</b>	phosphate carbonate

**COORDINATES**

Latitude	N	17.120
(Decimal °)		0.000
Longitude	W	177.250
		0.000
Z (in m)		

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

5) Characteristics of the deposit: Collected samples showed fossiliferous limestone and phosphatic corals debris covered up by a thin crust of manganese oxide. Chemical analysis gave: Ca, CO2 and anions 65.5 %; P2O5 28 %; SiO2 1.9 %.

**References:**

1) Le Lann F., 1972. Les phosphorites sous marines, BRGM 72 SGN 267 MAR, unpublished. 2) Hamilton, 1956.

Occurrence   
 Deposit   
 Deposit/File

**NAME: HORIZON SEAMOUNT**

**Commodities:** phosphate      **Type of deposit:** phosphorite coralian  
**Country:** USA      US      **District:** Mid Pacific Mountains

**Marine area:** Pacific central

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**TYOLOGY**

<b>Zone type</b>	seamount
<b>Morpho. 1</b>	bank
<b>Morpho. 2</b>	
<b>Petrography</b>	phosphatic limestone
<b>Mineralogy</b>	phosphate manganese

**COORDINATES**

Latitude	N	19.500
(Decimal °)		0.000
Longitude	W	169.000
		0.000
Z (in m)		

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

4) Works performed: dredging.  
 5) Characteristics of the deposit: collected samples showed volcanic rocks covered up by manganese dioxide. The crust sometimes has a thickness greater than 35 mm. The manganese nodules, which have also been collected, have a centre formed by either basaltic rock fragments or phosphatic limestone.

**References:**

Le Lann F., 1972. Les phosphorites sous marines, BRGM 72 SGN 267 MAR, unpublished.

- Occurrence
- Deposit
- Deposit/File

**NAME: HESS SEAMOUNT**

<b>Commodities:</b> phosphate		<b>Type of deposit:</b> phosphorite coralian	
<b>Country:</b> USA	US	<b>District:</b> Mid Pacific Mountains	

**Marine area:** Pacific central

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**TYPOLGY**

<b>Zone type</b>	seamount
<b>Morpho. 1</b>	bank
<b>Morpho. 2</b>	breccia nodule
<b>Petrography</b>	phosphatic limestone
<b>Mineralogy</b>	phosphate Mn

**COORDINATES**

Latitude	N	17.830
(Decimal °)		0.000
Longitude	W	174.250
		0.000
Z (in m)		

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

4) Works performed: dredging.

5) Characteristics of the deposit: Dredging realised over the sea-mount brought to the surface phosphatized fragments of corals and limestones and also manganese nodules. The centre of the nodules is formed by phosphatic globigerina ooze. The phosphorite were formed at the top of the sea-mount by replacement of the carbonate by phosphate; the existence of phosphorite over the abyssal plain nearby could be interpreted as slumping from the sea-mount upper part. The formation of manganese crust and nodules is posterior to the phosphatic phase (rarely contemporaneous).

**References:**

Le Lann F., 1972. Les phosphorites sous marines, BRGM 72 SGN 267 MAR. unpublished.

Occurrence   
 Deposit   
 Deposit/File

NAME: **PERU**

**Commodities:** phosphate      **Type of deposit:** phosphorite upwelling  
**Country:** Peru      PE      **District:**

**Marine area:** Pacific SE

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	outer shelf slope
<b>Morpho. 1</b>	sedimentary bed
<b>Morpho. 2</b>	nodule pellet
<b>Petrography</b>	diatom ooze
<b>Mineralogy</b>	francolite collophane apatite

**COORDINATES**

Latitude	S	-8.500
(Decimal °)	S	-18.000
Longitude	W	71.000
	W	79.000
Z (in m)		-70 to -480

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 2/17/95

**Company:** Atlantic Richfield Co.

	Ore	Heavy minerals	Commodities
<b>Grades</b>	17-35 % P2O5		
<b>Tonnage</b>			

**Description:**

1) Occurrences along the coast of Peru/Chile, parallel to the coast line on the ocean floor. The deposit is confined along two narrow sedimentary strips located on the shelf edge and the upper continental slope (-70 -160 m) (-360 -480 m).  
 2) Climate: Desertic. Mean annual average rain fall 41 mm.  
 3) Hydro: Peru current.  
 4) Works performed: Sampling (24) for fundamental scientific research: see other Peru.  
 5) Characteristics of the deposit: The phosphorite occurs as scattered nodules in fine grained biogenic sediments (chiefly diatom oozes) in an area where surface waters are said to be biologically highly productive due to upwelling of coastal waters containing considerable organic matter. Burnett (1973, 74, 77) describes the phosphatic rocks as being irregular in shape with a hackly and pitted surface. Many nodules are flattened in one dimension; others are roughly equal in shape. The surfaces are dull with colors that vary from light to dark grey. Mineralization from Pleistocene to interglacial period is represented by pellets, particles, nodules of francolite and collophane composition. All investigators of the Peru/Chile deposits believe that the deposits are, for the most part, recent in origin. Manheim and others postulate that the deposits are the result of replacement of carbonate tests in the interstitial waters of organic-rich sediments. Burnett thinks that the apatite has chemically precipitated out of solution rather than replaced previously existing materials. One onshore deposit in the Sechura Desert in northern Peru: bed 1-1.5 m thick with 20% P2O5.

**References:**

1) Garrand L., 1977. Ocean phosphorite world occurrences. 2) Anonymous. Les phosphates sédimentaires sous-marins, Ifremer internal report. 3) Burnett W.C., 1974. 4) Veeh H.H., 1973.

Occurrence   
 Deposit   
 Deposit/File

**NAME: CHATAM RISE**

**Commodities:** phosphate      **Type of deposit:** phosphorite upwelling  
**Country:** New Zealand      NZ      **District:** Reserve bank

**Marine area:** Pacific SW, Chatam rise

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	rise
<b>Morpho. 1</b>	lenticular
<b>Morpho. 2</b>	nodule
<b>Petrography</b>	conglomerate
<b>Mineralogy</b>	phosphate

**COORDINATES**

Latitude	S	-44.000
(Decimal °)	S	-44.000
Longitude	E	-177.000
	E	-178.000
Z (in m)		-375 to -410

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/16/95

**Company:** Fletcher Challenge Ltd

	Ore	Heavy minerals	Commodities
<b>Grades</b>			18.1 to 25.5% P2O5
<b>Tonnage</b>			25 Mt

**Description:**

1) The Chatham rise area is located east of New Zealand and appears like an underwater table-land between the Canterbury coast and Chatham Rise island.  
 2) Climate: Marine west coast. Hot and humid. Mean annual rainfall 1221 mm; maxi. during June, July and August. Prevailing surface winds from NW.  
 3) Hydro: Southland currents to the north and East cape currents to the south.  
 4) Works performed: 1950: discovery by R.V. Discovery II oceanographic expedition. 1967-1968: sampling by Global Marine Inc. (USA). 1975 NZ Oceanographic Institute: photography and close-spaced coring. 1978: evaluation by Preussag and NZOI.  
 5) Characteristics of the deposit: Phosphorite occurs patchily, in water depths of 375-410 m along some 400 km of the crest of Chatham Rise, as loose, superficial nodule gravels intermingled with and often overlain by fine, unconsolidated sandy muds and muddy sands. The main phosphorite concentrations appear to be located between longitudes 179°E and 180°. In this region the nodule layer is commonly 0.10-0.20 m thick, with a known maximum thickness of 0.7 m and the frequency distribution of nodules often 40-50 kg/m<sup>2</sup>, attains values in excess of 80 kg/m<sup>2</sup>. Phosphorite particle sizes vary from a few millimetres to a few hundreds of millimetres (10-40 mm). The phosphorite nodules are, in fact, diagenetically altered and indurated pelagic limestones and chalks of two distinct ages: Eocene-Oligocene (40-35 My) and Miocene (20-15 My). Individual nodules are almost invariably coated by a thin greenish-black veneer of glauconite, deposited on the nodule surface after phosphoric replacement of the parent limestone. Grade 18.10-25.4 % P2O5, average 21.5% P2O5. The layer containing the phosphorite nodules is interpreted as a "lag" or "remanié" deposit created by processes that have involved dissolution of the underlying calcareous formations and gentle winnowing away of the finer sediment fractions.

**References:**

1) Cullen D.J., 1984. Comments on the economic agronomic potential and the mining feasibility of the Chatham Rise phosphate deposit, 2nd int. seminar on the offshore mineral resources (Brest), Ed. GERMINAL. 2) Kudrass H.R. & Von Rad V., 1984. Geology and economic aspects of the Chatham rise phosphate deposit, 2nd int. seminar on the offshore mineral resources (Brest), Ed. GERMINAL.

Occurrence   
 Deposit   
 Deposit/File

**NAME: CAMPBELL PLATEAU**

**Commodities:** phosphate      **Type of deposit:** phosphorite upwelling  
**Country:** New Zealand      NZ      **District:** New Zealand SE

**Marine area:** Pacific SW

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	rise
<b>Morpho. 1</b>	lenticular
<b>Morpho. 2</b>	nodule
<b>Petrography</b>	conglomerate
<b>Mineralogy</b>	phosphate

**COORDINATES**

Latitude	S	-51.000
(Decimal °)	S	-51.000
Longitude	E	-166.000
	E	-177.000
Z (in m)		

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

1) Around Campbell Island, South of New Zealand and New Zealand plateau.  
 2) Climate: Marine west coast. Hot and humid. Mean annual rainfall 1221 mm; maxi. during June, July and August. Prevailing surface winds from NW.  
 3) Hydro: Southland currents to the north and East, Cape currents to the south.  
 4) Works performed: Sampling 1967.  
 5) Characteristics of the deposit: Phosphatic occurrences are known inside the Snares depression and over the Pukaki saddle. The phosphatization has been contemporaneous or slightly posterior to the deposit of the foraminifera oozes. The physico-chemical conditions, controlling the nodule genesis changed after the Miocene because the glauconitic sometimes very thick crust covers the nodules in the Snares depression. (Summerhayes, 1967). Higher temperature of the water and volcanic activities could have created, during the Miocene, favourable conditions for the formation of phosphate.

**References:**

Le Lann F., 1972. Les phosphorites sous marines, BRGM 72 SGN 267 MAR, unpublished. 2) Summerhayes C.P., 1967.



Occurrence   
 Deposit   
 Deposit/File

**NAME: TASMAN SHELF**

**Commodities:** phosphate      **Type of deposit:** phosphorite upwelling  
**Country:** Australia      AU      **District:** Tasmania NW

**Marine area:** Pacific SW

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	outer shelf
<b>Morpho. 1</b>	bank
<b>Morpho. 2</b>	nodule
<b>Petrography</b>	sand with phosphorite nodules
<b>Mineralogy</b>	phosphate

**COORDINATES**

Latitude	S	-40.500
(Decimal °)	S	-42.500
Longitude	E	-144.000
	E	-145.000
Z (in m)		-65 to -170

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/17/95

**Company:** Ocean Ressources N.L.

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

1) Continental shelf extending from South-West of King Island, off West Point, and near Macquarie Harbour.  
 2) Climate: Marine, west coast type. Mean annual precipitation 1000 mm, maxi. June, July, August.  
 4) Works performed: Aardverk cruise: dredge sampling (37) from depth between 68 and 132 m.  
 5) Characteristics of the deposit: Although most of the sea floor is relatively flat and sandy, rock crops out in some areas. In good conditions these areas can generally be detected with the ship's echo sounder, but in marginal sea conditions, when the efficiency of the echo sounder is reduced, areas of bedrock are not always obvious. From the dredging programme, nodules were obtained from most of the 37 stations dredged, with nodules making up more than 25% of the sample by volume at 16 stations. The best material was obtained from depths between 100 and 128 m. The results from seven P2O5 analyses show values between 18.7 % and 0.35 % P2O5. Further exploration surveys were planned for this area.

**References:**

Le Lann F., 1972. Les phosphorites sous marines, BRGM 72 SGN 267 MAR, unpublished.

Occurrence   
 Deposit   
 Deposit/File

**NAME: AUSTRALIA EAST**

**Commodities:** phosphate      **Type of deposit:** phosphorite upwelling  
**Country:** Australia      AU      **District:** New South Wales

**Marine area:** Pacific SW, Coral sea

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	shelf edge
<b>Morpho. 1</b>	bank
<b>Morpho. 2</b>	nodule granule oolithe
<b>Petrography</b>	conglomerate
<b>Mineralogy</b>	collophane carbonate

**COORDINATES**

Latitude	S	-29.000
(Decimal °)	S	-31.000
Longitude	E	-153.000
	E	-153.500
Z (in m)	-210 to - 385	

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/17/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			7.8 to 21.2 %
<b>Tonnage</b>			

**Description:**

1) Upper continental slopes off northern New South Wales.  
 2) Climate: Marine West coast. Annual average rainfall 1200-1600 mm. Dry season during summer. Winds 110 kn to NW (Jan.) to SE (July).  
 3) Hydro: From N and NE currents (East Australian currents: 2 kn). Swell from east.  
 4) Works performed: dredging.  
 5) Characteristics of the deposits: small (average 3 cm) dull grey, unpolished, irregular, phosphatic concretions and "conglomeratic" nodules and slabs were dredged from depths of 210-385 m from the upper continental slopes. Abraded quartzite pebbles, phosphatized bone fragments, solitary coral skeletons impregnated with collophane, weakly phosphatized bivalve fragments, and sharks' teeth typically occur in association with phosphorite nodules elsewhere, suggesting the existence of either condensed sedimentary sections or of an erosive winnowing of coarse material from sediments. Borch regards the contained fauna within the concretions and nodules as an indication of Miocene, possibly a Middle Miocene age. These concretions seem to have formed during diagenesis within what must have been phosphorus enriched Cenozoic slope sediments. These occurrences along with rounded pebbles on what may be an erosional bench (crusty surface generally covered by a dark crust of goethite of variable thickness, grey or black color) suggest that the initial concretions at these depths may have been eroded from host sediments by wave action during Tertiary or Pleistocene low sea level stands. P2O5 content from 7.8% to 21.2%. The most encouraging concentrations and grades are likely to be found west of Tasmania and south and southwest of King Island. Nodules of 13% P2O5 and 13-26% were collected from depths of 65-165 m.

**References:**

1) Loughmann and Graig, 1962. 2) Borch, 1970. 3) Garrand L., 1977. Offshore phosphorite world occurrences.

Occurrence   
 Deposit   
 Deposit/File

**NAME: POINTE NOIRE**

**Commodities:** phosphate      **Type of deposit:** phosphorite clastic  
**Country:** Congo      CG      **District:**

**Marine area:** Atlantic E

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**TYPOLGY**

<b>Zone type</b>	inner shelf
<b>Morpho. 1</b>	lenticular
<b>Morpho. 2</b>	pellet
<b>Petrography</b>	argilaceous limestone
<b>Mineralogy</b>	collophane francolite carbonate

**COORDINATES**

Latitude	S	-5.050
(Decimal °)		0.000
Longitude	E	-11.800
		0.000
Z (in m)		-35 to -50

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 2/20/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

1) The occurrence is located offshore 20 km south of Pointe Noire, 12 km off the coast line.  
 2) Climate: Tropical, equatorial forest type. Average annual rainfall 1200-1700 mm, maxi July-August. Winds to NE (January), NW (July).  
 3) Hydro: Sea clear. Tide semidiurnal, maxi magnitude 2 m. Area of water mixing between the cold Benguela current running north parallel to the coast and the warm South-Equatorial going south. Swell, with magnitude and directions depending on wind directions.  
 4) Works performed: Geophysical survey 1982- 1983 (Gammametry, seismic reflexion); sampling (grab), drilling 142 vibracores 1982-83-85.  
 5) Characteristics of the deposit: Around the occurrences stratified sediments are not consolidated. The sampling realised with a dredge or by coring shows: 1) debris of calcareous sandstone, phosphatic iron granules (Miocene) and marl or marly limestone (Eocene). Also coprolite conglomerate. 2) biogenic fragments with fish bones, coprolites, shark teeth. These remains showing a brown patina are from the conglomerate. The granulometry shows the following distribution: <1mm = 60%; 1mm< x<10mm = 31%, >10mm = 9%. Only the fraction 1mm-10mm is mineralised i.e. 31% of the sediments. The coprolites are 1-3 cm in length and 0.2 to 0.5 cm in diameter and a white color. Grade is around 28% for the coprolites and 10% for the limestone with phosphatic granules. The concentrations are the result of the mechanical action of the water during Holocene times over Miocene and Eocene underwater outcrops.

**References:**

1) BRGM, 1977-1988. Phosphates offshore du Congo, unpublished. 2) Giresse P., 1984. Les phosphates du Gabon: nature géochimique et conditions mécaniques d'accumulation, 2nd int. seminar on the offshore mineral resources (Brest), Ed. GERMINAL.

Occurrence   
 Deposit   
 Deposit/File

**NAME: MAYUMBA**

**Commodities:** phosphate      **Type of deposit:** phosphorite clastic  
**Country:** Gabon      GA      **District:**

**Marine area:** Atlantic E

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	outer shelf
<b>Morpho. 1</b>	lenticular
<b>Morpho. 2</b>	granule
<b>Petrography</b>	argilaceous limestone
<b>Mineralogy</b>	phosphate carbonate

**COORDINATES**

Latitude	S	-3.660
(Decimal °)	S	-4.160
Longitude	E	-10.000
	E	-11.000
Z (in m)		-50 to -100

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 2/20/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

- 1) The area covers 150 km offshore along the coast of Gabon from the Congo border. The investigated area is limited offshore to the isobath 100-110m.
- 2) Climate: Tropical, equatorial forest type. Average annual rainfall 1200-1700 mm, maxi July-August. Winds to NE (January), NW (July).
- 3) Hydro: Sea clear. Tide semidiurnal, maxi magnitude 2 m. Area of water mixing between the cold Benguela current running north parallel to the coast and the warm South-Equatorial going south. Swell, with magnitude and directions depending on wind directions.
- 4) Works performed: Geophysical survey 1979 (seismic reflexion: 1350 km); sampling (400) (grab); drilling 82 vibracores.
- 5) Characteristics of the deposit: Phosphatic coprolites were found near paleo-coastlines associated with outcrops of Eocene and Miocene age. No accumulation of significant economic interest.

**References:**

BRGM, 1979. Recherche de gravelles phosphatées au droit des côtes du Gabon, BRGM 79 SGN 318 MAR, unpublished.

Occurrence   
 Deposit   
 Deposit/File

**NAME: AGULHAS BANK**

**Commodities:** phosphate      **Type of deposit:** phosphorite elastic  
**Country:** South Africa      ZA      **District:** Good Hope Cape

**Marine area:** Atlantic SE

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	outer shelf slope
<b>Morpho. 1</b>	lenticular
<b>Morpho. 2</b>	cobble gravel
<b>Petrography</b>	calcareous & argillaceous sand
<b>Mineralogy</b>	collophane francolite apatite carbonate

**COORDINATES**

Latitude	S	-30.000
(Decimal °)	S	-36.000
Longitude	E	-18.000
	E	-26.000
Z (in m)		-70 to -500

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 2/17/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			16 to 32% P2O5
<b>Tonnage</b>			140 Mt

**Description:**

1) Continental platform south of Cap Agulhas, 20 km south off the coast.  
 2) Climate: Mediterranean, dry summer. Mean annual rainfall 615 mm, maxi during the winter. Winds dominant from the W.  
 3) Hydro: Area of intense mixing of water. Surface currents depend on trading winds.  
 4) Works performed: Discovered in 1872 following H.M.S Challenger expedition cruise sampling survey - Murray and Renard (1891) describe in detail the phosphatic concretions. Parker and Siesser (1972) and Summerhayes (1972-73) re-evaluated the area and calculated the reserves.  
 5) Characteristics of the deposit: During the Challenger expedition, phosphatic concretions were dredged at many of the shallower stations around continental shores, but never in such abundance or such typical development as at these stations to the south of the Cape of Good Hope. The phosphatized limestones are well-consolidated rocks composed of whole and fragmented sand-sized microfossils (40-65%) and macrofossil fragments (1-10%) set in a collophane micritic matrix. Silt sized angular quartz and feldspar may be present in accessory (1-5%) amounts. Ferruginous varieties are distinguished by their intimately mixed goethite, collophane and micrite cements with a general absence of macrofossils. The rocks are irregularly tabloid in shape with a mean size in the cobble range (1-6 cm). The low iron variety usually have a yellow-grey surface which is rough and pitted due to boring organism. The high iron variety have smooth, sometimes glazed, unbored dark brown to black surfaces. Glauconite is more abundant in the low iron variety. Summerhayes describes the phosphate as occurring principally in sand and gravel sized grains of phosphorite (up to 10% P2O5) and glauconite, and states that they were mechanically weathered from outcrops of tertiary phosphorite during late tertiary and Pleistocene regressions of the sea. It appears that portions of the deposit could benefit from simple screening but not to grades in excess of the parent-rock (16%). Also noted is the advantage of potash content found in glauconite.

**References:**

1) Garrand L., 1977. Offshore phosphorite world occurrences. 2) Dingle, 1977. Agulhas bank phosphorite, a review of 100 years of investigation, Trans. Geol. Soc. S. Af. Bul., 77 (3). 3) Summerhayes C.P., 1973. Distribution, origin and economic potential of phosphatic sediments from the Agulhas bank, Trans. Geol. Soc. S. Af. Bul., 76.

Occurrence   
 Deposit   
 Deposit/File

**NAME: SAN JUANICO**

**Commodities:** phosphate      **Type of deposit:** phosphorite clastic  
**Country:** Mexico      **MX**      **District:** Baja California

**Marine area:** Pacific NE

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**TYOLOGY**

<b>Zone type</b>	outer shelf
<b>Morpho. 1</b>	lenticular
<b>Morpho. 2</b>	pellet
<b>Petrography</b>	siliceous & calcareous sand
<b>Mineralogy</b>	francolite apatite carbonate quartz

**COORDINATES**

Latitude	N	26.500
(Decimal °)	N	26.250
Longitude	W	112.250
	W	113.000
Z (in m)		-65 to -110

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:** Minerales Submarinos Mexicanos S.A.

	Ore	Heavy minerals	Commodities
<b>Grades</b>			8.87 P205
<b>Tonnage</b>			773 Mt

**Description:**

1) Off the coast of Baja California. The San Juanico embayment is located 10 to 18 nautical miles off the coast. The area of interest is approximately 120 km in length, varies in width from 12 to 25 km and covers about 1372 km<sup>2</sup>.  
 2) Climate: Mediterranean semi-arid. Mean annual rainfall 120mm during the summer. Winds to S-SE (18-22 km/h (Jan.) to the SE (54 km/h) the rest of the year.  
 3) Hydro: Sea clear. Mixed tide, maxi magn 2.40m. California current N to S cold (0.3 knots), Davidson current S to N warm (0.4 knots). Swell magnitude 0.30 to 2m, 41.4% of the time; 2 to 3.6 m, 34% of the time.  
 4) Works performed: geophysics (gravity, bathymetry), core drilling (4 nautical miles grid with grid spacing reduced to 2 nautical miles in the most promising areas), drag bucket samples.  
 5) Characteristics of the deposit: The recent sediments are almost non existent on the platform. Lithology summary from Baja samples is as follows: 1) undifferentiated rock fragments; 2) calcareous siltstone fragments; 3) aggregate silt-particle fragments; 4) quartz grains; 5) colorless, platy to blocky grains (gypsum and/or feldspar); 6) fossil and fossil fragments replaced by phosphate (collophane); 7) oolites, mostly phosphatic; 8) fossils and fossil fragments transported (rounded, abraded, polished etc.); 9) fossil and fossil fragments autochthonous; 10) glauconite. Two distinct types of phosphate particles are recognised: 1) black-reddish brown ovoid structureless pellets are predominant in grain sizes between 0.125 and 0.25 mm; 2) particles of biogenous origin are predominant in coarser fractions. The San Juanito sands probably have some direct relationship to the onshore phosphorite occurrence known as the San Hilario deposit. Could be the result of erosion, transport and deposit of phosphatic sandstone by the dynamics of the water (swell, currents). Favorable aspects of the deposit are: shallow depths of occurrence, easy mining by suction dredging, easy processing.

**References:**

1) Lenoble J.P., 1987. Note sur les gisements de phosphates sous-marins de San Juanico, Ifremer internal report. 2) Garrard L., 1977. Offshore phosphorite world occurrences.

Occurrence   
 Deposit   
 Deposit/File

**NAME: BANCO RANGER**

**Commodities:** phosphate      **Type of deposit:** phosphorite blocks  
**Country:** Mexico      **MX**      **District:** Baja California

**Marine area:** Pacific NE

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	outer shelf
<b>Morpho. 1</b>	bank
<b>Morpho. 2</b>	block nodule
<b>Petrography</b>	massive phosphate
<b>Mineralogy</b>	phosphate carbonate

**COORDINATES**

Latitude	N	28.500
(Decimal °)		0.000
Longitude	W	115.500
		0.000
Z (in m)		-112 to -208

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:** Minerales Submarinos Mexicanos S.A.

	Ore	Heavy minerals	Commodities
<b>Grades</b>			26 % P2O5
<b>Tonnage</b>			110 to 150 Mt

**Description:**

1) Off the coast of Baja California. Banco Ranger is located about 32 km NNW of Cedros Island. The bank is fairly flat-topped with a gentle slope from the shallowest depth of 112m to the gentle slope at 208m. The flat top has a NS length of 18 km and a maximum width of 6.5 km.

2) Climate: Mediterranean semi-arid. Mean annual rainfall 120mm during the summer. Winds to S-SE (18-22 km/h) (Jan.) to the SE (54 km/h) the rest of the year.

3) Hydro: Sea clear. Mixed tide, maxi magn 2.40m. California current N to S cold (0.3 knots), Davidson current S to N warm (0.4 knots). Swell magnitude 0.30 to 2m, 41.4% of the time; 2 to 3.6 m, 34% of the time.

4) Works performed: geophysics (gravity, bathymetry), photos, drag bucket samples. Pre-feasibility study by a French joint venture in 1985 (Ifremer, Spie, Travocean) concludes to the need of additional survey (multibeam bathy, sonar, photo tracks, sampling) but the project did not start due to lack of funds on the Mexican side.

5) Characteristics of the deposit: Isobath map shows irregular surface with small cliffs and canyon. Sediments recovered by drag bucket are formed by sedimentary rocks (sandstone, siltstone, soft mudstone) and phosphorite. The mudstone contains abundant volcanic glass shards, radiolaria and pelagic foraminifera. Some samples collected by Emery are composed wholly of igneous rocks (rhyolite, andesite and basalt probably Miocene). Collophane, apatite represent mineralization. The nodule-blocks level is poorly recognized, the surface covered by them is 65% of the accessible topographic area. Samples collected by MSM show blocks, nodules and fine sand. The nodules and blocks are dark brown sometimes black, dark green, or grey with a fine cover of white lime. The size varies from 2 to 60 cm. The nodules and blocks show a conglomeratic structure where phosphatic rounded elements are cemented by collophane. The nodule-block composition is: P2O5 28.2%, CaO 44.7%, Fe2O3 1.8%, Al2O3 1.2%, F 7.8%. Sand, nodules and blocks could be recovered. Ore processing tests showed poor upgrading and recovery. However the phosphate from the blocks shows a high citric solubility and may be used directly as fertiliser after crushing.

**References:**

1) Lenoble J.P., 1986. Le gisement de phosphate de Banco Ranger, Ifremer internal report. 2) Travocean, 1987. Etude du projet de Ranger (Mexico), Travocean internal report.

Occurrence   
 Deposit   
 Deposit/File

**NAME: SAN DOMINGO**

**Commodities:** phosphate      **Type of deposit:** phosphorite clastic  
**Country:** Mexico      **MX**      **District:** Baja California

**Marine area:** Pacific NE

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	on land
<b>Morpho. 1</b>	paleobeach
<b>Morpho. 2</b>	granule
<b>Petrography</b>	phosphatic and shelly sand
<b>Mineralogy</b>	phosphate carbonate quartz

**COORDINATES**

Latitude	N	25.200
(Decimal °)		0.000
Longitude	W	112.100
		0.000
Z (in m)		0 to 5

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:** Rofomex

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			1.1 Gt

**Description:**

1) Onshore deposit.  
 4) Works performed: The mining project by dredging (purchase of Ellicott dredge) was 1.5 Mt/year. It failed to work because geological reasons and budget restriction. The existence of 30-40 m long indurated shell lenses over the exploitation project did not facilitated the exploitation. These rocks did not allowed a normal milling flotation. Also the mineralised lenses were smaller and more discontinous than forecasted from the drillings and consequently the mined ore grade was smaller.

**References:**

EMJ, 185 (11), Nov. 84.



Occurrence   
 Deposit   
 Deposit/File

**NAME: SAN JOSE BANK**

<b>Commodities:</b> phosphate	<b>Type of deposit:</b> phosphorite clastic	
<b>Country:</b> Mexico	MX	<b>District:</b> Baja California

**Marine area:** Pacific NE

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	outer shelf
<b>Morpho. 1</b>	lenticular
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	phosphate

**COORDINATES**

Latitude	N	31.350
(Decimal °)		0.000
Longitude	W	116.750
		0.000
Z (in m)		-120

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			3 Mt

**Description:**

1) Off the coast of Baja California. Located approximately 30 nautical miles SSW of Ensenada.  
 2) Climate: Mediterranean semi-arid. Mean annual rainfall 120mm during the summer. Winds to S-SE (18-22 km/h) (Jan.) to the SE (54 km/h) the rest of the year.  
 3) Hydro: Sea clear. Mixed tide, maxi magn 2.40m. California current N to S cold (0.3 knots), Davidson current S to N warm (0.4 knots). Swell magn 0.30 to 2m, 41.4% of the time; 2 to 3.6 m, 34% of the time.  
 4) Works performed: Sampling  
 5) Characteristics of the deposit: Mc Comas and Neel (1967) describe the San Jose Bank as covering an area of approximately 30 km<sup>2</sup> with an average water depth of 120 m. The topography appears to be somewhat irregular and sampling revealed that the surface material contained considerable contamination of non-phosphatic material. Because of irregular topography and contamination factor, San Jose appears less favorable for commercial exploitation than Banco Ranger.

**References:**

Occurrence   
 Deposit   
 Deposit/File

**NAME: CORONADO RIDGE**

**Commodities:** phosphate      **Type of deposit:** phosphorite upwelling  
**Country:** USA      US      **District:** California

**Marine area:** Pacific NE

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	shelf
<b>Morpho. 1</b>	lenticular
<b>Morpho. 2</b>	
<b>Petrography</b>	sand with nodules
<b>Mineralogy</b>	phosphate carbonate quartz

**COORDINATES**

Latitude	N	32.660
(Decimal °)		0.000
Longitude	W	117.500
		0.000
Z (in m)		0 to -550 m

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			27% P2O5
<b>Tonnage</b>			7.2 Mt

**Description:**

1) Off the southern California coast. On the continental margin is a long plateau parallel to Thirty Mile Ridge about 10 nautical miles Southwest of San Diego including Coronado Bank and adjacent areas.  
 2) Climate: Mediterranean dry summer. Mean annual rainfall 367 mm, maxi. during winter. Winds to S (Jan.), E-NE (Apr. -Jul.-Oct.).  
 3) Hydro: Mixed tide (maxi. 2.4 m). Cold surface currents in summer N to S (California current) 0.4 knots; warm surface currents in winter S to N (Davidson current) 0.3 knots.  
 4) Works performed: Numerous sampling, Scripps 1938, Dietz 1942, Emery 1960, Lockheed Aircraft - IMC 1963, Inderbitzen 1970.  
 5) Characteristics of the deposit: Continental margin has basin-and-bank topography due to Miocene diastrophism. The Coronado Bank forms a flat-topped bank with 2 highs separated by a saddle. Bottom materials are sand, conglomeratic deposits and bare rock. Numerous outcrops of sandstone, shale, conglomerate and limestone have been reported. The highest density of phosphorite specimens came from the saddle. The phosphorite occurs in 3 forms: 1) pellets from a few mm to nodules as large as 44 cm, 2) coating on other rocks 3) cement between fragments of phosphorite and other material. The highest grade nodules contain 28-30 % P2O5. Inderbitzen & al. reserve estimations in 1970: area 225 km2, bottom covered by nodules (estimated) 6%, bottom covered by phosphate sand (estimated) 0%. Volume of material: (assuming thickness nodules 0.3 m; sand 0 m) nodules 4.1 Mm3.

**References:**

Garrand L., 1977. Offshore phosphorite world occurrences.

Occurrence   
 Deposit   
 Deposit/File

NAME: **THIRTY MILE BANK**

**Commodities:** phosphate      **Type of deposit:** phosphorite upwelling  
**Country:** USA      US      **District:** California

**Marine area:** Pacific NE

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**TYOLOGY**

<b>Zone type</b>	outer shelf
<b>Morpho. 1</b>	lenticular
<b>Morpho. 2</b>	
<b>Petrography</b>	sand with nodules
<b>Mineralogy</b>	phosphate carbonate quartz

**COORDINATES**

Latitude	N	32.800
(Decimal °)		0.000
Longitude	W	117.800
		0.000
Z (in m)	240 to 450 m	

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			27% P2O5
<b>Tonnage</b>			14 Mt

**Description:**

1) Off the southern California coast. On the continental margin is an elongated plateau about 55 km W of San Diego. It includes Thirty Mile Bank and adjacent areas to the north and south.  
 2) Climate: Mediterranean dry summer. Mean annual rainfall 367 mm, maxi. during winter. Winds to S (Jan.), E-NE (Apr. -Jul.-Oct.).  
 3) Hydro: Mixed tide (maxi. 2.4 m). Cold surface currents in summer N to S (California current) 0.4 knots; warm surface currents in winter S to N (Davidson current) 0.3 knots.  
 4) Works performed: Numerous sampling, Scripps 1938, Dietz 1942, Emery 1960, Lockheed Aircraft - IMC 1963, Inderbitzen 1970.  
 5) Characteristics of the deposit: Continental margin has basin-and-bank topography due to Miocene diastrophism. The topographic high with irregular surface, bottom photos indicate an abundance of gravel, cobbles and boulders, many of which could be phosphorite nodules. Emery (1960) reported many localities of phosphorite deposits in this area. Inderbitzen & al. reserve estimations in 1970: area 264 km<sup>2</sup>, bottom covered by nodules (estimated) 10%, covered by phosphate sand (estimated) 0%. Volume of material: (assuming thickness nodules 0.3 m; sand 0 m) nodules 8 Mm<sup>3</sup>, sand 0 m.

**References:**

Garrand L., 1977. Offshore phosphorite world occurrences.

Occurrence   
 Deposit   
 Deposit/File

**NAME: FORTY MILE RIDGE**

**Commodities:** phosphate      **Type of deposit:** phosphorite upwelling  
**Country:** USA      US      **District:** California

**Marine area:** Pacific NE

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**TYOLOGY**

<b>Zone type</b>	outer shelf
<b>Morpho. 1</b>	lenticular
<b>Morpho. 2</b>	
<b>Petrography</b>	sand with nodules
<b>Mineralogy</b>	phosphate carbonate quartz

**COORDINATES**

Latitude	N	32.830
(Decimal °)		0.000
Longitude	W	118.330
		0.000
Z (in m)		-80 to 550 m

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			27% P2O5
<b>Tonnage</b>			8.9 Mt

**Description:**

1) Off the southern California coast. On the continental margin is about 74 km west of San Diego and includes Forty Mile Bank.  
 2) Climate: Mediterranean dry summer. Mean annual rainfall 367 mm, maxi. during winter. Winds to S (Jan.), E-NE (Apr. -Jul.-Oct.).  
 3) Hydro: Mixed tide (maxi. 2.4 m). Cold surface currents in summer N to S (California current) 0.4 knots; warm surface currents in winter S to N (Davidson current) 0.3 knots.  
 4) Works performed: Numerous sampling, Scripps 1938, Dietz 1942, Emery 1960, Lockheed Aircraft - IMC 1963, Inderbitzen 1970.  
 5) Characteristics of the deposit: Continental margin has basin-and-bank topography due to Miocene diastrophism. Forty Mile Ridge is a large, gently sloping topographic high with a relatively flat wave-cut surface at a depth of about 90 m. Bottom material is predominately sand and bare rock with scattered gravel, cobbles and boulders. Dietz and others (1942) reported one chemical analysis of 29.56 % P2O5. Bottom photos indicate a high concentration of gravel, cobbles and boulders, but the phosphorite content is assumed to be less than 40%.  
 Inderbitzen & al. reserve estimations in 1970: area 166 km2, bottom covered by nodules (estimated) 10%, bottom covered by phosphate sand (estimated) 0%. Volume of material: (assuming thickness nodules 0.3 m; sand 0 m) nodules 5 Mm3.

**References:**

Garrand L., 1977. Offshore phosphorite world occurrences.

Occurrence   
 Deposit   
 Deposit/File

**NAME: SANTA BARBARA HIGH**

**Commodities:** phosphate      **Type of deposit:** phosphorite upwelling  
**Country:** USA      US      **District:** California

**Marine area:** Pacific NE

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	inner & outer shelf
<b>Morpho. 1</b>	lenticular
<b>Morpho. 2</b>	
<b>Petrography</b>	sand with nodules
<b>Mineralogy</b>	phosphate carbonate quartz

**COORDINATES**

Latitude	N	33.800
(Decimal °)		0.000
Longitude	W	119.000
		0.000
Z (in m)		-30 to -550 m

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			27% P2O5
<b>Tonnage</b>			1.7 Mt + 4.9 Mt

**Description:**

- 1) Off the southern California coast. On the continental margin is a 326 km<sup>2</sup> portion of the ridge between Santa Barbara and Santa Cruz Islands.
- 2) Climate: Mediterranean dry summer. Mean annual rainfall 367 mm, maxi. during winter. Winds to S (Jan.), E-NE (Apr. -Jul.-Oct.).
- 3) Hydro: Mixed tide (maxi. 2.4 m). Cold surface currents in summer N to S (California current) 0.4 knots; warm surface currents in winter S to N (Davidson current) 0.3 knots.
- 4) Works performed: Numerous sampling, Scripps 1938, Dietz 1942, Emery 1960, Lockheed Aircraft - IMC 1963, Inderbitzen 1970.
- 5) Characteristics of the deposit: Continental margin has basin-and-bank topography due to Miocene diastrophism. Santa Barbara is a flat mesa with small topographic high at the south end. Bottom materials are sand, gravel, cobbles and base rock. Few samples contained phosphorite nodules. Inderbitzen & al. reserve estimations in 1970: area 326 km<sup>2</sup>, bottom covered by nodules (estimated) 1%, bottom covered by phosphate sand (estimated) 1%. Volume of material: (assuming thickness nodules 0.3 m; sand 0.9 m) nodules 0.98 Mm<sup>3</sup>, sand 2.93 Mm<sup>3</sup>.

**References:**

Garrand L., 1977. Offshore phosphorite world occurrences.

Occurrence   
 Deposit   
 Deposit/File

**NAME: NORTH CATALINA RIDGE**

**Commodities:** phosphate      **Type of deposit:** phosphorite upwelling  
**Country:** USA      US      **District:** California

**Marine area:** Pacific NE

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	outer shelf
<b>Morpho. 1</b>	lenticular
<b>Morpho. 2</b>	
<b>Petrography</b>	sand with nodules
<b>Mineralogy</b>	phosphate carbonate quartz

**COORDINATES**

Latitude	N	33.330
(Decimal °)		0.000
Longitude	W	118.300
		0.000
Z (in m)	00 to -450 m	

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			27% P2O5
<b>Tonnage</b>			3.1 Mt

**Description:**

1) Off the southern California coast. On the continental margin. This area is the northernmost extension of the topographic high which is the foundation of Catalina Island. The area of possible phosphorite deposits appears to cover only 65 km<sup>2</sup> of the ridge at depths averaging about 365 m.  
 2) Climate: Mediterranean dry summer. Mean annual rainfall 367 mm, maxi. during winter. Winds to S (Jan.), E-NE (Apr. -Jul.-Oct.).  
 3) Hydro: Mixed tide (maxi. 2.4 m). Cold surface currents in summer N to S (California current) 0.4 knots; warm surface currents in winter S to N (Davidson current) 0.3 knots.  
 4) Works performed: Numerous sampling, Scripps 1938, Dietz 1942, Emery 1960, Lockheed 5) Characteristics of the deposit: Continental margin has basin-and-bank topography due to Miocene diastrophism. The topographic high is irregular, the bottom materials appear to be cobbles, bare rock and some sand. Emery (1960) obtained phosphorite samples from this area.

**References:**

Garrand L., 1977. Offshore phosphorite world occurrences.

Occurrence   
 Deposit   
 Deposit/File

**NAME: SANTA MONICA BAY**

**Commodities:** phosphate      **Type of deposit:** phosphorite upwelling  
**Country:** USA      US      **District:** California

**Marine area:** Pacific NE

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	outer shelf
<b>Morpho. 1</b>	lenticular
<b>Morpho. 2</b>	
<b>Petrography</b>	sand with nodules
<b>Mineralogy</b>	phosphate carbonate quartz

**COORDINATES**

Latitude	N	33.800
(Decimal °)		0.000
Longitude	W	118.500
		0.000
Z (in m)		-70 m

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			27% P2O5
<b>Tonnage</b>			0.57 Mt + 7.65 Mt

**Description:**

1) Off the southern California coast. On the continental margin.  
 2) Climate: Mediterranean dry summer. Mean annual rainfall 367 mm, maxi. during winter. Winds to S (Jan.), E-NE (Apr. -Jul.-Oct.).  
 3) Hydro: Mixed tide (maxi. 2.4 m). Cold surface currents in summer N to S (California current) 0.4 knots; warm surface currents in winter S to N (Davidson current) 0.3 knots.  
 4) Works performed: Numerous sampling, Scripps 1938, Dietz 1942, Emery 1960, Lockheed Aircraft - IMC 1963, Inderbitzen 1970.  
 5) Characteristics of the deposit: Continental margin has basin-and-bank topography due to Miocene diastrophism. On Santa Monica Bay the sandy bottom is relatively flat, sloping to west. The bay is dissected by canyon to north and south of flat area. The phosphorite occurs as oolites and pellets of sand and silt sizes. Nodules of gravel-to-cobble size, are scattered throughout the area, but appear to be concentrated on the outer edge of the shelf and upper slope. The highest concentration for any of the nodular samples collected in the southern California area was taken from this bay and contained 31.4 % P2O5. The low grade was 24.8%. Sizes ranged from 1.2 to 5 cm in diameter. The outer half of the shelf was studied for phosphatic content of the sands containing phosphorite, glauconite and shell fragments. Quartz, mica and rock fragments occur as detrital particles. The heavy mineral content of the sand is 2.5 %. The phosphorite is oolitic and pelletal from 0.06 mm to 6 mm. The P2O5 content of the sand varied from 0.35 to 9.68%. Most of the other mineral grains are covered with a phosphorite veneer. Inderbitzen & al. reserve estimations in 1970: area 106 km2; bottom covered by nodules (estimated) 1%, bottom covered by phosphate sand (estimated) 15%.  
 Volume of material: (assuming thickness nodules 0.3 m; sand 0.9 m) nodules 0.3 Mm3, sand 4.8 Mm3.

**References:**

Garrand L., 1977. Offshore phosphorite world occurrences.

Occurrence   
 Deposit   
 Deposit/File

**NAME: SOUTH CATALINA RIDGE**

**Commodities:** phosphate      **Type of deposit:** phosphorite upwelling  
**Country:** USA      US      **District:** California

**Marine area:** Pacific NE

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	outer shelf
<b>Morpho. 1</b>	lenticular
<b>Morpho. 2</b>	
<b>Petrography</b>	sand with nodules
<b>Mineralogy</b>	phosphate carbonate quartz

**COORDINATES**

Latitude	N	33.330
(Decimal °)		0.000
Longitude	W	118.330
		0.000
Z (in m)		100 to -450 m

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			27% P2O5
<b>Tonnage</b>			0.16 Mt

**Description:**

1) Off the southern California coast. On the continental margin is the southern end of the topographic high from which Santa Catalina Island projects. The subject area is about 67 km<sup>2</sup> including four isolated topographic highs.  
 2) Climate: Mediterranean dry summer. Mean annual rainfall 367 mm, maxi. during winter. Winds to S (Jan.), E-NE (Apr. -Jul.-Oct.).  
 3) Hydro: Mixed tide (maxi. 2.4 m). Cold surface currents in summer N to S (California current) 0.4 knots; warm surface currents in winter S to N (Davidson current) 0.3 knots.  
 4) Works performed: Numerous sampling, Scripps 1938, Dietz 1942, Emery 1960, Lockheed Aircraft - IMC 1963, Inderbitzen 1970.  
 5) Characteristics of the deposit: Continental margin has basin-and-bank topography due to Miocene diastrophism. The topographic high with irregular surface, bottom materials appear to be primarily coarse sand, mostly calcareous. Emery (1960) reported phosphorite deposits to exist in this area. Inderbitzen & al. reserve estimations in 1970: area 31 km<sup>2</sup>, bottom covered by nodules (estimated) 1%, bottom covered by phosphate sand (estimated) 0%. Volume of material: (assuming thickness nodules, 0.3 m; sand 0 m) nodules 94 000 m<sup>3</sup>.

**References:**

Garrand L., 1977. Offshore phosphorite world occurrences.



Occurrence   
 Deposit   
 Deposit/File

**NAME: SAN NICOLAS RIDGE**

**Commodities:** phosphate      **Type of deposit:** phosphorite upwelling  
**Country:** USA      US      **District:** California

**Marine area:** Pacific NE

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**TYOLOGY**

<b>Zone type</b>	shelf
<b>Morpho. 1</b>	lenticular
<b>Morpho. 2</b>	
<b>Petrography</b>	sand with nodules
<b>Mineralogy</b>	phosphate carbonate quartz

**COORDINATES**

Latitude	N	33.330
(Decimal °)		0.000
Longitude	W	119.660
		0.000
Z (in m)	20 to -450 m	

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			27% P2O5
<b>Tonnage</b>			6.4 Mt

**Description:**

1) Off the southern California coast. On the continental margin is a 461 square miles area between San Nicolas Island and Santa Rosa Island.  
 2) Climate: Mediterranean dry summer. Mean annual rainfall 367mm, maxi. during winter. Winds to S (Jan.), E-NE (Apr. -Jul.-Oct.).  
 3) Hydro: Mixed tide (maxi magn 2.4m). Cold surface currents in summer N to S (California current) 0.4 knots; warm surface currents in winter S to N (Davidson current) 0.3 knots.  
 4) Works performed: Numerous sampling, Scripps 1938, Dietz 1942, Emery 1960, Lockheed Aircraft - IMC 1963, Inderbitzen 1970.  
 5) Characteristics of the deposit: Continental margin has basin-and-bank topography due to Miocene diastrophism. The area has two flat banks separated by a saddle. Emery (1960) describes the bottom sediments as basalt pebbles and cobbles, phosphorite nodules, coarse calcareous sand near shore, and fine sand in deeper water. Fifty one percent of the sediments are calcareous, all with abundant glauconite.  
 Inderbitzen & al. reserve estimations in 1970: area: 1200 km<sup>2</sup>, bottom covered by nodules (estimated) 1%, bottom covered by phosphate sand (estimated) 0%. Volume of material: (assuming thickness nodules, 0.3 m; sand 0 m) nodules 5.2 Mm<sup>3</sup>.

**References:**

Garrand L., 1977. Offshore phosphorite world occurrences.

Occurrence   
 Deposit   
 Deposit/File

**NAME: TANNER CORTEZ RIDGE**

**Commodities:** phosphate      **Type of deposit:** phosphorite upwelling  
**Country:** USA      US      **District:** California

**Marine area:** Pacific NE

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	shelf
<b>Morpho. 1</b>	lenticular
<b>Morpho. 2</b>	
<b>Petrography</b>	sand with nodules
<b>Mineralogy</b>	phosphate carbonate quartz

**COORDINATES**

Latitude	N	32.500
(Decimal °)		0.000
Longitude	W	119.330
		0.000
Z (in m)		-4 to -450 m

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			27% P2O5
<b>Tonnage</b>			4.1 Mt

**Description:**

1) Off the southern California coast. On the continental margin is a large 775 km<sup>2</sup> area about 100 nautical miles west of San Diego, consisting of Cortez Bank, Tanner Bank, the saddle between them and a small isolated area to the east.  
 2) Climate: Mediterranean dry summer. Mean annual rainfall 367mm, maxi. during winter. Winds to S (Jan.), E-NE (Apr. -Jul.-Oct.).  
 3) Hydro: Mixed tide (maxi. 2.4 m). Cold surface currents in summer N to S (California current) 0.4 knots; warm surface currents in winter S to N (Davidson current) 0.3 knots.  
 4) Works performed: Numerous sampling, Scripps 1938, Dietz 1942, Emery 1960, Lockheed Aircraft - IMC 1963, Inderbitzen 1970.  
 5) Characteristics of the deposit: Continental margin has basin-and-bank topography due to Miocene diastrophism. The Banks have two relatively flat areas separated by a saddle. The bottom sediments have been described by Holtzman (1952), consisting of outcrops of rock, boulders, cobbles, pebbles and coarse calcareous sand. Emery (1960) shows specimen localities over the entire area.  
 Inderbitzen and others reserve estimations in 1970: area: 776 km<sup>2</sup>, bottom covered by nodules (estimated) 1%, bottom covered by phosphate sand (estimated) 0%. Volume of material: (assuming thickness nodules 0.3 m; sand 0 m) nodules 2.4 Mm<sup>3</sup>.

**References:**

Garrand L., 1977. Offshore phosphorite world occurrences.

Occurrence   
 Deposit   
 Deposit/File

**NAME: BLAKE PLATEAU**

**Commodities:** phosphate Mn      **Type of deposit:** phosphorite clastic  
**Country:** USA      US      **District:** Florida

**Marine area:** Atlantic NW

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYPOLOGY**

<b>Zone type</b>	continental slope
<b>Morpho. 1</b>	pavement
<b>Morpho. 2</b>	crust nodule gravel
<b>Petrography</b>	calcareous sand
<b>Mineralogy</b>	francolite Mn oxides carbonate

**COORDINATES**

Latitude	N	32.660
(Decimal °)	N	30.660
Longitude	W	77.500
	W	79.330
Z (in m)	-200 to -900	

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			22.2% CP + 9.9% NM
<b>Tonnage</b>			2.1Gt CP + 1.2Gt NM

**Description:**

1) Small closed depression in the Florida Channel between the Bahama Bank and the peninsular coast. 150 km off the Florida coast. Depths 750 to 850 m.  
 2) Climate: Subtropical humid. Mean annual rainfall 1380 mm; maxi. during summer times. Winds to E (Jan.) N- NE (Apr.-Jul.) S (Oct.).  
 3) Hydro: Sea clear, water T° 21°C. Tide semidiurnal, maxi. 1.5 m. Swell 1.5m 10-20%. Currents Gulf stream, NE (0.66m/s); Antilles NW (0.35 m/s); Thermocline counter current (5-40 cm/s).  
 4) Works performed: Geophysical survey (seismic), photo, coring, sampling.  
 5) Characteristics of the deposit: Sediments on the Blake Plateau contain 98-99% carbonate and are for the most part a well sorted, medium grained cream to light tan foraminiferal sand. A dark greenish-grey mossy form of glauconite occurs and is believed to be the result of reworking of Miocene or older formations exposed on the sea floor. Also present, green grains of recent glauconite. Glauconite is a common constituent of phosphate nodules. Manganese oxide form extensive brown to dark brown crusts. Phosphate nodules (average 8 cm) and phosphatic sediments occur extensively on the north end of the plateau and extend to the outer escarpment. Several dredge hauls indicate a concentration of nodules in scour depressions and generally their occurrence is best described as a lag gravel resulting from erosion by the Gulf stream. Pratt (1971) describes the appearance of the phosphate nodules as dark brown to tan, irregularly shaped lumps, characteristically smooth on the bottom and rough and nodular on the upper surface. They are conglomeratic and unweathered. Local accretion and recementation are common where they have not been exposed to circulating seawater. Otherwise surfaces are slowly dissolving. Mineralization: Francolite. Surface 7400 km<sup>2</sup>, thickness 10 cm. Age: Miocene with late phosphatization phase. Pratt (1971) states that the phosphate from the Blake Plateau surface is genetically similar and stratigraphically about the same age as the well known deposits found from Florida to North Carolina.

**References:**

1) Le Lann F., 1972. Les phosphorite sous-marines, BRGM 72 SGN 267 MAR, unpublished. 2) Garrand L., 1977. Offshore phosphorite world occurrences. 3) Manheim F.T. 4) Pratt R.M., 1980. Marine phosphorite.

Occurrence   
 Deposit   
 Deposit/File

**NAME: POURTALES TERRACE**

**Commodities:** phosphate      **Type of deposit:** phosphorite clastic  
**Country:** USA      US      **District:** Florida strait

**Marine area:** Atlantic NW

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	outer shelf
<b>Morpho. 1</b>	lenticular
<b>Morpho. 2</b>	
<b>Petrography</b>	sand, nodule
<b>Mineralogy</b>	phosphate carbonate

**COORDINATES**

Latitude	N	24.330
(Decimal °)		0.000
Longitude	W	81.160
	W	82.330
Z (in m)		-130 to -280

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

1) In the Florida Keys, Strait of Florida.  
 2) Climate: Subtropical humid. Average annual rainfall 1380 mm, maxi. during summer. Winds to SW (Oct.-Jan.), NW (Apr.-Jul.).  
 3) Hydro: sea clear. Tide mixed, maxi. 1.5 m. Currents NE (Florida currents) 2.5 knots and counter current SW. Waves 10% > 1.5 m.  
 4) Works performed: Part of a general reconnaissance USGS AEC: 3000 bottom sediment samples collected.  
 5) Characteristics of the deposit: Gorsline and Milligan (1963) describe samplings of the area which revealed phosphorite concentration over a length of 70 miles and width of 5 miles. The phosphatic material shows conglomeration, concentric laminated and dendritic replacement features. The deposits consist of nodules (4-8 cm), bones and irregular masses all laying on bedrock of Miocene age. Surface shows dark color and crusty aspect (10% Fe). The phosphatic material has been assigned an age of middle or late Miocene. The ocean environment is dominated by the Florida Strait current which is warm, saline, tropical water with a total lack of any cold upwelling waters. So, phosphatic material probably has been transported and redeposited.

**References:**

Garrand L., 1977. Offshore phosphorite world occurrences.

Occurrence   
 Deposit   
 Deposit/File

**NAME: ONSLOW BAY**

**Commodities:** phosphate      **Type of deposit:** phosphorite clastic  
**Country:** USA      US      **District:** North Carolina

**Marine area:** Atlantic NW

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYPOLOGY**

<b>Zone type</b>	inner shelf
<b>Morpho. 1</b>	lenticular
<b>Morpho. 2</b>	
<b>Petrography</b>	calcareous sand
<b>Mineralogy</b>	phosphate carbonate

**COORDINATES**

Latitude	N	34.000
(Decimal °)		0.000
Longitude	W	77.500
		0.000
Z (in m)		-15 to -22

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			29.7 to 31% P2O5
<b>Tonnage</b>			780 Mt

**Description:**

1) North Carolina continental shelf. Off Cap Fear.  
 2) Climate: Subtropical humid. Mean annual precipitation 1380 mm, maxi. during the summer. Winds to E (Jan.) N-NE (Apr.-Jul.), S-SE (Oct.).  
 3) Hydro: Tide semidiurnal, maxi. 1.5 m. Currents NE gulf stream (1.1 knot); NW Antilles (0.7-0.9 knots), Thermocline counter current. Sea clear, water T° 21°C.  
 4) Works performed: Luternauer and Pilkey (1967) collected 300 surface grab samples.  
 5) Characteristics of the deposit: The principal components of the sediments are quartz sand, calcareous organic remains, phosphorite pellets and local concentration of glauconite. The majority of sediments have a mean diameter of 0.25 to 0.50 mm and lack material finer than silt size. Phosphorite pellets are typically found in some abundance in the mixed quartz-shell fragment sands of the central shelf. All the pellets are of medium sand size and appear to have been rounded and abraded by transport. Concerning origin, Luternauer and Pilkey, believe that the phosphorite is detrital principally because the median grain size of the acid insoluble residue and that of the phosphorite fractions is so closely related. Little reason to expect such a relationship to occur if phosphorite grains are in situ chemical precipitates. They conclude that the phosphoritic grains could have been transported onto the shelf by Pleistocene rivers carrying materials eroded from phosphatic Coastal Plain outcrops, which commonly have grains similar to those found on the shelf. On the other hand, the sporadic or irregular abundance and distribution of phosphorite grains favors a residual origin from shelf outcrops. P2O5 content of total samples as determined by chemical analysis fluctuated between 1 and 7% and the abundance of phosphorite is 3 to 50% of the sediment.

**References:**

1) Anonymous, 1986. Subsea mineral resources, USGS B 1689-A, 27. 2) Le Lann F., 1972. Phosphorites sous-marines, BRGM 72 SGN 267 MAR, unpublished. 3) Garrand L., 1977. Offshore phosphorite world occurrences.

Occurrence   
 Deposit   
 Deposit/File

**NAME: SAN PABLO SEAMOUNT**

**Commodities:** phosphate Mn      **Type of deposit:** phosphorite upwelling  
**Country:** USA      US      **District:**

**Marine area:** Atlantic NW

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	seamount
<b>Morpho. 1</b>	crust
<b>Morpho. 2</b>	
<b>Petrography</b>	Fe Mn crust
<b>Mineralogy</b>	phosphate hematite Mn oxides

**COORDINATES**

Latitude	N	39.000
(Decimal °)		0.000
Longitude	W	61.000
		0.000
Z (in m)		

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

- 4) Works performed: dredging.
- 5) Characteristics of the deposit: Iron and Manganese occurrences found on the top of the seamount contain phosphate.

**References:**

Aumento, Lawrence and Plant, 1968.

Occurrence   
 Deposit   
 Deposit/File

**NAME: TARPOON SPRING**

**Commodities:** phosphate U      **Type of deposit:** phosphorite clastic  
**Country:** USA      US      **District:** Florida

**Marine area:** Atlantic NW, Mexico gulf

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	inner shelf
<b>Morpho. 1</b>	lenticular
<b>Morpho. 2</b>	
<b>Petrography</b>	siliceous phosphatic sand
<b>Mineralogy</b>	phosphate quartz

**COORDINATES**

Latitude	N	28.180
(Decimal °)	N	27.630
Longitude	W	82.800
	W	82.900
Z (in m)		-25 to -30

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

1) East of USA. West coast of Florida.  
 2) Climate: Subtropical humid. Mean annual rainfall 1500 mm, maxi. during summer. Winds to S (Jan.), NW (Apr. - Jul.), SW (Oct.)  
 3) Hydro: Sea clear. Mixed tide, maxi. 1.5 m. Prevailing surface currents NW 0.9 knots - Waves 10% > 1.5 m.  
 4) Works performed: part of a general reconnaissance USGS - AEC, bottom sediment samples collected (3000), some 572 analysed for phosphate and uranium.  
 5) Characteristics of the deposit: The continental shelf sediments off the west coast consist of: 1) Detrital sands chiefly quartz confined to the inner 20 miles of the continental shelf, average content 0.5 % P<sub>2</sub>O<sub>5</sub>, 1 ppm U. Maxi. concentration 13.4 % P<sub>2</sub>O<sub>5</sub>, 40 ppm U. 2) Calcareous sands of organic origin which cover the outer 100 miles of the shelf. No phosphorite detected, average content 0.15% P<sub>2</sub>O<sub>5</sub>. Gould (1953) determined that the unconsolidated sediments in these areas of high phosphate concentration are either underlain by older phosphate bearing limestone and coquina or are intimately associated with adjacent outcrops of phosphatic formations on land. The dissemination and distribution of the phosphorite in the inshore zone suggests that it is being supplied by rivers draining the peninsular phosphate deposits (Petersen, 1953).

**References:**

Garrand L., 1977. Offshore phosphorite world occurrences.

Occurrence   
 Deposit   
 Deposit/File

**NAME: VENICE ENCLEWOOD**

**Commodities:** phosphate U      **Type of deposit:** phosphorite clastic  
**Country:** USA      US      **District:** Florida

**Marine area:** Atlantic NW, Mexico gulf

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	inner shelf
<b>Morpho. 1</b>	lenticular
<b>Morpho. 2</b>	
<b>Petrography</b>	siliceous sand
<b>Mineralogy</b>	phosphate

**COORDINATES**

Latitude	N	27.000
(Decimal °)		0.000
Longitude	W	82.500
		0.000
Z (in m)		-25 to -30

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

1) East of USA. West coast of Florida.  
 2) Climate: Subtropical humid. Mean annual rainfall 1500 mm, maxi. during summer. Winds to S (Jan.), NW (Apr. - Jul.), SW (Oct.).  
 3) Hydro: Sea clear. Mixed tide, maxi. 1.5 m. Prevailing surface currents NW 0.9 knots. Waves 10% >1.5 m.  
 4) Works performed: part of a general reconnaissance USGS - AEC, bottom sediment samples collected (3000), some 572 analysed for phosphate and uranium.  
 5) Characteristics of the deposit: The continental shelf sediments off the west coast consist of: 1) detrital sands chiefly quartz confined to the inner 20 miles of the continental shelf, average content 0.5 % P<sub>2</sub>O<sub>5</sub>, 1 ppm U. Maxi. concentration 13.4 % P<sub>2</sub>O<sub>5</sub>, 40 ppm U. 2) calcareous sands of organic origin which cover the outer 100 miles of the shelf. No phosphorite detected, average content 0,15% P<sub>2</sub>O<sub>5</sub>. Gould (1953) determined that the unconsolidated sediments in these areas of high phosphate concentration are either underlain by older phosphate bearing limestone and coquina or are intimately associated with adjacent outcrops of phosphatic formations on land. The dissemination and distribution of the phosphorite in the inshore zone suggests that it is being supplied by rivers draining the peninsular phosphate deposits (Petersen - 1953).

**References:**

Garrand L., 1977. Offshore phosphorite world occurrences.



Occurrence   
 Deposit   
 Deposit/File

**NAME: CHAMEIS BAY**

**Commodities:** diamond **Type of deposit:** placer paleochannel  
**Country:** Namibia **NA** **District:** Namaqualand

**Marine area:** Atlantic SE

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**TYOLOGY**

<b>Zone type</b>	outer shelf
<b>Morpho. 1</b>	bed rock fractures
<b>Morpho. 2</b>	
<b>Petrography</b>	siliceous sand & silts
<b>Mineralogy</b>	diamond

**COORDINATES**

Latitude	S	-28.000
(Decimal °)	S	-28.660
Longitude	E	-15.330
	E	-16.250
Z (in m)		-100 to -150

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 2/17/95

**Company:** De Beers

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

1) Namibia, Atlantic continental platform between the Orange river mouth and Chamais Bay.  
 2) Climate: Subdesertic. Average annual rainfall (0-53 mm) maxi in winter. Prevailing winds: from S to SE in summer. Wind speed in January is about 3m/s in the morning, picks up to over 10 m/s afternoon, and drops in the evening. In July wind is little more than 1 m/s before noon and from the SW, it picks up to 2 m/s afternoon but comes from the S (Schulze, 1965).  
 3) Hydro: Swell depends on wind direction. Cold currents from S (Benguela) and warm from N (Angola). Meso-tidal (2-4 m) to micro-tidal (< 2m) wave. On the inner shelf the principal hydrodynamic forces are wave-induced bottom currents and littoral drift.  
 4) Works performed: Geophysical survey (sonar) and visual observation.  
 5) Characteristics of the deposit: The seabed in the area of interest is relatively flat and covered by unconsolidated sediments of variable thickness. This platform presents some steps (1.5 m high) quite separated and have a general dipping of 1/70. Boulders of variable sizes, but whose size and number decrease towards the open-sea, cover the platform. Deep gullies are present and their directions are in connection with rock joint systems (110°, 140°, 360°, 10°). The bedrock is formed by schistose rocks which are easily altered and not very hard (Grootderm serie). It is covered by younger sediments (sandstone, conglomerate and limestone). Recent sediments form a very thin bed (<0.5m) but the thickness varies from one place to another (<0.5m represents 72% of the surface; 0.5 to 4m, 23%; 4 to 12m, 5%). The unconsolidated sediments are represented by boulders, cobbles, pebbles, gravel, sand, silt, clay and shell. In some places very thin foraminifera beds cover fine sand and shell fragments. The diamonds are scattered over the bedrock. Big boulders forming obstacles at the sediment transport dynamic could sometimes present diamond concentrations. Generally, the high diamond concentrations are localised by the bedrock and inside the gullies developed in it. Percentage of diamonds is around 0.32 carats/m<sup>3</sup>.

**References:**

1) Murray J.W. & al., 1970. The geological environment of some diamond deposits off the coast of SW Africa, NERCIGS rep GB, 1970 T 70 N 13, 118-141. 2) Travocean, 1991. Etude des techniques d'exploration et d'exploitation des diamants dans la zone de 20 à 60 m d'eau du plateau continental, Travocean internal report.

Occurrence   
 Deposit   
 Deposit/File

**NAME: GROEN RIVER**

**Commodities:** diamond **Type of deposit:** placer paleobeach  
**Country:** South Africa **ZA** **District:** Namaqualand

**Marine area:** Atlantic SE

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	inner shelf
<b>Morpho. 1</b>	bed rock fractures
<b>Morpho. 2</b>	
<b>Petrography</b>	coarse siliceous sand
<b>Mineralogy</b>	diamond

**COORDINATES**

Latitude	S	-30.450
(Decimal °)	S	-30.950
Longitude	E	-17.600
	E	-17.750
Z (in m)		-25

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 2/17/95

**Company:** Dansa Diamonds

	Ore	Heavy minerals	Commodities
<b>Grades</b>			1 to 0.01 Ct/t
<b>Tonnage</b>			>11 Mcarats

**Description:**

1) Mining concession located at the mouth of the Groen and Spoeg rivers.  
 2) Climate: Subdesertic. Average annual rainfall (0-53 mm) with maxi in winter. Prevailing winds from the S to SE in summer. Wind speed in January is 3m/s in morning, picks up to over 10 m/s in afternoon, and drops in evening. In July wind is little more than 1 m/s before noon and from SW, it picks up to 2 m/s afternoon but comes from S (Schulze, 1965).  
 3) Hydro: Swell depending wind direction. Cold currents from S (Benguela) and warm from N (Angola). Meso-tidal (2-4 m) to micro-tidal (< 2m) waves. On the inner shelf the principal hydrodynamic forces are wave-induced bottom currents and littoral drift.  
 4) Works performed: Exploration started by Dansa in Oct. 87, from Olifan river in S to Buffers river in N. Geological studies, geophysical surveys. Sampling (1200 samples collected) grid 100m.  
 5) Characteristics of the deposit: The platform presents terraces at depths: -25, -35, -60, -75 et -100m separated by small cliffs. The bedrock shows numerous joint gullies, cavities and potholes with depth < 2m and diameter from 5-20m to 200-600 m. The bedrock (gneiss) is covered by unconsolidated sediments from bottom to top: bedrock fragments 0.5 m, compact clay 0.5 m, shell and pebbles 0.01-2 m (diamond host rock), shell and cobbles 1 m, argillaceous sand ± indurated 0-12 m, fluid ooze 0-1 m. Diamond concentration evaluated by sampling: 1) concession 8a, 1 carat/t gravels extracted; 2) concession 9a, 1 carat/100t deltaic sediments. Average size 2.55 carats; biggest diamond recovered 22.5 carats. The deposits of Namaqualand are secondary placers formed from primary kimberlites located in the centre of South Africa. Several generations of host rocks have been imagined (Precambrian - Cretaceous). Tectonic activities increased erosion and transport to the sea; wind and glacial transports also possible. Concentration by mechanical factors during transport and transgression regression. But works by waves and currents are dominant factors, soil surface irregularities are dominant traps.

**References:**

1) Anonymous, 1972. The occurrence of diamonds along the coast between the Orange River estuary and the Port Nolloth Reserve, Trans. Geol. Soc. S. Af. Bul., 54. 2) Murray J.W. & al., 1970. The geological environment of some diamond deposits off the coast of SW Africa, NERCIGS rep GB 1970 T 70 N 13, 118-141. 3) Travocean, 1991. Etude des techniques d'exploration et d'exploitation des diamants dans la zone de 20 à 60 m d'eau du plateau continental, Travocean internal report.

Occurrence   
 Deposit   
 Deposit/File

**NAME: CHAMEIS BAY to DIAZ POINT**

**Commodities:** diamond      **Type of deposit:** placer paleochannel  
**Country:** Namibia      NA      **District:** Namib desert

**Marine area:** Atlantic SE

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	foreshore inner shelf
<b>Morpho. 1</b>	bed rock fractures
<b>Morpho. 2</b>	
<b>Petrography</b>	siliceous gravel
<b>Mineralogy</b>	diamond

**COORDINATES**

Latitude	S	-28.000
(Decimal °)	S	-26.690
Longitude	E	-15.700
	E	-15.050
Z (in m)		0 to -25

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 2/17/95

**Company:** De Beers

	Ore	Heavy minerals	Commodities
<b>Grades</b>			1.7cts to 0.7 cts/m3
<b>Tonnage</b>			> 11 000 000 cts

**Description:**

- 1) Namibia. Coastal belt in front of the Namib desert. Distance off the coast 300m.
- 2) Climate: Subdesertic. Average annual rainfall (0-53 mm) maxi in winter. Prevailing winds from S to SE in summer. Resultant wind in Jan. about 3m/s in morning, picks up to over 10 m/s in afternoon, and drops again in evening. In July wind is little more than 1 m/s before noon and from SW, picks up to 2 m/s in afternoon but comes from S (Schulze,1965).
- 3) Hydro: Swell depends on wind direction. Cold currents from S (Benguela) and warm from N (Angola). Meso-tidal (2-4 m) to micro-tidal (< 2m) waves. On the inner shelf the principal hydrodynamic forces are wave-induced bottom currents and littoral drift.
- 4) Works performed: In 1921 Marine Diamonds Corp. starts exploration offshore: geological studies, geophysical surveys, sampling (drilling perpendicular to the coast line).
- 5) Characteristics of the deposit: The geomorphology depends on the petrology: easily altered rocks give uniform surfaces, quartzite form ridges and schist valleys; granit and gneiss give hillocks or pap-like hills. Various shorelines during Tertiary are marked by cliffs, ridges, barriers, sand strands parallel to the coast at various depths. Joint, strike and slope gullies on the platform. Bedrock covered by unconsolidated sediments from bottom to top: bedrock fragments 0.5 m, compact clay 0.5 m, shell and gravels 0.50 m (diamond host rock), shell and cobbles 1 m, argillaceous sand ± indurated 0-12 m, fluid ooze 0-1 m. Gravel with spherical and angular pebbles and "birdseed" (coarse sand). Diamond concentration evaluated by sampling: 1.4 carats/m3. The deposits are secondary placer formed from primary Kimberlites located in the centre of South Africa. Several generations of host rocks imagined (Precambrian-Cretaceous). Tectonic activities increased erosion and transport to the sea; wind and glacial transports possible. Concentration by mechanical factors during transport and transgression regression. Works performed by waves and currents are dominant factors, soil surface irregularities are dominant traps.

**References:**

- 1) Anonymous, 1972. The occurrence of diamonds along the coast between the Orange River estuary and the Port Nolloth Reserve, Trans. Geol. Soc. S. Af. Bul., 54. 2) Murray J.W. & al., 1970. The geological environment of some diamond deposits off the coast of SW Africa, NERCIGS rep GB 1970 T 70 N 13, 118-141. 3) Travocean, 1991. Etude des techniques d'exploration et d'exploitation des diamants dans la zone de 20 à 60 m d'eau du plateau continental, Travocean internal report.

Occurrence   
 Deposit   
 Deposit/File

**NAME: BROADACRES MINING AREA**

**Commodities:** diamond **Type of deposit:** placer paleochannel  
**Country:** South Africa **ZA** **District:** Namaqualand

**Marine area:** Atlantic SE

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	foreshore
<b>Morpho. 1</b>	bed rock fractures
<b>Morpho. 2</b>	
<b>Petrography</b>	coarse siliceous sand
<b>Mineralogy</b>	diamond

**COORDINATES**

Latitude	S	-31.670
(Decimal °)	S	-31.280
Longitude	E	-18.220
	E	-18.000
Z (in m)		0 to -5

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 2/17/95

**Company:** Broadacres

	Ore	Heavy minerals	Commodities
<b>Grades</b>			1ct/m3
<b>Tonnage</b>			100 000 carats

**Description:**

1) The area extends 12 km N of the mouth of the "Olifan River".  
 2) Climate: Subdesertic. Average annual rainfall (0-53 mm) maxi in winter. Prevailing winds from S to SE in summer. Resultant wind in Jan. about 3m/s in morning, picks up to >10 m/s in afternoon, and drops in evening. July wind is about 1 m/s before noon from SW and picks up to 2 m/s in afternoon from S (Schulze 1965).  
 3) Hydro: Swell depending on wind direction. Cold currents from S (Benguela) and warm from N (Angola). Meso-tidal (2-4 m) to micro-tidal (< 2m) waves. Principal hydrodynamic forces are wave-induced bottom currents and littoral drift.  
 4) Works performed: geological studies, geophysical surveys, sampling.  
 5) Characteristics of the deposit: The coastal morphology is influenced by lithology and structures. Variable rock hardness allowed formation of ridges, gullies, potholes easing diamond trapping. Platform covered by fine quartz sand with garnets, ilmenite, epidote, pyrite, shales, feldspathic rocks, amygdaloid mafic lavas. Size and shape of rock fragments variable, small and rounded in N, coarser and angular near Olifan River. Average diamond concentration around a low 1 carat/m3. Exploitation of rich potholes (20 carats/m3). Diamond size 0.5-1 carats; average 0.9 carats. Deposits are secondary placer formed from primary kimberlites located in the centre of South Africa (?). Several generations of host rocks are imagined (Precambrian - Cretaceous). Tectonic activities increased erosion and transport to the sea; wind and glacial transports also possible. Concentration by mechanical factors during transport and transgression regression. But works performed by waves and currents are dominant factors, soil surface irregularities are dominant traps. The Orange River is the transporting agent but the changes of its bed site produced diamond dispersion. The present position of Olifan River could be the same as during Pleistocene.

**References:**

1) Anonymous, 1972. The occurrence of diamonds along the coast between the Orange River estuary and the Port Nolloth Reserve, Trans. Geol. Soc. S. Af. Bul., 54. 2) Murray J.W. & al., 1970. The geological environment of some diamond deposits off the coast of SW Africa, NERCIGS rep GB 1970 T 70 N 13, 118-141. 3) Travocean, 1991. Etude des techniques d'exploration et d'exploitation des diamants dans la zone de 20 à 60 m d'eau du plateau continental, Travocean internal report. 4) Walker & Gurney, 1985. The recovery of diamonds from the surf zone of the South Atlantic near Olifan River, RSA Scripps institution of oceanography US 1985.

Occurrence   
 Deposit   
 Deposit/File

**NAME: RICHARDS BAY**

**Commodities:** Ti Zr      **Type of deposit:** placer paleobeach  
**Country:** South Africa      ZA      **District:** Natal

**Marine area:** Indian SW

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	on land
<b>Morpho. 1</b>	paleobeach & dune
<b>Morpho. 2</b>	beach top
<b>Petrography</b>	sand
<b>Mineralogy</b>	ilmenite rutile zircon

**COORDINATES**

Latitude	S	-28.800
(Decimal °)		0.000
Longitude	E	-32.000
		0.000
Z (in m)		0 to 30

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 2/15/95

**Company:** Richards Bay Minerals

	Ore	Heavy minerals	Commodities
<b>Grades</b>	%6 I+0.30 R+0.65 Z		
<b>Tonnage</b>	700 000 Mt		Mt:35 I+2.1 R+4.55 Z

**Description:**

1) East coast of South Africa, north of Durban. The deposit is a beach sand placer.  
 2) Climate: Tropical savannah. Mean annual precipitation 1500 mm. Prevailing surface winds: From SE to the NW trade winds (July), from NE to the SW monsoon winds and SE to NW trade winds (January).  
 3) Hydro: Currents from N to S or SW (Mozambic current).  
 4) Works performed: 1925 discovery of titaniferous heavy sand; 1967 first geological study and first evaluation; 1969-1973 drilling survey; 1973-1975 pilot plant 50t/day (100 kt handled)  
 5) Characteristics of the deposit: Onshore sand strips parallel to the shoreline and forming sand-hill chain, 35 to 40 m height, laying on argillaceous bedrock, 25 m above sea-level. The geometry: length 17 km, width 2 km, thickness 35 m. The mineral percentage of the sand is as follows: 5% ilmenite, 0.3% rutile, 0.65% zircon. After milling process, it is possible to recover for 1 ton of sand, 40 kg of ilmenite, 2.7 kg of rutile and 5.5 kg of zircon. Reserves are evaluated at 700 Gt. Ilmenite after smelting can produce 45% of titaniferous slag and 85% TiO<sub>2</sub>, and more than 22% of soft iron with very low manganese content.

**References:**

Technical reviews; Mining magazine, Nov. 76; Mining journal, Nov. 80.

Occurrence   
 Deposit   
 Deposit/File

**NAME: NORTH DAKAR**

**Commodities:** Ti **Type of deposit:** placer paleobeach  
**Country:** Senegal **SN** **District:** Thiès

**Marine area:** Atlantic E

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	inner shelf
<b>Morpho. 1</b>	paleobeach
<b>Morpho. 2</b>	
<b>Petrography</b>	siliceous sand
<b>Mineralogy</b>	ilmenite

**COORDINATES**

Latitude	N	16.000
(Decimal °)	N	14.700
Longitude	W	16.500
	W	17.500
Z (in m)		-20 to -30

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 2/20/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>	1.25 to 5 %	55% TiO2 0.24 Cr2O3	
<b>Tonnage</b>			

**Description:**

1) Off the Senegal coast, N of Cap Vert peninsula. Area 550 km<sup>2</sup> from the shoreline to the -45m isobath.  
 2) Climate: Tropical savannah. Mean annual precipitation 572 mm, maxi in summer. Prevailing surface winds: from NE in January and from N-NW in July.  
 3) Hydro: Littoral drift to S under NW swell. North Atlantic water, motivated by trade winds, circulates in a clockwise direction from N to S (Canary current).  
 4) Works performed: 1972 Bathymetry and seismic surveys (30 profiles, spacing 2.5 km). 1973 seismic and magnetic: 130 km. Sampling by cores (32 on 3 profiles spaced 1 km total 130m recovered).  
 5) Characteristics of the deposit: narrow platform to S with strong declivity; wider to N with slow declivity. Towards S Cayar canyon cuts deeply the platform and comes close to the shoreline. The sand transits to the open sea through the canyon and is removed by the surf. Thickness of unconsolidated sediments is variable in correlation with the canyon hydrodynamics (thickness reduction). Normally, the upper part is a silty green ooze (4m in N, 3-4m in the middle part, 2m in S), covering fine beige to yellow-orange dune sands. Sometimes between the ooze and the sand are grey sands with carbonaceous matters. Under the beige dune sands appear grey sands or indurated coquinoid sands. Heavy minerals form lenses parallel to the coast inside the sand; in the north Dakar area, the lens is 45 km long and the HM content increases towards the Cayar canyon. Ilmenite, zircon, rutile, leucoxene, staurotide, magnetite, garnets, andalusite, monazite form the heavy mineral content. The HM content is too low for exploitation given current market conditions.

**References:**

BRGM, 1973-1974. Operation ROSILDA, campagne de recherche au large de Dakar 73 SGN 057 MAR, 74 SGN 044 MAR, 74 SGN 256 MAR, unpublished.

Occurrence   
 Deposit   
 Deposit/File

**NAME: SOUTH DAKAR**

**Commodities:** Ti Cr      **Type of deposit:** placer paleobeach  
**Country:** Senegal      SN      **District:**

**Marine area:** Atlantic E

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	inner shelf
<b>Morpho. 1</b>	paleobar
<b>Morpho. 2</b>	
<b>Petrography</b>	siliceous grainsized sand
<b>Mineralogy</b>	ilmenite chromite

**COORDINATES**

Latitude	N	14.580
(Decimal °)	N	14.680
Longitude	W	17.250
	W	17.250
Z (in m)		-30

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 2/20/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>	1 to 3%	55% TiO2 0.24 Cr2O3	
<b>Tonnage</b>			

**Description:**

1) South of the Cap Vert Peninsula. Area 1000 km2 between the coast and the -30m isobath. Inside that area, a small zone between M Bour and Rufisque have been studied in more details.  
 2) Climate: Tropical savannah. Mean annual precipitation 572 mm, maxi during summer. Prevailing surface winds: from NE in January and from N-NW in July.  
 3) Hydro: The swell from NW rotates around the Cape Vert Peninsula. A divergence of current directions appears from that point. The current is losing energy and allows a littoral drift from the west towards the east. The circulation of upper waters of the Atlantic is motivated by the trade winds; the North Atlantic water circulates in a clockwise direction from N to S (Canary current).  
 4) Works performed: 1972: bathymetry and seismic surveys (30 profiles 1250 km, spacing 2.5 km, surface covered 1500 km2). 1973: scintillometry, 14 parallel profiles; vibracore samplings 64. and a new seismic and magnetic survey.  
 5) Characteristics of the deposit: The continental platform, presents some variations of the declivity around -18 and -25 m. A small cliff (10-15 m height) appears around -50m (may have been formed during quaternary sea regression). An underwater paleolaguna separated from the deep sea by a dune sand hill (-40m) is today filled by more than 10m of sediments sometimes indurated. The lithology of this laguna shows, from the top to the bottom, the following sedimentary beds: 1- fine to medium size greenish sands (0.5 to 3 m); 2- argillaceous peat to silty muds with oyster shells; 3- muddy sand, grey to black, containing organic debris to argillaceous sand beige-brown, sometimes silty clay; 4- silicified biocalcarenite; 5- marly limestone. For the open sea, the sediment succession is: 1- grain-sorted sands and coquinoïd sands (old shoreline?); 2- silicified biocalcarenite (homogeneous to -50m). Ilmenite, zircon, rutile, staurotide, monazite, cassiterite, garnet, disthene and anatase form the heavy minerals. The highest grades are localised inside the grain-sorted sands. Numerous sand beach placers exist in this area.

**References:**

BRGM, 1973-1974. Operation ROSILDA, campagne de recherche au large de Dakar, 73 SGN 057 MAR, 74 SGN 044 MAR, 74 SGN 256 MAR, unpublished.

Occurrence   
 Deposit   
 Deposit/File

**NAME: MINNINUP**

**Commodities:** Ti **Type of deposit:** placer beach paleobeach  
**Country:** Australia AU **District:** Western Australia SW, Geographe Bay

**Marine area:** Indian SE

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	foreshore lagoon
<b>Morpho. 1</b>	paleobeach
<b>Morpho. 2</b>	
<b>Petrography</b>	fine to medium siliceous & calcareous sa
<b>Mineralogy</b>	ilmenite

**COORDINATES**

Latitude	S	-33.500
(Decimal °)		0.000
Longitude	E	-115.500
		0.000
Z (in m)		-7 to +7

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/17/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

1) West Australia, Geographer Bay, close to the shore.  
 2) Climate: Mediterranean. Annual average rainfall 883 mm; maxi. during the winter (July). Surface prevailing winds from the NW (72 km/h) during the winter and W-SW (50 km/h) essentially during the summer. Cyclones (1 every 3 years) produce strong winds, waves and storms. The tropical storm track (Nov.-May) from the N-NE follows the coast line.  
 3) Hydro: Current directions result from seasonal variations in the winds. Normally the currents come from SW and follow the coast line.  
 4) Works performed: Sampling.  
 5) Characteristics of the deposit: The area of interest is located along the shoreline, north of the large onshore heavy mineral deposits of Yoganup and Capel. The geomorphology of the Minninup area could be divided into several units: 1) inner shelf with seabed <5m, slow declivity, mollusc biotype, covers of calcareous sands (rich in HM) and gravels with quartz fragments of variable sizes; 2) beach forming a narrow strip 50 km long with fine to medium size sediments (HM well represented); 3) vegetated parabolic dunes, mobile parabolic dunes, and linear dunes (HM); 4) drained wetlands with estuarine channels, flats & lagoons; 5) limestone hinterland.  
 The Holocene sedimentary formations from the beach and the inner shelf are represented by two units: 1) The upper unit (<2.5m) of which the upper part is massive and formed by fine sands rich in quartz, limestone, fragments of gastropods and seaweeds; the rest is formed by fine to middle size sands with the same composition as above; it contains 10-90% of HM with rich laminae of 30 cm. 2) The lower unit forms a thin bed < 1m with poor sorted sands, containing quartz, carbonates, HM and gravels; it contains 40% of HM with homogeneous distribution through the coarse sands.

**References:**

Lindsay B. & al. Stratigraphic evolution on heavy mineral accumulation in the Minninup shoreline, SW Australia.



Occurrence   
 Deposit   
 Deposit/File

**NAME: FORSTER**

**Commodities:** Ti Zr **Type of deposit:** placer paleobeach  
**Country:** Australia AU **District:** New South Wales

**Marine area:** Pacific SW

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	shelf
<b>Morpho. 1</b>	paleobeach
<b>Morpho. 2</b>	
<b>Petrography</b>	medium siliceous sand
<b>Mineralogy</b>	rutile ilmenite zircon

**COORDINATES**

Latitude	S	-32.500
(Decimal °)	S	-31.500
Longitude	E	-152.500
	E	-153.000
Z (in m)		-18 to -155

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/17/95

**Company:** Planet Resources Group NL

	Ore	Heavy minerals	Commodities
<b>Grades</b>	0.21% + 0.22%		
<b>Tonnage</b>	71 Mt + 91 Mt		

**Description:**

1) East coast of Australia. The area extends from Coff's Harbour to Broughton Island.  
 2) Climate: Marine West coast. Annual average rainfall 1200-1600 mm. Dry season during summer. Winds 110 kn to NW (Jan.) to SE (July).  
 3) Hydro: From N and NE currents (East Australian current: 2 kn). Swell from east, average magnitude 3 m.  
 4) Works performed: 428 drillings between 1967- 1970.  
 5) Characteristics of the deposit: The continental platform is almost horizontal. Five underwater paleo-shorelines seem to exist between 18 and 155 m. The seabed is covered with sand showing variable thickness. In the north of NSW, the maximum thickness is 43 m. The thicker layers are located along old fluvial channels and near the actual shoreline. The typical lithological section is from the bottom to the top: 1) beach sand with good sorting, rounded grains, relatively coarse, with HM; 2) peat >80 cm; 3) ferruginous indurated thin bed; 4) bleached sand (dune) where HM are disseminated but sometimes concentrated in the upper part. Quartz, limonite, shell fragments, are associated with HM: rutile, zircon, leucoxene, ilmenite. The rutile, zircon highest grades are found in the first meters of the drilling. The granulometry of the minerals are always lower than 0.2 mm (rutile 0.15 mm, leucoxene 0.18 mm, zircon 0.14 mm, ilmenite 0.18 mm). The average grade for the rutile is 0.08% (0.01-1.02%), zircon 0.08% (0.01- 0.93%), leucoxene 0.04 % (0.01-0.24%), ilmenite 0.20% (0.01-1.19%). Several mineralised areas have been delineated. Area I: 153,800 t (R+Z) from 71.1 Mt of sand with 0.22% of HM; Area II: 190,900 t (R+Z) from 91.4 Mt of sand with 0.21% of HM.

**References:**

BRGM, 1972. Mission d' information en Australie et au Japon du 10 septembre au 12 octobre 1972, BRGM 73 SGN 019 MAR, unpublished.

Occurrence   
 Deposit   
 Deposit/File

**NAME: CALICUT BEYPORE RIVER**

**Commodities:** Au **Type of deposit:** placer paleobeach paleochannel  
**Country:** India **IN** **District:** Kerala

**Marine area:** Indian N, Arabian sea

**ADMINISTRATION**

**TYOLOGY**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

<b>Zone type</b>	foreshore
<b>Morpho. 1</b>	paleochannel
<b>Morpho. 2</b>	paleobeach
<b>Petrography</b>	siliceous sand
<b>Mineralogy</b>	gold

**COORDINATES**

Latitude	N	11.140
(Decimal °)		0.000
Longitude	E	-75.740
		0.000
Z (in m)		-5

**STAGE**

**MINING RIGHTS**

Exploration:  Free:   
 Mining:  Under control:   
 Processing:  Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

- 1) Beypore is situated at 20 km S of Calicut on the SW of Dekkan shield, Kerala state.
- 2) Climate: Tropical equatorial forest. Annual average rainfall 2500-3000 mm, maxi. from SW monsoon, June to September. In January, NE monsoon.
- 3) Hydro: Tide (1-2 m). SW monsoon is also the period of maxi. sea turbulence. The predominant direction of waves is from SW, W-SW, W, W-NW, with periods ranging from 5-14 s. For waves from the SW the tendency of sediment transport is mostly NE and for waves from W-SW and W several directions. For W-NW, the transport tendency is toward the S.
- 4) Works performed: The Geological Survey of India undertook a detailed exploration for gold off the coast of northern Kerala. Drilling began off the Beypore River mouth 8 km south of Calicut with a Holland made drill ship (M.J., 1992).
- 5) Characteristics of the deposit: Results indicated viable quantities of gold off the Beypore and Kasaragod coast in Kerala. Two chartered Netherland vessels confirmed the deposit (M.M., 1984).

**References:**

- 1) 1984. Marine Mining, 4(3), May 1984. 2) 1992. Marine Journal, 31, 9 July 1992.

Occurrence   
 Deposit   
 Deposit/File

**NAME: HEINZE BASIN**

**Commodities:** Sn W      **Type of deposit:** placer paleobeach  
**Country:** Myanmar, Birmania      BU      **District:**

**Marine area:** Indian N, Bengal bay

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	inner shelf
<b>Morpho. 1</b>	paleobeach
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	cassiterite wolfram

**COORDINATES**

Latitude	N	14.650
(Decimal °)		0.000
Longitude	E	-97.800
		0.000
Z (in m)		-16 to -30

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

1) West part of Burma.  
 2) Climate: Tropical rain forest. Mean annual precipitation 4000 mm, maxi during summer. Prevailing winds from SW during summer and from NE during winter.  
 3) Hydro: From November to March, the surface water flows from north to south-west and from May to September SW to NE. Some currents follow the coast more or less.  
 4) Works performed: In 1975, an exploration survey was carried out by the UNDP and one mining corporation of Burma. The survey involved geological mapping, geochemical sampling and marine seismic reflection profiling. (1.7 MUS\$). A mining project was set up after the results of the exploration project at a cost of 30 MUS\$. Mining was performed using a 350 litre bucket ladder dredge with a digging depth of 16-27m. The ore was treated in a portable floating plant with further upgrading in the central concentrator in Tavoy. Output in 1982 amounted to 4200 t and 1983 7% of the world tin/tungsten production came from these shallow coastal waters.

**References:**

Occurrence   
 Deposit   
 Deposit/File

**NAME: QUILON TRAVANCORE**

**Commodities:** Ti **Type of deposit:** placer paleobeach  
**Country:** India **IN** **District:** Kerala

**Marine area:** Indian N

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	inner shelf
<b>Morpho. 1</b>	spreading
<b>Morpho. 2</b>	paleobeach
<b>Petrography</b>	siliceous & calcareous sand
<b>Mineralogy</b>	ilmenite rutile quartz carbonate

**COORDINATES**

Latitude	N	8.800
(Decimal °)		0.000
Longitude	E	-77.450
		0.000
Z (in m)		-10 to -15

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 2/15/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

1) Quilon district, state of Kerala, SW of India. It extends over 23 km, a few kilometres N of Quilon.  
 2) Climate: Tropical equatorial forest. Annual average rainfall 2500-3000 mm, maxi. from SW monsoon, June to September. In January, NE monsoon.  
 3) Hydro: Tide (1-2 m). SW monsoon is also the period of maxi. sea turbulence. The predominant direction of waves is from SW, W-SW, W, W-NW, with periods ranging from 5-14 s. (For waves from the SW the tendency of sediment transport is mostly NE and for waves from W-SW and W several directions. For W-NW, the transport tendency is toward the S.  
 4) Works performed: Sampling.  
 5) Characteristics of the deposit: The deposit, a former elevated offshore sandbar, lies in front of the mouths of 2 large rivers. Where there was formerly deep water between the bar and the original mainland there are now lagoons and low-lying flats which are flooded during the rainy season. Black sands containing up to 80% HM are present on the modern-day beach, the enrichment resulting from wave action. The black sand extends to 3 m below tide mark. Behind the beach are grey-coloured dunes containing up to 40 to 50% HM, and rising to 7 m above sea level. Buried underneath these dunes are old beach deposits as rich in HM as modern-day beach deposits. The average width of the deposit is 240 m; the average grade is 18% HM. The average composition of HM suite is as follow: ilmenite 68% (TiO2 60.60%, Fe2O3 24.18%, FeO 9.25%), leucosene 2%, rutile 7% (TiO2 93.04%, Fe2O3 3.36%), zircon 6% (ZrO2 65%, SiO2 30.3%), monazite 1%, sillimanite 14%. The ilmenite has a relatively high chromium content 0.12% Cr2O3 and a high ferric iron content 24.18% Fe2O3, both undesirable properties for pigment manufacture. Resource estimation: 17.53 Mt ilmenite, 1.27 Mt rutile, 1.29 Mt zircon, 0.12 Mt monazite. Recent geological exploration of the continental shelf provide supporting evidence of the extension of the placer deposit into deeper water. Studies of the sediments indicate that the entire outer continental shelf is blanketed with quartz sand and varying proportions of HM.

**References:**

1) Anonymous, 1989. India, a major ilmenite producer, Petromin. 2) Tipper, 1914. The monazite sands of Travancore, RGSIT 44. 3) Viswanathan P., 1950. Zircon and sillimanite in Travancore, Sciences & Culture, 15 (11).

Occurrence   
 Deposit   
 Deposit/File

**NAME: SIGATOKO SANDS**

**Commodities:** Fe Cr      **Type of deposit:** placer paleobeach  
**Country:** Fiji      FJ      **District:** Viti Levi

**Marine area:** Pacific W

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**TYOLOGY**

<b>Zone type</b>	inner shelf
<b>Morpho. 1</b>	paleobeach
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	magnetite chromite

**COORDINATES**

Latitude	S	-18.200
(Decimal °)		0.000
Longitude	E	-177.520
		0.000
Z (in m)		

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

4) Works performed: UNDP and MRD carried out studies of the Sigatoko sands in 1983. Vibro core sampling produced encouraging results indicating substantial amounts of magnetic and chromiferous minerals off Viti Levu.

**References:**

1) Anonymous, 1984. Mining annual review, EMJ, 339. 2) Anonymous, 1984. EMJ, 59, July 1984.

Occurrence   
 Deposit   
 Deposit/File

**NAME: MATEPANO RIVER**

**Commodities:** Au **Type of deposit:** placer paleochannel  
**Country:** Solomon **SB** **District:** Guadalcanal N

**Marine area:** Pacific W

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**TYOLOGY**

<b>Zone type</b>	inner shelf
<b>Morpho. 1</b>	paleochannel
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	gold

**COORDINATES**

Latitude	S	-9.420
(Decimal °)		0.000
Longitude	E	-160.220
		0.000
Z (in m)		-30 to -65

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 3/16/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

- 1) North of Guadalcanal Island. Mouth of the Matepano river.
- 4) Works performed: Echo soundings and sub-bottom seismic reflection profiles were performed over more than 100 km. Sampling program for gold in 1970 over an area off the mouth of the Matepano River to a depth of 30-66 m. Analysis of the 88 samples collected by piston cores and dredges.
- 5) Characteristics of the deposit: Gold content is between 0.045 to 0.087 ppm.

**References:**

Anonymous, 1978. Ocean Mining report, 8-10, Feb. 1978.

- Occurrence
- Deposit
- Deposit/File

**NAME: SIN'AM-DONG KIBONG-DONG**

<b>Commodities:</b> Th Rare-Earth		<b>Type of deposit:</b> placer paleobeach	
<b>Country:</b> North Korea	NK	<b>District:</b> Pyongan Pukdo	

**Marine area:** Pacific NW, Korean bay

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**TYOLOGY**

<b>Zone type</b>	inner shelf
<b>Morpho. 1</b>	paleobeach
<b>Morpho. 2</b>	
<b>Petrography</b>	siliceous sand
<b>Mineralogy</b>	monazite

**COORDINATES**

Latitude	N	39.780
(Decimal °)		0.000
Longitude	E	-124.580
		0.000
Z (in m)		

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

5) Characteristics of the deposit: The monazite is concentrated by the action of sea waves and forms high grade placers. It originates from the deposit of a coastal terrace that is more promising than the former. Two kilometres further East, the placer of Kibong Dong is found in the lower part of the coastal terrace and is one meter in thickness. High grade of monazite.

**References:**

Hideo Tsuda, 1969. Monazite deposits in Korea, Geol. Miner. Resources Far East, Ed. Ogura.

Occurrence   
 Deposit   
 Deposit/File

**NAME: IMURUAN BAY**

**Commodities:** Ti Zr U Th Rare-Earth      **Type of deposit:** placer beach paleobeach  
**Country:** Philippines      PH      **District:** Palawan NW

**Marine area:** Pacific W, China S sea, Nanhai

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	on land foreshore
<b>Morpho. 1</b>	beach
<b>Morpho. 2</b>	
<b>Petrography</b>	siliceous sand
<b>Mineralogy</b>	monazite rutile zircon monazite

**COORDINATES**

Latitude	N	10.700
(Decimal °)		0.000
Longitude	E	-119.360
		0.000
Z (in m)		

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

1) The deposits are located along the beach areas between Pilar and Dansol municipalities, Sorsogon.  
 2) Climate: Tropical, equatorial forest type. Maxi. rainfall: July-August. Mean annual rainfall 2160 mm. Temperature 20-30°C. Winds from NE (NE trade) in January, from S-SW (SW monsoon) in July.  
 4) Works performed: sampling.  
 5) Characteristics of the deposits: The magnetite bearing beach sand deposits are disposed along open beaches and those adjacent to the present outlets of rivers and creeks. In most of the deposits, there is no general position in the concentration of black sands. The surface concentration of black sand falls under two types. One is less than one millimetre thick between low tide and high tide levels; the other and the thicker is usually more than a decimetre thick above high tide level. The magnetic components are essentially of magnetite grains with minor grains made up of hematite-magnetite inter growths and few grains of transparent minerals with attached bodies of magnetite. Most of the magnetite grains are rounded to subrounded, but some are angular.

**References:**

Malicdem D.G. & al., 1974. Magnetite bearing beach sand deposit Pilar-Dansol area, Sorsogon, Bureau of Mines, Rep invest Philippines n°76.



Occurrence   
 Deposit   
 Deposit/File

**NAME: FORT DAUPHIN**

**Commodities:** Ti Th Rare-Earth Zr      **Type of deposit:** placer beach  
**Country:** Madagascar      MG      **District:** Madagascar SE

**Marine area:** Indian SW

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	on land foreshore
<b>Morpho. 1</b>	beach
<b>Morpho. 2</b>	
<b>Petrography</b>	siliceous sand
<b>Mineralogy</b>	ilmenite monazite zircon

**COORDINATES**

Latitude	S	-25.000
(Decimal °)		0.000
Longitude	E	-47.000
		0.000
Z (in m)		0

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 2/15/95

**Company:** Société des Monazites de Madagascar

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

- 1) South East part of Madagascar.
- 2) Climate: Tropical rain forest. Mean annual precipitation 2000 mm. Maxi in April and September. Prevailing winds from SE (SE trades).
- 3) Hydro: South equatorial currents from the East, with change of direction near the Madagascar coast to the NW, SW and NS. Strong swell. Tide.
- 4) Works performed: Sampling
- 5) Characteristics of the deposit: The product from the erosion of the "anosyenne" zircon rich granitic complex, are carried by hydrographic system to the sea and scattered over the continental platform. The storms with deep swell move the sediments and the combined action with tides bring these materials back to the shore. Small mining exploitation on the backshore in 1956, produced 200 t of monazite and 20 t of zircon. Ilmenite was stored, as the price was too low.

**References:**

Lecoq, 1957. Une perspective minière nouvelle à Madagascar: les sables à monazite, Mines et Métallurgie, 3509.

Occurrence   
 Deposit   
 Deposit/File

NAME: **ZANZIBAR**

Commodities: Ti Zr Th Rare-Earth      Type of deposit: placer paleobeach  
 Country: Tanzania      TZ      District: Zanzibar Island

Marine area: Indian SW

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

Zone type	on land foreshore
Morpho. 1	paleobeach
Morpho. 2	
Petrography	sand
Mineralogy	ilmenite zircon rutile monazite

**COORDINATES**

Latitude	S	-6.500
(Decimal °)		0.000
Longitude	E	-39.000
		0.000
Z (in m)		0

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 2/15/95

Company:

	Ore	Heavy minerals	Commodities
Grades			35.6 % Ilmenite
Tonnage	7 106 t		5.2 % zircon, 3 % ru

**Description:**

1) Eastern coastal belt of Tanzania. Backshore area.  
 2) Climate: Tropical savannah. Annual average rainfall 1486mm with two maxi, April and November; dry season during winter. Surface prevailing winds from SE (April to October) and NE (November to March).  
 3) Hydro: During the long SE monsoon, prevailing winds generate northerly along shore currents which are not stopped during the short NE monsoon, but merely shifted away from the shore. In the Dar es Salaam-Bagamayo area, the influence of northerly currents is even greater, because the shelf is only a few km width there. Tides (4.5 m).  
 4) Works performed: Beach profiles measurements (After each spring tide, bi-weekly, at 5 selected localities) Sampling -trenches (400 samples).  
 5) Characteristics of the deposit: The coastal belt of Tanzania is made up of two units, namely the Mtoni Terrace adjacent to the shoreline and composed of Pleistocene-Recent sediments and by the Mio-Pliocene Tanga Terrace from which it is separated by a step. Concentrations of HM are found within the Mtoni Terrace, which consist of lagoon swamps, raised reef limestones and older and recent beach ridges. The richest concentrations are found north of the mouths of the bigger rivers (Ruvuma River). HM contains garnet, ilmenite, kyanite, zircon, rutile, magnetite, and monazite. Concentrations vary along the coast from S to N, but mineralogical assemblage is fairly constant. The average content of the HM of the sand is 23% (garnet 39.2%, Ilmenite 33.8%, kyanite + zircon 21.7%, rutile 3.8%, others 1.4%). The source rocks are the Precambrian Basement rocks to the immediate west of the coastal belt and, to a lesser extent, the younger sedimentary rocks from Karroo to recent in age. The HM are transported to the sea by perennial rivers such as the Pangani, Wami, Ruvu, Rufiji and Ruvuma. One part is carried to the shelf, where large concentrations of heavy minerals are thought to be present because of eustatic level changes in the Pleistocene, when the level of erosion was approximately 50m lower. Northerly currents and nearshore wave action transport these HM to the Tanzanian shores.

**References:**

Duyverman, 1981. The occurrence of HM sands along the Tanzanian coast, J.G.S. India, 22 (2).

Occurrence   
 Deposit   
 Deposit/File

**NAME: PULMODDAI**

**Commodities:** Ti **Type of deposit:** placer paleobeach  
**Country:** Sri Lanka **LK** **District:** Sri Lanka NE

**Marine area:** Indian N

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	foreshore inner shelf
<b>Morpho. 1</b>	paleobeach
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	ilmenite rutile zircon monazite

**COORDINATES**

Latitude	N	9.500
(Decimal °)		0.000
Longitude	E	-80.500
		0.000
Z (in m)		

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 2/16/95

**Company:** Ceylan Minerals Sand Co.

	Ore	Heavy minerals	Commodities
<b>Grades</b>	14.5 % HV		
<b>Tonnage</b>	11.297 Mwt	1.312 Mt	kt: 903 I+9.5 R+39 Z

**Description:**

1) Area off Pulmoddai, NE of Sri Lanka.  
 2) Climate: Tropical savannah. Mean annual precipitation 1500 mm with maxi. in July. Winds: NE Monsoon (Jan.) SW Monsoon (Jul.).  
 3) Hydro: North equatorial current from E (Nov.-Mar.). Monsoon current from W to E and NE (May-Sept.).  
 4) Works performed: Bathymetry (22 profiles), shallow-penetration seismic (15 profiles = 180 km), side-scan sonar, grab sampling (150 grab samples), vibracores (43). Prospecting was carried out by Preussag AG, Hannover and Metallgesellschaft, Frankfurt assisted by Ceylan Mineral Sands Corporation (CMSC).  
 5) Characteristics of the deposit: According to the seismic results the shelf is covered by a uniform Holocene layer of 3-5 m thickness, underlain by 25 m thick Pleistocene sediments in troughs and a few to 0 m in areas where the bedrock forms anticlines. The surface sediments show a sonar distribution that is generally parallel to the coastline, depending on the water depth. The geophysical and vibrocoring results show that the near shore heavy-mineral-bearing Holocene fine sand overlies either biogenic coarse sand, Pleistocene sediments, or gneiss bedrock and outcrops towards the east several hundred meters from the coastline. Heavy mineral concentrations in the surface sediments (up to 58% of weight in raw sand) occur in the near shore silt/fine sand zone. In cores taken adjacent to the shoreline, several horizons of black sand with heavy mineral content (between 60 and 94% in comparison to raw sand) were found. The percentage of minerals in HM content is as follows: 52.8 to 86.6% by weight ilmenite; 0.2 to 4.9% rutile; 2 to 7.4% zircon. The calculation of ore reserves was carried out by applying an EDP program, based on the variogram analysis. There are proven ilmenite, rutile and zircon reserves of 0.95 Mt.

**References:**

Meyer K., 1983. Titanium and Zircon placer prospecting off Pulmoddai, Sri Lanka, Marine Mining, 4 (2-3).

Occurrence   
 Deposit   
 Deposit/File

**NAME: NORTH PUERTO RICO**

**Commodities:** Fe Th      **Type of deposit:** placer beach  
**Country:** Puerto Rico      PR      **District:** Rio de la Plata mouth

**Marine area:** Atlantic W, Mexico gulf

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	foreshore inner shelf
<b>Morpho. 1</b>	beach
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	magnetite monazite

**COORDINATES**

Latitude	N	18.500
(Decimal °)		0.000
Longitude	W	66.260
		0.000
Z (in m)		0 to -20

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/15/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

1) North Puerto Rico. Mouth of the "Rio de la Plata" river.  
 2) Climate: Tropical rain forest. Annual average rainfall 1500 mm. Surface prevailing winds from NE (trade winds).  
 3) Hydro: SE Antilles currents (1.1 knots). Mixed tides.  
 4) Works performed: sampling.  
 5) Characteristics of the deposit: The insular shelf is covered with a several km wide bank of dark-coloured river-derived clastic sediment. Laterally, the river sediment grades rapidly into relict light-coloured calcareous sands. The shelf is 0.5 to 4 km wide and breaks at around 80 m. The average shelf gradient is 27 m/km. The Rio de la Plata canyon that leads to the Puerto Rican trench forms a large indentation in the shelf of the study area. The heavy minerals assemblage of the 125 to 250 µm carbonate free size fraction is dominated by the amphibole group, the pyroxene group, epidote, magnetite, and monazite. Possible secondary or authigenic minerals include limonite, leucoxene and hematite. Minerals that usually occur at less than the 1% level are zoizite, kyanite, andalusite, sillimanite, garnet. Rock fragments and altered unidentifiable grains constitute up to 3% of the total HM fraction. The abundance of HM fraction in the 125-250µm fraction makes up 15% or more of the carbonate free sand in this fraction. The percentage decreases with the water depth. Magnetite and monazite appears as predominant minerals. On the seaward edge of the continental shelf, the only significant degree of concentration of HM occurs on the beach and in the near shore zone, at a depth of less than 20 m. Most of the sorting observed in the HM fractions is probably characteristic of a narrow, steep high wave energy system. The steep shelf furnished a favourable setting for the rapid cross-shelf transit of material and repeated sorting and dispersal of detritus from the frequent fluvial "events". The wave energy required for the sorting process concentrates the HM in a relatively narrow zone.

**References:**

Occurrence   
 Deposit   
 Deposit/File

**NAME: ILE D'ELBE**

**Commodities:** Fe **Type of deposit:** placer paleobeach  
**Country:** Italy **IT** **District:** Rio Marina

**Marine area:** Mediterranean, Tyrrhenian sea

**ADMINISTRATION**

**TYOLOGY**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

<b>Zone type</b>	inner shelf
<b>Morpho. 1</b>	paleobeach
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	magnetite

**COORDINATES**

Latitude	N	42.820
(Decimal °)		0.000
Longitude	E	-10.250
		0.000
Z (in m)		-5 to -30

**STAGE**

**MINING RIGHTS**

Exploration:  Free:   
 Mining:  Under control:   
 Processing:  Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

1) The area is located between Capo Pero and Rio Marina on Elbe Island.  
 4) Works performed: Geophysical survey and drillings (34 vibracores).  
 5) Characteristics of the deposit: Exploration offshore, in front of the onshore placer of Rio Marina and Rialbano, confirms the existence of a mineralised sand band, with a thickness of around 3 m. Italsider Company, owner of the mining concession, would have exploited offshore iron rich mineralised sand with a suction dredge.

**References:**

Aiello E., Bartolini C. & al., 1980. Boll. Soc. Geol. Ital., 99 (3), 319-340.

Occurrence   
 Deposit   
 Deposit/File

**NAME: CAPO LINARO & MONTE ARGENTARIO**

**Commodities:** Fe **Type of deposit:** placer paleobeach  
**Country:** Italy **IT** **District:**

**Marine area:** Mediterranea, Tyrrhenian sea

**ADMINISTRATION**

**TYOLOGY**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

<b>Zone type</b>	outer shelf
<b>Morpho. 1</b>	paleobeach
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	magnetite

**COORDINATES**

Latitude	N	42.250
(Decimal °)	N	42.000
Longitude	E	-11.000
	E	-11.800
Z (in m)		-60

**STAGE**

**MINING RIGHTS**

Exploration:  Free:   
 Mining:  Under control:   
 Processing:  Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>	4.8 % *		
<b>Tonnage</b>			

**Description:**

2) Climate: Mediterranean. Mean annual precipitation 600 mm. Prevailing winds from the North and East.  
 4) Works performed: seismic, magnetism, core drillings.  
 5) Characteristics of the deposit: Bed 15 cm thick, located 1.5 m below sea floor. The granulometric fraction of the sand between 62-250 µm hold 4.8% of magnetite.

**References:**

Aiello E., 1978. Studio della piattaforma continentale Medio tirrenica per la ricerca di sabbie metallifere, da Capo Linaro a Monte Argentario. Boll. Soc. Geol. Ital., 97.

Occurrence   
 Deposit   
 Deposit/File

**NAME: ZAMBEZI ESTUARY**

**Commodities:** Ti Zr      **Type of deposit:** placer paleobeach  
**Country:** Mozambique      MZ      **District:** Zambeze

**Marine area:** Indian SW, Mozambic channel

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	estuary
<b>Morpho. 1</b>	paleochannel
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	ilmenite zircon rutile

**COORDINATES**

Latitude	S	-18.850
(Decimal °)		0.000
Longitude	E	-36.100
		0.000
Z (in m)		-30 to -60

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 2/15/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			Mt: 50 I+0.9 R+4 Z

**Description:**

1) Mozambique channel. Off the coast between Quelimane and the Zambesi delta.  
 2) Climate: Tropical savannah. Mean annual precipitation 1500 mm. Prevailing surface winds: From SE to the NW trade winds(July), from NE to the SW Monsoon winds and SE to NW trade winds (January).  
 3) Hydro: Currents from N to S or SW (Mozambique current).  
 4) Works performed: Financed by the German BMFT (Federal Ministry for Research and Technology) using R/V VALDIVIA in 1971 and 1973; with narrow-beam echo-sounder, side-scan sonar, air-gun, proton magnetometer, towed scintillometer, photo sledge, dredges, grab-samplers, corers and vibrocorer (Geodoff). Statistics: Profiles 17050 km bathymetry, 11800 km reflection seismic, 5500 km magnetometry, 3590 km side-scan sonar, 200 km scintillometry, 10 refraction seismic profiles (10 km each), 147 km photographic survey (13800 bottom photographs); 1025 grab samples, 26 dredge hauls, 321 m cores from a piston corer or gravity box corer, 281 m cores from a vibrocorer, 280 m samples from a hydro-airlift sampler.  
 5) Characteristics of the deposit: Average inclination of the shelf rarely exceeds 1%. It is divided by 3m to 10m high step along the 50-55 m isobaths. Underwater sand dunes and ripples with erosional furrows. Sediment shows from the top: 1) terrigenous, fine to medium grained sands (0.1- 6m thick); 2) terrigenous, micaceous, sometimes bedded sand (0-4 m thick); 3) transgressional horizon, coarse sand with quartz gravel, mud nodules, abraded shells and reworked limonitic concretions from an underlying fossil soil. This horizon, lower limit of the Holocene, is mostly underlain by laminated silty clay, silt and very fine sand; reddish brown fossil soil with limonitic concretions, calcareous nodules, peat and roots (deltaic Pleistocene environment). The sand above the transgressional horizon contains disseminated heavy minerals in lenses, the sediments below are normally free of them. Maximum observed heavy mineral content: 11%; cut-off for delineation of areas of interest: 3%. Average in the heavy mineral fractions: 45.5% ilmenite, 4.2% zircon, 1% rutile, 0.8% magnetite, titanomagnetite, hematite. This deposit could be originally a series of beach sand placers in the area of the Pleistocene Zambesi Delta, when the sea level was lower. During early Holocene transgression, the Pleistocene beach sand was intensively reworked and a homogenisation of light and HM occurred.

**References:**

Beiersdorf H. & al., 1980. Placer deposits of ilmenite and zircon on the Zambezi shelf, Geologisches Jahrbuch, Reihe D, Heft 36, 70.

Occurrence   
 Deposit   
 Deposit/File

**NAME: FRISE ISLAND**

**Commodities:** Ti Zr      **Type of deposit:** placer paleobeach  
**Country:** Germany      DE      **District:** Frise

**Marine area:** Atlantic NE, North sea

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYPOLGY**

<b>Zone type</b>	foreshore inner shelf
<b>Morpho. 1</b>	paleobeach
<b>Morpho. 2</b>	beach
<b>Petrography</b>	fine sand
<b>Mineralogy</b>	ilmenite zircon

**COORDINATES**

Latitude	N	53.000
(Decimal °)	N	53.500
Longitude	E	-4.750
	E	-6.000
Z (in m)		-10

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>	3.7 to 6.6 %		27-42% I+11-13% Z
<b>Tonnage</b>			57000t I+23000t Z

**Description:**

1) Intertidal zone and foreshore as far as the 10 m isobath. HM concentration parallel to the shoreline.  
 2) Climate: Marine.  
 5) Characteristics of the works: Fine sands form a belt parallel to the island coast as far as the 10 m isobath. The mean values of the sand granulometry are between 125 and 149 µm. Five concentration zones have been delineated over a surface of 11 km<sup>2</sup>. The cut off grade for zircon is 0.3% and ilmenite 0.8%.

**References:**

Anonymous, 1979. Geologisches Jahrbuch, reihe D, heft 32, 23-68.



Occurrence   
 Deposit   
 Deposit/File

**NAME: GOLD COAST**

**Commodities:** Ti Zr      **Type of deposit:** placer paleobeach  
**Country:** Australia      AU      **District:** Queensland

**Marine area:** Pacific SW

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	outer shelf
<b>Morpho. 1</b>	paleobeach
<b>Morpho. 2</b>	
<b>Petrography</b>	medium siliceous sand
<b>Mineralogy</b>	rutile ilmenite zircon

**COORDINATES**

Latitude	S	-28.150
(Decimal °)	S	-27.160
Longitude	E	-153.570
	E	-153.540
Z (in m)		-150

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/17/95

**Company:** Planet Resources Group NL

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

- 1) Located on the East coast of Australia. Offshore area located south of Brisbane latitude. Coast between Danger point and Moreton cap.
- 2) Climate: Marine West coast. Annual average rainfall 1200-1600 mm. Dry season during summer. Winds 1-10 kn NW (Jan.) to SE (July).
- 3) Hydro: From N and NE currents (East Australian currents: 2 kn). Swell from East average magnitude 3 m.
- 4) Works performed: Exploration started in 1967 with two boats. Seismic profiles (13). 1041 drillings realised (6000 m).
- 5) Characteristics of the deposit: The continental platform is almost horizontal. Five underwater paleo-shorelines seem to exist between 18 and 155 m. The seabed is covered with sand showing variable thickness. The typical lithological section is from the bottom to the top: 1) beach sand with good sorting, rounded grains, relatively coarse, with HM; 2) peat >80 cm; 3) ferruginous indurated thin bed; 4) bleached sand (dune) where HM are disseminated but sometimes concentrated in the upper part. Quartz, limonite, shell fragments are associated with HM: rutile, zircon, ilmenite (50% of HM), magnetite, epidote, garnets etc. Exploration did not define large concentration of HM in this area.

**References:**

BRGM, 1972. Mission d' information en Australie et au Japon du 10 septembre au 12 octobre 1972, BRGM 73 SGN 019 MAR, unpublished.

Occurrence   
 Deposit   
 Deposit/File

**NAME: TWEED HEADS**

**Commodities:** Ti Zr      **Type of deposit:** placer paleobeach  
**Country:** Australia      AU      **District:** New South Wales

**Marine area:** Pacific SW

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**TYOLOGY**

<b>Zone type</b>	inner shelf
<b>Morpho. 1</b>	paleobeach
<b>Morpho. 2</b>	
<b>Petrography</b>	medium siliceous sand
<b>Mineralogy</b>	rutile zircon ilmenite

**COORDINATES**

Latitude	S	-29.370
(Decimal °)	S	-28.150
Longitude	E	-153.400
	E	-153.570
Z (in m)		-35 to -40

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/17/95

**Company:** Planet Resources Group NL

	Ore	Heavy minerals	Commodities
<b>Grades</b>	0.2 %		
<b>Tonnage</b>			426 000 t (R + Z)

**Description:**

1) East coast of Australia between Cook Island in the North and Yamba in the South.  
 2) Climate: Marine West coast. Annual average rainfall 1200-1600 mm. Dry season during summer. Winds 110 kn to NW (Jan.) to SE (July).  
 3) Hydro: From N and NE currents (East Australian current: 2 knots). Swell from east, average magnitude 3 m.  
 4) Works performed: Exploration started in 1967 with two boats. 312 drillings (2458 m).  
 5) Characteristics of the deposit: The continental platform is almost horizontal. Five underwater paleo-shorelines seem to exist between 18 and 155 m. The seabed is covered with sand showing variable thickness. In the north of NSW, the maximum thickness is 43 m. The thickers are located along old fluvial channels and near the actual shoreline. The typical lithological section is from the bottom to the top: 1) beach sand with good sorting, rounded grains, relatively coarse, with HM; 2) peat >80 cm; 3) ferruginous indurated thin bed; 4) bleached sand (dune) where HM are disseminated but sometimes concentrated in the upper part. Quartz, limonite, shell fragments, are associated with HM: rutile, zircon, leucoxene, ilmenite. The rutile, zircon highest grades are found in the first meters of the drilling. The granulometry of the minerals are always lower than 0.2 mm (rutile 0.15 mm, leucoxene 0.18 mm, zircon 0.14 mm, ilmenite 0.18 mm). The average grade is 0.76% (0.09 to 6.96%); the ratio rutile/zircon = 0.873 and the grade rutile+zircon = 0.2%. Estimated reserves 426,000 t rutile + zircon in mineralised sand at 0.2%.

**References:**

BRGM, 1972. Mission d' information en Australie et au Japon du 10 septembre au 12 octobre 1972, BRGM 73 SGN 019 MAR, unpublished.

Occurrence   
 Deposit   
 Deposit/File

**NAME: LA REUNION ISLAND**

**Commodities:** TiFe **Type of deposit:** placer beach  
**Country:** Reunion **FR** **District:** Reunion NW

**Marine area:** Indian SW

**ADMINISTRATION**

**TYOLOGY**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

<b>Zone type</b>	foreshore
<b>Morpho. 1</b>	beach
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	olivin titanomagnetite

**COORDINATES**

Latitude	S	-21.100
(Decimal °)		0.000
Longitude	E	-55.530
		0.000
Z (in m)		0

**STAGE**

**MINING RIGHTS**

Exploration:  Free:   
 Mining:  Under control:   
 Processing:  Unknown:

Up-dated on: 3/2/95

**Company:**

	<b>Ore</b>	<b>Heavy minerals</b>	<b>Commodities</b>
<b>Grades</b>	16 to 23 % Olivin		
<b>Tonnage</b>			100 000 t Fe+Ti

**Description:**

- 1) NW of the Island.
- 2) Climate: Tropical savannah. Mean annual precipitation 1400 mm. Prevailing winds from the SE (SE Trades). Tropical storm track (Nov.-May) from NE.
- 3) Hydro: Prevailing swell to the NW.
- 4) Works performed: Sampling.
- 5) Characteristics of the deposit: The island is geologically formed by strato-volcanoes. Olivine basalts, trachytic volcanic rocks (ignimbrite, syenites, pumice), and coral limestones are found on the Island. Detritic formations on the backshore contain Olivine and titanomagnetite.

**References:**

Anonymous, 1984. Inventaire des ressources minérales sous-marines dans les DOM-TOM, GERMINAL.

Occurrence   
 Deposit   
 Deposit/File

**NAME: VIRGINIA - GEORGIA**

**Commodities:** Ti Zr Th Rare-Earth      **Type of deposit:** placer paleobeach paleochannel  
**Country:** USA      US      **District:** Virginia, Georgia

**Marine area:** Atlantic NW

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	outer shelf
<b>Morpho. 1</b>	spreading
<b>Morpho. 2</b>	paleobeach
<b>Petrography</b>	fine to medium siliceous & calcareous sa
<b>Mineralogy</b>	ilmenite zircon monazite

**COORDINATES**

Latitude	N	30.000
(Decimal °)	N	38.000
Longitude	W	81.300
	W	75.000
Z (in m)		-30

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>	2 % ML		
<b>Tonnage</b>	825 Mt		

**Description:**

1) Atlantic continental shelf.  
 2) Climate: Subtropical humid. Average annual rainfall 1380 mm, maxi. in summer. Winds to SW (Oct.-Jan.), NW (Apr.-Jul.).  
 3) Hydro: sea clear; tide mixed, maxi. magn. 1.5 m; currents NE (Florida currents) 2.5 knots and counter current SW. Water circulation forms large-scale eddies; between Cape Hatteras (C.H.) and New Jersey, dominant bottom currents on inner and middle shelf are to S and landward. Outer shelf currents not well known, but net direction of bottom transport is presumed to be offshore. Waves 10% > 1.5 m.  
 4) Works performed: Geological, geomorphological, geophysical surveys, sampling.  
 5) Characteristics of the deposit: The shelf varies in width from <5 km off S Florida to about 145 km off Cape Cod, MA. Slope uniform and smooth, local relief <48 m, seaward gradient <1/1000 (Hollister, 1973). Sand covers nearly all the shelf between New Jersey and Florida. The sand is mainly unimodal, well-sorted, with symmetrical grain-size distribution curve. Mean grain size generally increases toward the shelf break. Most of the shelf N of C.H. is covered with a relict low-carbonate feldspathic sand, whereas shelf sediments S of C.H., are characterised by relatively high carbonate content and low feldspar content. Sediments immediately adjacent to large piedmont rivers tend to have low carbonate and high feldspar contents. Most of the sediments are residual or relict deposits and have been weathered from underwater outcrops. Modern nearshore shelf sediments are unstained fine sands and muds. The zone is marked by a rather abrupt seaward boundary. Rivers delivered sediment during the Pleistocene. Today very little sand is transported onto the shelf by run-off. Three inter-gradational HM provinces characterise the area: 1) North: pyroxenes and amphiboles are dominant, ilmenite and zircon are minor elements. 2) Centre: ilmenite, monazite and zircon are dominant. 3) South: ilmenite is dominant. Results from preliminary studies indicate that the sediments contain an average of 2% wet HM. Assuming an average tonnage factor of 1.2 t/m<sup>3</sup> for the sediments, this suggests a potential of as much as 30 Gt of HM (825 Mm<sup>3</sup> of sand and gravel).

**References:**

Anonymous, 1987. An economic reconnaissance of selected HM placer deposits in the U.S. exclusive economic zone, USBM open file report.

Occurrence   
 Deposit   
 Deposit/File

**NAME: PENARAN**

**Commodities:** U **Type of deposit:** vein  
**Country:** France **FR** **District:** St Nazaire

**Marine area:** Atlantic NE

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYPOLGY**

<b>Zone type</b>	inner shelf
<b>Morpho. 1</b>	vein
<b>Morpho. 2</b>	
<b>Petrography</b>	porphyroid granit
<b>Mineralogy</b>	pechblende sulfide quartz

**COORDINATES**

Latitude	N	47.360
(Decimal °)		0.000
Longitude	W	2.530
		0.000
Z (in m)		

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 2/17/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			0.7
<b>Tonnage</b>			600 t

**Description:**

- 1) Southern Brittany. 15 km south of the Vilaine river mouth.
- 2) Climate: Marine west coast. Mean annual precipitation 500 mm. Prevailing winds from the W or WSW.
- 3) Hydro: Swell associated with the prevailing winds. Tide currents.
- 4) Works performed: 1985: Ifremer R.V. "La Thalia", seismic & sonar survey and magnetometry.
- 5) Characteristics of the deposit: Underground uranium mine with offshore extension, depleted since 1990. Pechblende with subordinate sulfides are found in veins spatially related to carboniferous granite. An E-W Hercynian shear zone cut the Guerande leucogranite (300-340 My). Sea exploration defined the great extension of the granite offshore and the possibilities of discovery of new uranium occurrences.

**References:**

Cottaz Y. & al., 1985. Le synforme de Piriac: notice explicative, IFREMER/CEA.

Occurrence   
 Deposit   
 Deposit/File

**NAME: POULDU COVE**

**Commodities:** Fe Ti      **Type of deposit:** placer beach  
**Country:** France      FR      **District:** Bretagne S

**Marine area:** Atlantic NE

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	on land foreshore
<b>Morpho. 1</b>	beach
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	ilmenite magnetite garnet

**COORDINATES**

Latitude	N	47.750
(Decimal °)		0.000
Longitude	W	3.530
		0.000
Z (in m)		

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 2/20/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>		Magn. : 24.3 %; Ilm.	
<b>Tonnage</b>		small	

**Description:**

1) Southern Brittany. Distance from shore 0-10 km.  
 2) Climate: Marine west coast. Mean annual precipitation 500 mm. Prevailing winds from the W or WSW.  
 3) Hydro: Swell associated with the prevailing winds. Tide currents.  
 4) Works performed: Sampling.  
 5) Characteristics of the deposit: The coast shows an alternation of stony areas and sandy areas (dunes) cut by four estuaries. The continental platform is rendered uneven by isles and ridges. In the Pouldu area, the eastern part is sandy and the western part, rocky. HM concentrations are found as massive beds along cliffs or stony places, as small beds alternating with barren sand beds on the beach and as thin veneering on the beach sand dunes. Beach black sands are characterised by their high grade in magnetite (24.3% of HM), associated with ilmenite (36.1%), garnet (15.7%), staurotide (8.9%) and epidote (8.3%). The suites are different from the suites of the adjoining area (Concarneau, Gavres, Quiberon, Groix) and of the other magnetite districts of Brittany. The Pouldu heavy sands provide an example of interference between different origins: proximal sources (the immediate hinterland) for epidote and magnetite; more distal sources (the remote hinterland) for staurotide; ilmenite and garnet are more ubiquitous minerals. The morphoscopy of the magnetite, the abundance of the epidote and the weakness of the ZTR index, point out the immaturity of the suites. Limited extension of the HM concentration (average 100 m) does not allow mining.

**References:**

Chauris L., 1988. Les sables noirs à magnétite de l'anse de Pouldu en Bretagne méridionale, BRGM Géologie de la France, 4.

Occurrence   
 Deposit   
 Deposit/File

**NAME: SAINT QUAY PORTRIEUX**

**Commodities:** Fe Ti      **Type of deposit:** placer beach  
**Country:** France      FR      **District:** Bretagne, Côte d'Armor

**Marine area:** Atlantic NE

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	foreshore
<b>Morpho. 1</b>	beach
<b>Morpho. 2</b>	
<b>Petrography</b>	fine smooth sand
<b>Mineralogy</b>	magnetite ilmenite

**COORDINATES**

Latitude	N	48.650
(Decimal °)		0.000
Longitude	W	2.820
		0.000
Z (in m)		0

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 2/20/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>		M : 23 % ; I : 48 %	
<b>Tonnage</b>			

**Description:**

1) Northern Brittany. Armorican Massif. North of St Brieuc.  
 2) Climate: Marine west coast. Mean annual precipitation 500 mm. Prevailing winds from the W or WSW (Westerlies).  
 3) Hydro: Swell associated with the prevailing winds. Tide currents.  
 4) Works performed: Sampling.  
 5) Characteristics of the deposit: In the Saint Quay Portrieux area, a great amount of sand, coming from the erosion of a strongly altered gabbro-dioritic complex, has been reworked by the sea hydrodynamics. Black sand minerals are the last remnants of the mother rock where they were disseminated. The HM occurrences should be considered as sub-autochthonous placers. The high HM grade, sometimes 95%, shows the power of the sea hydrodynamics. The black sand grains are rounded, highly ferruginous, fine and smooth. The HM concentration is variable from one place to another. Massive concentration on the upper foreshore area. Length >10m, width: several meters, thickness: 10 cm. Accumulation along the small channels located on the inter-tidal zone. The grade of the mineralisation depends on the shore orientation. Percentage of HM in the sand is >50% (magnetite 23% and ilmenite 48%).

**References:**

Chauris L., 1982. Placers littoraux à ilménite et magnétite: les sables noirs des plages de Saint Quay à Portrieux (Massif Armoricain), Mém. Géol. Univ. Dijon, 7, 301-311.

Occurrence   
 Deposit   
 Deposit/File

**NAME: CAPE BRETON ISLAND**

**Commodities:** coal      **Type of deposit:** stratiform  
**Country:** Canada      CA      **District:** Nova Scotia, Cape Breton

**Marine area:** Atlantic NW

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	inner shelf
<b>Morpho. 1</b>	bed
<b>Morpho. 2</b>	
<b>Petrography</b>	
<b>Mineralogy</b>	coal

**COORDINATES**

Latitude	N	46.200
(Decimal °)		0.000
Longitude	W	60.930
		0.000
Z (in m)		

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:** DEVCO

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

- 1) Onshore coal mine with extension offshore.
- 2) Climate:
- 3) Hydro:
- 4) Works performed: Exploitation is done by underground mining.
- 5) Characteristics of the deposit: On the surface the thickness of the coal bed varies from 0.9 to 4 m (average 1.8 m); the dipping seaward is around 10°. The coal is volatile rich, bituminous and sometimes contains sulphur and cinders (sulphur: 0.7 to 6%; cinders: 2 to 20%). Annual production 2.8 Mt.

**References:**

Anonymous, 1982. Mining Equipment Int., 6 (5), 32-41, May 1982.



Occurrence   
 Deposit   
 Deposit/File

**NAME: SUNDERLAND**

**Commodities:** coal **Type of deposit:** stratiform  
**Country:** Great Britain **GB** **District:** Durham

**Marine area:** Atlantic NE, North sea

**ADMINISTRATION**

**TYOLOGY**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

<b>Zone type</b>	outer shelf
<b>Morpho. 1</b>	bed
<b>Morpho. 2</b>	
<b>Petrography</b>	
<b>Mineralogy</b>	coal

**COORDINATES**

Latitude	N	54.900
(Decimal °)		0.000
Longitude	W	1.380
		0.000
Z (in m)		

**STAGE**

**MINING RIGHTS**

Exploration:  Free:   
 Mining:  Under control:   
 Processing:  Unknown:

Up-dated on: 3/2/95

**Company:** National Coal Board

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

- 1) 6 to 11 km offshore from shoreline.
- 2) Climate: Marine west coast. Mean annual precipitation 500 mm. Prevailing winds from the W or WSW (Westerlies).
- 4) Works performed: 6000 km of seismic profiles and 126 drills (43 000 m with 32,250 m with core). Coal Mining exploitation. The offshore reserves represent 5% of the national reserves.

**References:**

Occurrence   
 Deposit   
 Deposit/File

**NAME: WHANGAEHU RIVER**

**Commodities:** TiFe      **Type of deposit:** placer paleobeach  
**Country:** New Zealand      NZ      **District:** North Island

**Marine area:** Pacific SW, Tasman sea

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	inner shelf
<b>Morpho. 1</b>	paleobeach
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	titanomagnetite

**COORDINATES**

Latitude	S	-40.030
(Decimal °)		0.000
Longitude	E	-175.060
		0.000
Z (in m)		

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>	0.9% TiO2		
<b>Tonnage</b>			

**Description:**

- 1) On the North Island, west coast, between Kalpara Harbour and Whangaeahu River.
- 2) Climate: Marine, west coast, hot and humid. Mean annual rainfall 1221 mm, maxi. during June July and August. Winds: North to East 18-147 km/h.
- 3) Hydro: Westland Current from the North-East 0.5 m/s. Urville current from East to Southeast 0.01-0.13 m/s. Swell W-SW.
- 4) Works performed: 1959-60 Magnetometry, drilling vibrocoring (23), sampling (103).
- 5) Characteristics of the deposit: The regional geology is represented by tertiary volcanic formations overlying Palaeozoic and Mesozoic graywacke formations. The continental shelf, 32 km wide in the north and 220 km wide by Cook Straits, dips gently to the sea (0.1-0.5%). The continental slope is located at -170 m. Canyons and sand accumulations are present. The inner shelf (0-40 m) is covered by recent terrigenous fine sands passing slowly to muddy sands (50-90% sands), sandy muds (10-50% sands) and finally to mud (<10% sands) when on the mid shelf. This granulometric tendency is reversed through the outer shelf, with an increase in coarse elements, biogenic sands and rock fragments (hydraulic turbulences). The titanomagnetite (55% Fe, 9% TiO2) represents 3-36 % of the heavy minerals (average 10%) and appears along paleoshoreline (5). The titanomagnetite is derived from Taranaki andesitic rocks. The volcanic rocks have been altered, eroded and carried to the sea by numerous rivers.

**References:**

Tixeron M. & Babot J., 1972. Gîtologie prévisionnelle pour la recherche des placers des plateaux continentaux, BRGM 72 SGN 109 MAR, 193, unpublished.

Occurrence   
 Deposit   
 Deposit/File

**NAME: CEDROS ISLAND**

**Commodities:** phosphate      **Type of deposit:** phosphorite clastic  
**Country:** Mexico      MX      **District:** Baja California  
**Marine area:** Pacific NE

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	outer shelf
<b>Morpho. 1</b>	lenticular
<b>Morpho. 2</b>	sand nodule
<b>Petrography</b>	sand
<b>Mineralogy</b>	phosphate

**COORDINATES**

Latitude	N	28.000
(Decimal °)		0.000
Longitude	W	115.410
		0.000
Z (in m)		

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 2/17/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

- Off the coast of Baja California. Located approximately 10 nautical miles SW of Cedros Island.
- Climate: Mediterranean semi-arid. Mean annual rainfall 120mm during the summer. Winds to S-SE (18-22 km/h) (Jan.) to the SE (54 km/h) the rest of the year.
- Hydro: Sea clear. Mixed tide, maxi magn 2.40m. California current N to S cold (0.3 knots), Davidson current S to N warm (0.4 knots). Swell magn 0.30 to 2m, 41.4% of the time; 2 to 3.6 m, 34% of the time.
- Works performed: Sampling
- Characteristics of the deposit: The shelf has been recognized as containing phosphorite nodules and/or sand. Chemical composition of Cedros Island phosphorite nodules is: P2O5 27.5% - CaO 42.70% - Ins 7.85% - F 3.19%. No indications on the size of the area.

**References:**

Garrand L., 1977. Offshore phosphorite world occurrences.

Occurrence   
 Deposit   
 Deposit/File

**NAME: CEARA SEAMOUNT**

**Commodities:** phosphate | **Type of deposit:** phosphorite upwelling  
**Country:** Brazil | BR | **District:**

**Marine area:** Atlantic W

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	continental slope
<b>Morpho. 1</b>	lenticular
<b>Morpho. 2</b>	pellet nodule
<b>Petrography</b>	sand, calcareous clay
<b>Mineralogy</b>	phosphate

**COORDINATES**

Latitude	S	-3.300
(Decimal °)		0.000
Longitude	W	37.300
		0.000
Z (in m)		-200 to -2000

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

5) Description of the deposit: The first mention of marine phosphorite off the coast of South America was by Murray and Renard (1881) in their report of the voyage of the H.M.S Challenger. On the leg from the Falkland Islands to Rio de la Plata, two samples were recovered which contained glauconitic pebbles and phosphatic concretions along with blue muds. Harrington (1966) mentions phosphatic nodules having been dredged from the sea bottom off the coasts of Bahia and Sao Paulo. Probably the most extensive report on the Brazilian off-shore sediments is that of Milliman and Summerhayes (1975). They report mainly normal concentrations of phosphate in the sediments which include terrigenous sands, carbonates, and argillaceous rocks. Phosphate content in most sediments off north-eastern Brazil is less than 0.2% P2O5 and tends to increase slightly seawards to a high of 0.37%. The only areas found to contain higher concentrations were Ceara Seamount and Pernambuco Plateau where values in rocks and in the centers of manganese nodules were about 6 % P2O5 (Milliman and Amaral, 1975).

**References:**

Garrand L., 1977. Offshore phosphorite world occurrences. Milliman & Amaral, 1975.

Occurrence   
 Deposit   
 Deposit/File

**NAME: PAITA**

**Commodities:** phosphate      **Type of deposit:** phosphorite upwelling  
**Country:** Peru      PE      **District:** Peru N

**Marine area:** Pacific SE

**ADMINISTRATION**

**TYOLOGY**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

<b>Zone type</b>	outer shelf slope
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	diatom ooze
<b>Mineralogy</b>	francolite collophane apatite

**COORDINATES**

Latitude	S	-4.900
(Decimal °)		0.000
Longitude	W	81.600
		0.000
Z (in m)		-320

**STAGE**

**MINING RIGHTS**

Exploration:       Free:   
 Mining:       Under control:   
 Processing:       Unknown:

Up-dated on: 2/17/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

1) Occurrences along the coast of Peru/Chile, parallel to the coast line on the ocean floor. The deposit is confined along two narrow sedimentary strips located on the shelf edge and the upper continental slope (-70 -160 m) (-360 -480 m).

2) Climate: Desertic. Mean annual average rain fall 41 mm.

3) Hydro: Peru current.

4) Works performed: Sampling (1) for fundamental scientific research.

5) Characteristics of the deposit: The phosphorite occurs as scattered nodules in fine grained biogenic sediments (chiefly diatom oozes) in an area where surface waters are said to be biologically highly productive due to upwelling of coastal waters containing considerable organic matter. Burnett (1973, 74, 77) describes the phosphatic rocks as being irregular in shape with a hackly and pitted surface. Many nodules are flattened in one dimension; others are roughly equal in shape. The surfaces are dull with colors that vary from light to dark grey. Mineralization from Pleistocene to interglacial period is represented by pellets, particles, nodules of francolite and collophane composition. All investigators of the Peru/Chile deposits believe that the deposits are, for the most part, recent in origin. Manheim and others postulate that the deposits are the result of replacement of carbonate tests in the interstitial waters of organic-rich sediments. Burnett thinks that the apatite has chemically precipitated out of solution rather than replaced previously existing materials. One onshore deposit in the Sechura Desert in northern Peru: bed 1-1.5 m thick with 20% P2O5.

**References:**

1) Garrand L., 1977. Ocean phosphorite world occurrences. 2) Anonymous. Les phosphates sédimentaires sous-marins, Ifremer internal report. 3) Burnett W.C., 1974. 4) Veeh H.H., 1973.

Occurrence   
 Deposit   
 Deposit/File

**NAME: NORTH BELEM**

**Commodities:** phosphate      **Type of deposit:** phosphorite upwelling  
**Country:** Brazil      BR      **District:**

**Marine area:** Atlantic W

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	continental slope
<b>Morpho. 1</b>	lenticular
<b>Morpho. 2</b>	pellet nodule
<b>Petrography</b>	sand, calcareous clay
<b>Mineralogy</b>	phosphate

**COORDINATES**

Latitude	N	3.500
(Decimal °)		0.000
Longitude	W	48.250
		0.000
Z (in m)		-200 to -2000

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

5) Description of the deposit: The first mention of marine phosphorite off the coast of South America was by Murray and Renard (1881) in their report of the voyage of the H.M.S Challenger. On the leg from the Falkland Islands to Rio de la Plata, two samples were recovered which contained glauconitic pebbles and phosphatic concretions along with blue muds. Harrington (1966) mentions phosphatic nodules having been dredged from the sea bottom off the coasts of Bahia and Sao Paulo. Probably the most extensive report on the Brazilian off-shore sediments is that of Milliman and Summerhayes (1975). They report mainly normal concentrations of phosphate in the sediments which include terrigenous sands, carbonates, and argillaceous rocks. Phosphate content in most sediments off north-eastern Brazil is less than 0.2% P<sub>2</sub>O<sub>5</sub> and tends to increase slightly seawards to a high of 0.37%. The only areas found to contain higher concentrations were Ceara Guyot and Pernambuco Plateau where values in rocks and in the centers of manganese nodules were about 6 % P<sub>2</sub>O<sub>5</sub> (Milliman and Amaral, 1975). On the Northern coast the sediment are Pleistocene.

**References:**

Garrand L., 1977. Offshore phosphorite world occurrences. Milliman & Amaral, 1975.

Occurrence   
 Deposit   
 Deposit/File

**NAME: PERNAMBUCO SHELF**

**Commodities:** phosphate      **Type of deposit:** phosphorite upwelling  
**Country:** Brazil      BR      **District:**

**Marine area:** Atlantic W

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	continental slope
<b>Morpho. 1</b>	lenticular
<b>Morpho. 2</b>	pellet nodule
<b>Petrography</b>	sand, calcareous clay
<b>Mineralogy</b>	phosphate

**COORDINATES**

Latitude	S	-8.200
(Decimal °)		0.000
Longitude	W	34.200
		0.000
Z (in m)		-200 to -2000

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

5) Description of the deposit: The first mention of marine phosphorite off the coast of South America was by Murray and Renard (1881) in their report of the voyage of the H.M.S Challenger. On the leg from the Falkland Islands to Rio de la Plata, two samples were recovered which contained glauconitic pebbles and phosphatic concretions along with blue muds. Harrington (1966) mentions phosphatic nodules having been dredged from the sea bottom off the coasts of Bahia and Sao Paulo. Probably the most extensive report on the Brazilian off-shore sediments is that of Milliman and Summerhayes (1975). They report mainly normal concentrations of phosphate in the sediments which include terrigenous sands, carbonates, and argillaceous rocks. Phosphate content in most sediments off north-eastern Brazil is less than 0.2% P<sub>2</sub>O<sub>5</sub> and tends to increase slightly seawards to a high of 0.37%. The only areas found to contain higher concentrations were Ceara Guyot and Pernambuco Plateau where values in rocks and in the centers of manganese nodules were about 6 % P<sub>2</sub>O<sub>5</sub> (Milliman and Amaral, 1975). Within the area the sediments are Pleistocene.

**References:**

Garrand L., 1977. Offshore phosphorite world occurrences. Milliman & Amaral, 1975.

Occurrence   
 Deposit   
 Deposit/File

**NAME: ARACAJU EAST**

**Commodities:** phosphate | **Type of deposit:** phosphorite upwelling  
**Country:** Brazil | BR | **District:**

**Marine area:** Atlantic W

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	outer shelf
<b>Morpho. 1</b>	lenticular
<b>Morpho. 2</b>	pellet nodule
<b>Petrography</b>	sand, calcareous clay
<b>Mineralogy</b>	phosphate

**COORDINATES**

Latitude (Decimal °)	S	-10.700
		0.000
Longitude	W	36.400
		0.000
Z (in m)		-100 to -200

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

5) Description of the deposit: The first mention of marine phosphorite off the coast of South America was by Murray and Renard (1881) in their report of the voyage of the H.M.S Challenger. On the leg from the Falkland Islands to Rio de la Plata, two samples were recovered which contained glauconitic pebbles and phosphatic concretions along with blue muds. Harrington (1966) mentions phosphatic nodules having been dredged from the sea bottom off the coasts of Bahia and Sao Paulo. Probably the most extensive report on the Brazilian off-shore sediments is that of Milliman and Summerhayes (1975). They report mainly normal concentrations of phosphate in the sediments which include terrigenous sands, carbonates, and argillaceous rocks. Phosphate content in most sediments off north-eastern Brazil is less than 0.2% P<sub>2</sub>O<sub>5</sub> and tends to increase slightly seawards to a high of 0.37%. The only areas found to contain higher concentrations were Ceara Guyot and Pernambuco Plateau where values in rocks and in the centers of manganese nodules were about 6 % P<sub>2</sub>O<sub>5</sub> (Milliman and Amaral, 1975). Within the area the sediments are Pleistocene.

**References:**

Garrand L., 1977. Offshore phosphorite world occurrences. Milliman & Amaral, 1975.



Occurrence   
 Deposit   
 Deposit/File

**NAME: CARAVELAS EAST**

**Commodities:** phosphate      **Type of deposit:** phosphorite upwelling  
**Country:** Brazil      BR      **District:**

**Marine area:** Atlantic W

**ADMINISTRATION**

**TYOLOGY**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

<b>Zone type</b>	continental edge
<b>Morpho. 1</b>	lenticular
<b>Morpho. 2</b>	pellet nodule
<b>Petrography</b>	sand, calcareous clay
<b>Mineralogy</b>	phosphate

**COORDINATES**

Latitude	S	-18.700
(Decimal °)		0.000
Longitude	W	38.550
		0.000
Z (in m)		-200

**STAGE**

**MINING RIGHTS**

Exploration:       Free:   
 Mining:       Under control:   
 Processing:       Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

5) Description of the deposit: The first mention of marine phosphorite off the coast of South America was by Murray and Renard (1881) in their report of the voyage of the H.M.S Challenger. On the leg from the Falkland Islands to Rio de la Plata, two samples were recovered which contained glauconitic pebbles and phosphatic concretions along with blue muds. Harrington (1966) mentions phosphatic nodules having been dredged from the sea bottom off the coasts of Bahia and Sao Paulo. Probably the most extensive report on the Brazilian off-shore sediments is that of Milliman and Summerhayes (1975). They report mainly normal concentrations of phosphate in the sediments which include terrigenous sands, carbonates, and argillaceous rocks. Phosphate content in most sediments off north-eastern Brazil is less than 0.2% P2O5 and tends to increase slightly seawards to a high of 0.37%. The only areas found to contain higher concentrations were Ceara Guyot and Pernambuco Plateau where values in rocks and in the centers of manganese nodules were about 6 % P2O5 (Milliman and Amaral, 1975). Within the area the sediments are Pleistocene.

**References:**

Garrard L., 1977. Offshore phosphorite world occurrences. Milliman & Amaral, 1975.

Occurrence   
 Deposit   
 Deposit/File

**NAME: SOUTHERN BRAZIL**

**Commodities:** phosphate | **Type of deposit:** phosphorite upwelling  
**Country:** Brazil | BR | **District:**

**Marine area:** Atlantic W

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	continental edge
<b>Morpho. 1</b>	lenticular
<b>Morpho. 2</b>	pellet nodule
<b>Petrography</b>	sand, calcareous clay
<b>Mineralogy</b>	phosphate

**COORDINATES**

Latitude	S	-22.400
	S	-30.500
(Decimal °)	W	42.000
	W	48.660
Longitude		
Z (in m)		-200

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

5) Description of the deposit: The first mention of marine phosphorite off the coast of South America was by Murray and Renard (1881) in their report of the voyage of the H.M.S Challenger. On the leg from the Falkland Islands to Rio de la Plata, two samples were recovered which contained glauconitic pebbles and phosphatic concretions along with blue muds. Harrington (1966) mentions phosphatic nodules having been dredged from the sea bottom off the coasts of Bahia and Sao Paulo. Probably the most extensive report on the Brazilian off-shore sediments is that of Milliman and Summerhayes (1975). They report mainly normal concentrations of phosphate in the sediments which include terrigenous sands, carbonates, and argillaceous rocks. Phosphate content in most sediments off north-eastern Brazil is less than 0.2% P<sub>2</sub>O<sub>5</sub> and tends to increase slightly seaward to a high of 0.37%. The only areas found to contain higher concentrations were Ceara Guyot and Pernambuco Plateau where values in rocks and in the centers of manganese nodules were about 6 % P<sub>2</sub>O<sub>5</sub> (Milliman and Amaral, 1975). Occurrences have been found at S22.4° W42.9°, S23.4° W42°, S24.2° W44°, S28° W45.5°, S30.5° W48.66°

**References:**

Garrand L., 1977. Offshore phosphorite world occurrences. Milliman & Amaral, 1975.

Occurrence   
 Deposit   
 Deposit/File

**NAME: WALVIS BAY**

**Commodities:** phosphate      **Type of deposit:** phosphorite clastic  
**Country:** Namibia      NA      **District:**

**Marine area:** Atlantic SE

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	outer shelf
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	sand, diatom ooze
<b>Mineralogy</b>	phosphate

**COORDINATES**

Latitude	S	-24.500
(Decimal °)		0.000
Longitude	E	-13.800
		0.000
Z (in m)		-150 to -215

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 2/15/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			16% P2O5
<b>Tonnage</b>			4 Gt P2O5

**Description:**

1) Off the coast of South West Africa, SW of Walvis Bay.  
 2) Climate: Subdesertic, average annual rainfall (0-53 mm) with maxi during the winter. Prevailing winds are from the S to SE during the summer. Schulze (1965) notes that the resultant wind speed in January is about 3m/s in the morning, picking up to over 10 m/s in the afternoon, and dropping off again in the evening. In July the resultant wind speed is little more than 1 m/s before noon and originates from the SW. The wind picks up to 2 m/s in the afternoon but comes from the S.  
 3) Hydro: Swell depending on the wind direction. Cold currents from south (Benguela) and warm from north (Angola). Meso-tidal (tidal range between 2 m and 4 m) to micro-tidal (< 2m) wave dominated region. On the inner shelf the principal hydrodynamic forces are wave-induced bottom currents and littoral drift.  
 4) Works performed: Senin sampling (1970) 140 samples. Summerhayes (1973) 900 samples on a 10 mile grid.  
 5) Characteristics of the deposit: Phosphorus occurs in diatom oozes under the following forms: Dispersed phosphorus; biogenic fragments (bones of fish and sea mammal, fish scales); coprolites; phosphatic concretions. The highest concentrations are usually associated with medium and fine sands 0.20 -0.30 mm. Maximum phosphorus concentrations are mainly at depths of 150-215 m where conditions are most favourable for sediment washing and sorting. Modern phosphorite seems to be forming diagenetically in the fine-grained organic rich sediment typical of this area of upwelling, but only in very small amounts. The bulk of the phosphate is bound in relict detrital grains of phosphorite. These were derived in the late Tertiary or during low sea level times in the Pleistocene, by mechanical reworking of diatomaceous mud (north of Walvis Bay) or by the erosion of previously existing phosphorite (throughout the area). The rich relict phosphate deposit near Walvis Bay is probably about 0.5m thick and may constitute a reserve of some 4 Gt P2O5. The grade of the deposit could benefit from screening. (Summerhayes and others 1973) From Cape Town to the Kunene river numerous deposits of this type are known, but the grade is lower than 16% and has no immediate economic interest. The coordinates are: S19° E12°, S26°50 E14°50, S29° E16°, S30°25 E16°, S31° E16°, S32°75 E17°25, S34° E18°.

**References:**

Garrand L., 1977. Offshore phosphorite world occurrences.

Occurrence   
 Deposit   
 Deposit/File

**NAME: SOCOTRA ISLAND**

**Commodities:** phosphate      **Type of deposit:** phosphorite clastic  
**Country:** Yemen      YE      **District:** Socotra Island

**Marine area:** Indian N, Aden gulf

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	outer shelf
<b>Morpho. 1</b>	depression
<b>Morpho. 2</b>	nodule
<b>Petrography</b>	
<b>Mineralogy</b>	apatite collophane carbonate

**COORDINATES**

Latitude	N	12.100
(Decimal °)		0.000
Longitude	E	-53.600
		0.000
Z (in m)		-210

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

1) The Socotra Island is separated from the African shelf by a 1150 m trench. A large quantity of nodule-pebble phosphorite was discovered just east of the trench at a depth of 210 m.  
 2) Climate: Desertic. Mean annual precipitation 0-100 mm. Winds to SW (Jan.) and to NE (July).  
 3) Hydro: Sea clear. Currents from SW to NE. Somalia current (May-Sept.) and from NE to SW (Nov.-March)  
 4) Works performed: Gevork'yan and Chugunny (1970) on the 1966 voyage of the research vessel M Lomonosov collected samples along an E-W line from Socotra Island across the trench, to African coast.  
 5) Characteristics of the deposit: The area with massive concentration of phosphorite nodules consists of a step-shaped depression separated from the main part of the shelf by a sediment free scarp 100 m high. The floor of the depression is rocky, suggesting that the phosphorite nodules are the product of erosion of older sedimentary rocks and have become trapped in the depression. The nodules range in size from 2-3 cm; a few as large as 5 cm. Most of the nodules are dark brown; but some varieties are a lighter shade. Five morphological types have been differentiated. Thin section of nodules from each group indicate that there is no major difference at all in the sections. The main difference being in the quantity and mineralogical composition. Analysis of the thin sections indicates that the phosphorites are probably syngenetic with the formation of the sediment. The phosphorites have gone through the first stage of diagenesis and are now undergoing redistribution and crystallisation around centres of foraminifera or large aggregate accumulations. Chemical analysis indicates 28.56% P2O5 and 1.34% F. The nodules contain 10 to 15% impurities, including calcite, clay matter, iron oxide, and quartz.

**References:**

Garrand L., 1977. Offshore phosphorite world occurrences.

Occurrence   
 Deposit   
 Deposit/File

**NAME: PILAR DANSOL**

**Commodities:** Fe **Type of deposit:** placer beach  
**Country:** Philippines **PH** **District:** Sorsogon bay  
**Marine area:** Indonesia, Sibuyan sea

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	foreshore
<b>Morpho. 1</b>	beach
<b>Morpho. 2</b>	
<b>Petrography</b>	
<b>Mineralogy</b>	magnetite

**COORDINATES**

Latitude	N	12.870
(Decimal °)	N	12.900
Longitude	E	-123.600
	E	-123.660
Z (in m)		0

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>		0.46%	
<b>Tonnage</b>		>69.25 kt	

**Description:**

- 1) The deposits are located along the beach areas between Pilar and Dansol municipalities, Sorsogon.
- 2) Climate: Tropical, equatorial forest type. Maxi. rainfall: July-August. Mean annual rainfall 2160 mm. Temperature 20-30°C. Winds from NE (NE trade) in January, from S-SW (SW monsoon) in July.
- 4) Works performed: sampling.
- 5) Characteristics of the deposits: The magnetite bearing beach sand deposits are disposed along open beaches and those adjacent to the present outlets of rivers and creeks. In most of the deposits, there is no general position in the concentration of black sands. The surface concentration of black sand falls under two types. One is less than one millimetre thick between low tide and high tide levels; the other and the thicker is usually more than a decimetre thick above high tide level. The magnetic components are essentially of magnetite grains with minor grains made up of hematite-magnetite inter growths and a few grains of transparent minerals with attached bodies of magnetite. Most of the magnetite grains are rounded to subrounded, but some are angular.

**References:**

Malicdem D.G. & al., 1974. Magnetite bearing beach sand deposit Pilar-Dansol area, Sorsogon, Bureau of Mines, Rep invest Philippines n°76.

Occurrence   
 Deposit   
 Deposit/File

**NAME: PONTEVEDRA**

**Commodities:** Sn **Type of deposit:** placer paleochannel  
**Country:** Spain **ES** **District:** Galicia W  
**Marine area:** Atlantic NE

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	bay
<b>Morpho. 1</b>	paleochannel
<b>Morpho. 2</b>	
<b>Petrography</b>	coarse sand
<b>Mineralogy</b>	cassiterite

**COORDINATES**

Latitude	N	42.500
(Decimal °)		0.000
Longitude	W	8.710
		0.000
Z (in m)		

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 2/16/95

**Company:** ENADIMSA

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

1) The area of interest is located in the southern part of the Pontevedra Bay, 1-2 km offshore, north of the shoreline going from Pta Casas to Bueu.  
 2) Climate: Mediterranean with dry summer. The mean annual precipitation: 700 mm with a maxi. during the winter. Prevailing surface winds from the SW during the winter and from the N and W during the summer.  
 3) Hydro: currents from N to S (North Atlantic currents around the Sargassa sea).  
 4) Works performed: From Sept. 21 to Oct. 7, 1978: geophysical survey (seismic reflexion), sampling (107) with cylindrical dredge and Van Veen dredge.  
 5) Characteristics of the deposit: Sedimentation in the Bay is dominated by four types of sediments: sand with cobbles, sand, sandy mud and mud. The coarse detritic sedimentary formations are localised along the coast of the Bay. Going towards the centre, the sediments are more and more muddy. This type of sedimentation is the consequence of clockwise water circulation inside the Bay area. Numerous grains of cassiterite were found during the sampling but the best showing was located south of Pontevedra Bay, north of the coast extending from Bueu to Pta Casas. Here the mineralization is associated with coarse marine clastic sediments overlying porphyroid granodiorite and orthogneiss, bedrock formation. The formation of placer deposits have been facilitated by: 1) Existence of large depression over the actual Pontevedra Bay during the Pleistocene ice-periods; 2) Erosion and intense weathering of granitic materials during Gunz and Mindel ice-age; 3) Formation of a detritic cone with a sea level lower than actual between the beginning of Riss ice-age and the middle of Wurm; 4) Progressive transgression of the sea and appearance of deltaic type of sedimentation on the Pontavedra area; 5) Dynamic of the sea water and concentration of the mineralization.

**References:**

ENADIMSA, 1979. Investigacion minera de detalle en los fondos submarinos de la zona de las rias de Pontevedra y Vigo (Gali-Rias).

Occurrence   
 Deposit   
 Deposit/File

**NAME: VIGO**

**Commodities:** Sn **Type of deposit:** placer paleovalley  
**Country:** Spain **ES** **District:** Galicia W

**Marine area:** Atlantic NE

**ADMINISTRATION**

**TYOLOGY**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

<b>Zone type</b>	bay
<b>Morpho. 1</b>	paleochannel
<b>Morpho. 2</b>	
<b>Petrography</b>	coarse sand
<b>Mineralogy</b>	cassiterite wolfram

**COORDINATES**

Latitude	N	42.350
(Decimal °)		0.000
Longitude	W	8.710
		0.000
Z (in m)		

**STAGE**

**MINING RIGHTS**

Exploration:  Free:   
 Mining:  Under control:   
 Processing:  Unknown:

Up-dated on: 2/16/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

1) The area of interest is located offshore north of Vigo, 1-2 km from the shore.  
 2) Climate: Mediterranean with dry summer. The mean annual precipitation: 700 mm with a maxi. during the winter. Prevailing surface winds from the SW during the winter and from the N and W during the summer.  
 3) Hydro: currents from N to S (North Atlantic currents around the Sargassa sea).  
 4) Works performed: From Sept. 21 to Oct. 7, 1978: geophysical survey (seismic reflexion), sampling (107) with cylindrical dredge and Van Veen dredge.  
 5) Characteristics of the deposit: The sedimentation of the Bay is represented mostly by muddy sand and mud overlying basement rocks (porphyroid granodiorite, paragneiss and orthogneiss). Cassiterite and wolfram grains were found in the samples collected north of Vigo. The formation of placer deposits have been facilitated by: 1) Existence of large depression over the actual Vigo Bay during the Pleistocene ice-periods; 2) Erosion and intense weathering of granitic materials during Gunz and Mindel ice-age; 3) Formation of a detritic cone with a sea level lower than actual between the beginning of Riss ice-age and the middle of Wurm; 4) Progressive transgression of the sea and appearance of deltaic type of sedimentation on the Vigo area; 5) Dynamic of the sea water and concentration of the mineralization.

**References:**

ENADIMSA, 1979. Investigacion minera de detalle en los fondos submarinos de la zona de las rias de Pontevedra y Vigo (Gali-Rias).

Occurrence   
 Deposit   
 Deposit/File

**NAME: UMPQUA**

**Commodities:** Cr **Type of deposit:** placer paleobeach  
**Country:** USA **US** **District:** Oregon

**Marine area:** Pacific NE

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	outer shelf
<b>Morpho. 1</b>	paleobeach
<b>Morpho. 2</b>	paleochannel
<b>Petrography</b>	sand mud
<b>Mineralogy</b>	chromite

**COORDINATES**

Latitude	N	43.470
(Decimal °)	N	43.820
Longitude	W	124.580
		0.000
Z (in m)		-105 to -160

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

1) West coast of USA, Oregon State, Curry county. Distance from the coast 35 miles.  
 2) Climate: Marine, West Coast. Annual average rainfall 243 mm; maxi from Oct. to Feb.. Prevailing surface winds: NW 48 km/h from Apr. to June; SW 78 km/h Oct.; SE 70 km/h January. T= 5-20°C.  
 3) Hydro: Sea calm in summer, rough in winter (tempest 16%). Water T= 10-15°. Tide slight, maxi. 1.8 m. Currents: South California (0.25-1 m/s) in summer; North Davidson in winter (0.25-1 m/s) and upwelling in summer 0.01 m/s. Swell magnitude 3-6 m in winter, 5 m (16%) Nov. to March, 0.90 m in summer.  
 4) Works performed: Bathymetry 10 m interval. Low resolution seismic 675 km; high resolution seismic 300 km sparker, 250 km sparker and 50 km uniboom. Magnetism 60 km (Proton precession). Sampling 173 grabs and 73 box and piston cores.  
 5) Characteristics of the deposit: platform 10-20 miles wide. Outer edge water depth 165-183 m. Submerged terraces (probably wave-cut benches) identified. Some terraces correlated with brief sea level still-stands during Holocene transgression that acted as barriers to landward move of HM. Three facies: 1) a transgressive sand facies of well-sorted fine sand; 2) a modern mud facies of silt and clay; and 3) a mixed facies of sand and mud. The sand was deposited during Holocene transgression, and the modern muds derived from coastal rivers. The mixed sediment facies results from reworking of modern muds by benthic organisms into the underlying basal transgressive sands. Sediment distribution sub-parallel to shoreline is patchy and thickness changes from few to >33 m. Well-defined HM concentrations are in the unconsolidated surface and near-surface sediments. The Umpqua accumulation is 40 km long N and S of Umpqua River mouth. Concentration 2-10 km wide in water depths 105-160 m. HM concentration 10-20%. Tonnage: (LaVerne D.Kulm & al 1990) 31.25 Mt ilmenite, 9.47 Mt magnetite, 5.44 Mt chromite, 6.06 Mt garnets, small zircon, gold 5-150 ppb. Placers result from interaction between fluvial transport, tectonic uplift, rise and fall of sea level during Pleistocene and Holocene (Bowman 1972, 1973).

**References:**

1) Kulm L.D. and Peterson C.D., 1990. Preliminary evaluation of heavy-mineral content of continental shelf placer deposits off Cape Blanco, Rogue River and Umpqua River, Open File report 0-89-12. 2) Kulm L.D., 1988. Potential heavy mineral and metal placers on the southern Oregon continental shelf, Marine Mining, 7, 361-395.



Occurrence   
 Deposit   
 Deposit/File

**NAME: AREA B**

**Commodities:** Sn **Type of deposit:** placer paleovalley  
**Country:** Thailand **TH** **District:** Thailand W coast

**Marine area:** Indonesia, Andaman sea

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	inner shelf
<b>Morpho. 1</b>	paleochannel
<b>Morpho. 2</b>	
<b>Petrography</b>	clayey sand
<b>Mineralogy</b>	cassiterite

**COORDINATES**

Latitude	N	8.500
(Decimal °)	N	8.850
Longitude	E	-98.100
	E	-98.150
Z (in m)		-30 to -45

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

1) Distance from shore 5-10 km, surface 121 km<sup>2</sup>.  
 2) Climate: this area has a humid tropical climate (equatorial forest type); precipitation 2400 mm/year with a maximum from September to January. NE wind direction from November to April then SW direction.  
 3) Hydro: The sea is calm from November to April then rough from May to October. The tides are slight, average 2.5 m. The current direction and velocity are linked to the predominant winds. Swell is variable from 1 to 6 m.  
 4) Works performed: seismic, sonar, magnetometry along profiles and traverses 1 km apart. Drilling: 232; total length in sediment: 1555 m; average penetration: 6.7 m maxi: 15.7 m; nbr of holes >10 m = 10; range of water depth: 16.5 to 45.6 m; average recovery 69.6%. PNUD offshore project research realised in 1980-1983 over areas where the water depth was between 30-45 m.  
 5) Characteristics of the deposit: The sedimentology defines two separated units, over a granitic and metamorphic basement rocks. The upper unit formed by muddy sand and clean sand, with abundant shell and coral fragments. Glauconite, barite, indicate a marine origin. The lower unit has sandy clay and clayey sand in it upper position. The proportion of clay and rock fragments often increases downwards; thickness is variable. This lower unit seems to have a continental origin. On that C area, fine and well sorted sand overlying bedrock may have aeolian origin. Sampling shows some tin values but not of economic interest.

**References:**

Anonymous, 1987. Offshore exploration for tin and heavy minerals in the Andaman sea, West coast of Thailand, Report UN/DTC THA 78/008 NY.

Occurrence   
 Deposit   
 Deposit/File

**NAME: THAI S COAST**

**Commodities:** diamond **Type of deposit:** placer paleobeach  
**Country:** Thailand **TH** **District:** Thailand S coast

**Marine area:** Indonesia, Thailand gulf

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	inner shelf
<b>Morpho. 1</b>	paleobeach
<b>Morpho. 2</b>	paleochannel
<b>Petrography</b>	pebbly mudstone
<b>Mineralogy</b>	cassiterite diamond

**COORDINATES**

Latitude	N	7.000
(Decimal °)	N	9.000
Longitude	E	-98.000
	E	-99.000
Z (in m)		

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

1) Diamonds can be found as far as 6 km from the shore.  
 2) Climate: This area has a humid tropical climate (equatorial forest type); precipitation 2400 mm/year with a maximum from September to January. NE wind direction from November to April then SW direction.  
 3) Hydro: The sea is calm from November to April then rough from May to October. The tides are slight, average 2.5 m. The current direction and velocity are linked to the predominant winds. Swell is variable from 1 to 6 m.  
 5) Characteristics of the deposit: Some good quality diamonds have been recovered as a by-product of placer tin mining in different areas: Aokham (SE of Phuket Island), Ban Ak, Ban Thung Tuk, Takua Pa. Diamonds range from 1.8 mm (0.04 carats) to 10.0 mm (6.79 carats) in size. (Stephens et al., 1966; Garson et al., 1975; Aranyakanon, 1985) - The source of diamonds is not definitely known. No kimberlite has been found in Thailand at present. The most likely source is the pebbly mudstone facies of Phuket group (Stephens, Garson). The origin of diamond still needs further investigation. Cut diamond export 1986: 125 799 carats (25 kg); uncut export 7943 carats.

**References:**

1) Aranyakanon P., 1955. Diamond discovery in Phang-Nga and Phuket, South Thailand, Report of investigation, Roy Dept Min (Bangkok), 1, 35-36. 2) Pongsak Vihit, 1983. Gemstones in Thailand.

Occurrence   
 Deposit   
 Deposit/File

**NAME: CHICLAYO**

**Commodities:** phosphate      **Type of deposit:** phosphorite upwelling  
**Country:** Peru      PE      **District:** Peru N

**Marine area:** Pacific SE

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	outer shelf slope
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	nodule
<b>Petrography</b>	diatom ooze
<b>Mineralogy</b>	francolite collophane apatite

**COORDINATES**

Latitude	S	-7.250
(Decimal °)		0.000
Longitude	W	80.500
		0.000
Z (in m)		-350

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/15/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

1) Occurrences along the coast of Peru/Chile, parallel to the coast line on the ocean floor. The deposit is confined along two narrow sedimentary strips located on the shelf edge and the upper continental slope (-70 -160 m) (-360 -480 m).

2) Climate: Desertic. Mean annual average rain fall 41 mm.

3) Hydro: Peru current.

4) Works performed: Sampling (1) for fundamental scientific research: phosphorite grains, age Present.

5) Characteristics of the deposit: The phosphorite occurs as scattered nodules in fine grained biogenic sediments (chiefly diatom oozes) in an area where surface waters are said to be biologically highly productive due to upwelling of coastal waters containing considerable organic matter. Burnett (1973, 74, 77) describes the phosphatic rocks as being irregular in shape with a hackly and pitted surface. Many nodules are flattened in one dimension; others are roughly equal in shape. The surfaces are dull with colors that vary from light to dark grey. Mineralization from Pleistocene to interglacial period is represented by pellets, particles, nodules of francolite and collophane composition. All investigators of the Peru/Chile deposits believe that the deposits are, for the most part, recent in origin. Manheim and others postulate that the deposits are the result of replacement of carbonate tests in the interstitial waters of organic-rich sediments. Burnett thinks that the apatite has chemically precipitated out of solution rather than replaced previously existing materials. One onshore deposit in the Sechura Desert in northern Peru: bed 1-1.5 m thick with 20% P2O5.

**References:**

1) Garrand L., 1977. Ocean phosphorite world occurrences. 2) Anonymous. Les phosphates sédimentaires sous-marins, Ifremer internal report. 3) Burnett W.C., 1974. 4) Veeh H.H., 1973.

Occurrence   
 Deposit   
 Deposit/File

NAME: **CHIMBOTE**

**Commodities:** phosphate      **Type of deposit:** phosphorite upwelling  
**Country:** Peru      PE      **District:** Peru N

**Marine area:** Pacific SE

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	outer shelf slope
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	sand nodule
<b>Petrography</b>	diatom ooze
<b>Mineralogy</b>	francolite collophane apatite

**COORDINATES**

Latitude	S	-9.200
(Decimal °)	S	-9.230
Longitude	W	78.630
	W	79.660
Z (in m)		-70 to -340

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 2/17/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

1) Occurrences along the coast of Peru/Chile, parallel to the coast line on the ocean floor. The deposit is confined along two narrow sedimentary strips located on the shelf edge and the upper continental slope (-70 -160 m) (-360 -480 m).

2) Climate: Desertic. Mean annual average rain fall 41 mm.

3) Hydro: Peru current.

4) Works performed: Sampling (3) for fundamental scientific research: 1) 9.20S 79.1W, 300 m, Phosphorite sands, Present; 2) 9.23S 79.66W, 260-340 m, phosphorite nodules Holocene (Burnett, 1974); 3) 9.23S 78.63W, 300 m sands and grains Present (Manheim, 1975).

5) Characteristics of the deposit: The phosphorite occurs as sand size grains in fine grained biogenic sediments (chiefly diatom oozes) in an area where surface waters are said to be biologically highly productive due to upwelling of coastal waters containing considerable organic matter. Burnett (1973, 74, 77) describes the phosphatic rocks as being irregular in shape with a hackly and pitted surface. Many nodules are flattened in one dimension; others are roughly equal in shape. The surfaces are dull with colors that vary from light to dark grey. Mineralization from Pleistocene to interglacial period is represented by pellets, particles, nodules of francolite and collophane composition. All investigators of the Peru/Chile deposits believe that the deposits are, for the most part, recent in origin. Manheim and others postulate that the deposits are the result of replacement of carbonate tests in the interstitial waters of organic-rich sediments. Burnett thinks that the apatite has chemically precipitated out of solution rather than replaced previously existing materials. One onshore deposit in the Sechura Desert in northern Peru: bed 1-1.5 m thick with 20% P2O5.

**References:**

1) Garrand L., 1977. Ocean phosphorite world occurrences. 2) Anonymous. Les phosphates sédimentaires sous-marins, Ifremer internal report. 3) Burnett W.C., 1974. 4) Veeh H.H., 1973.

Occurrence   
 Deposit   
 Deposit/File

**NAME: HUARMEY**

**Commodities:** phosphate      **Type of deposit:** phosphorite upwelling  
**Country:** Peru      PE      **District:** Peru N

**Marine area:** Pacific SE

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	outer shelf slope
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	nodule
<b>Petrography</b>	diatom ooze
<b>Mineralogy</b>	francolite collophane apatite

**COORDINATES**

Latitude	S	-9.700
(Decimal °)	S	-9.930
Longitude	W	79.400
	W	79.870
Z (in m)		-200 to -360

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 2/17/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

1) Occurrences along the coast of Peru/Chile, parallel to the coast line on the ocean floor. The deposit is confined along two narrow sedimentary strips located on the shelf edge and the upper continental slope (-70 -160 m) (-360 -480 m).

2) Climate: Desertic. Mean annual average rain fall 41 mm.

3) Hydro: Peru current.

4) Works performed: Sampling (3) for fundamental scientific research: 1) 9.70S 79.87W, 200 m, phosphorite Pleistocene to Present (Veeh, 1973). 2) 9.80S 79.40W, 360 m phosphorite nodules Holocene (Burnett, 1974). 3- 9.93S 79.45W, 891 m, phosphorite nodules Holocene (Burnett, 1974).

5) Characteristics of the deposit: The phosphorite occurs as scattered nodules in fine grained biogenic sediments (chiefly diatom oozes) in an area where surface waters are said to be biologically highly productive due to upwelling of coastal waters containing considerable organic matter. Burnett (1973, 74, 77) describes the phosphatic rocks as being irregular in shape with a hackly and pitted surface. Many nodules are flattened in one dimension; others are roughly equal in shape. The surfaces are dull with colors that vary from light to dark grey. Mineralization from Pleistocene to interglacial period is represented by pellets, particles, nodules of francolite and collophane composition. All investigators of the Peru/Chile deposits believe that the deposits are, for the most part, recent in origin. Manheim and others postulate that the deposits are the result of replacement of carbonate tests in the interstitial waters of organic-rich sediments. Burnett thinks that the apatite has chemically precipitated out of solution rather than replaced previously existing materials. One onshore deposit in the Sechura Desert in northern Peru: bed 1-1.5 m thick with 20% P2O5.

**References:**

1) Garrand L., 1977. Ocean phosphorite world occurrences. 2) Anonymous. Les phosphates sédimentaires sous-marins, Ifremer internal report. 3) Burnett W.C., 1974. 4) Veeh H.H., 1973.

Occurrence   
 Deposit   
 Deposit/File

**NAME: PATIVILCA**

**Commodities:** phosphate      **Type of deposit:** phosphorite upwelling  
**Country:** Peru      PE      **District:** Peru center

**Marine area:** Pacific SE

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**TYOLOGY**

<b>Zone type</b>	outer shelf
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	diatom ooze
<b>Mineralogy</b>	francolite collophane apatite

**COORDINATES**

Latitude	S	-10.750
(Decimal °)		0.000
Longitude	W	78.500
		0.000
Z (in m)		-200

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 2/17/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

1) Occurrences along the coast of Peru/Chile, parallel to the coast line on the ocean floor. The deposit is confined along two narrow sedimentary strips located on the shelf edge and the upper continental slope (-70 -160 m) (-360 -480 m).

2) Climate: Desertic. Mean annual average rain fall 41 mm.

3) Hydro: Peru current.

4) Works performed: Sampling (1) for fundamental scientific research: phosphorite Pleistocene to Present (Veeh, 1973).

5) Characteristics of the deposit: The phosphorite occurs as scattered nodules in fine grained biogenic sediments (chiefly diatom oozes) in an area where surface waters are said to be biologically highly productive due to upwelling of coastal waters containing considerable organic matter. Burnett (1973, 74, 77) describes the phosphatic rocks as being irregular in shape with a hackly and pitted surface. Many nodules are flattened in one dimension; others are roughly equal in shape. The surfaces are dull with colors that vary from light to dark grey. Mineralization from Pleistocene to interglacial period is represented by pellets, particles, nodules of francolite and collophane composition. All investigators of the Peru/Chile deposits believe that the deposits are, for the most part, recent in origin. Manheim and others postulate that the deposits are the result of replacement of carbonate tests in the interstitial waters of organic-rich sediments. Burnett thinks that the apatite has chemically precipitated out of solution rather than replaced previously existing materials. One onshore deposit in the Sechura Desert in northern Peru: bed 1-1.5 m thick with 20% P2O5.

**References:**

1) Garrand L., 1977. Ocean phosphorite world occurrences. 2) Anonymous. Les phosphates sédimentaires sous-marins, Ifremer internal report. 3) Burnett W.C., 1974. 4) Veeh H.H., 1973.

Occurrence   
 Deposit   
 Deposit/File

**NAME: LIMA**

**Commodities:** phosphate      **Type of deposit:** phosphorite upwelling  
**Country:** Peru      PE      **District:** Peru center

**Marine area:** Pacific SE

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	outer shelf slope
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	sand nodule
<b>Petrography</b>	diatom ooze
<b>Mineralogy</b>	francolite collophane apatite

**COORDINATES**

Latitude	S	-12.200
(Decimal °)	S	-12.500
Longitude	W	77.600
	W	77.900
Z (in m)		-345 to -450

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 2/17/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

1) Occurrences along the coast of Peru/Chile, parallel to the coast line on the ocean floor. The deposit is confined along two narrow sedimentary strips located on the shelf edge and the upper continental slope (-70 -160 m) (-360 -480 m).  
 2) Climate: Desertic. Mean annual average rain fall 41 mm.  
 3) Hydro: Peru current.  
 4) Works performed: Sampling (3) for fundamental scientific research: 12.20S 77.90W, 345 m; 12.30S 77.50W, 450 m; 12.50S 77.60W, 446 m phosphorite Pleistocene to Present (Veeh, 1973).  
 5) Characteristics of the deposit: phosphorite Pleistocene to Present (Veeh, 1973). The phosphorite occurs as scattered nodules in fine grained biogenic sediments (chiefly diatom oozes) in an area where surface waters are said to be biologically highly productive due to upwelling of coastal waters containing considerable organic matter. Burnett (1973, 74, 77) describes the phosphatic rocks as being irregular in shape with a hackly and pitted surface. Many nodules are flattened in one dimension; others are roughly equal in shape. The surfaces are dull with colors that vary from light to dark grey. Mineralization from Pleistocene to interglacial period is represented by pellets, particles, nodules of francolite and collophane composition. All investigators of the Peru/Chile deposits believe that the deposits are, for the most part, recent in origin. Manheim and others postulate that the deposits are the result of replacement of carbonate tests in the interstitial waters of organic-rich sediments. Burnett thinks that the apatite has chemically precipitated out of solution rather than replaced previously existing materials. One onshore deposit in the Sechura Desert in northern Peru: bed 1-1.5 m thick with 20% P2O5.

**References:**

1) Garrand L., 1977. Ocean phosphorite world occurrences. 2) Anonymous. Les phosphates sédimentaires sous-marins, Ifremer internal report. 3) Burnett W.C., 1974. 4) Veeh H.H., 1973.

Occurrence   
 Deposit   
 Deposit/File

**NAME: SAN NICOLAS**

**Commodities:** phosphate      **Type of deposit:** phosphorite upwelling  
**Country:** Peru      PE      **District:** Peru center

**Marine area:** Pacific SE

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	outer shelf slope
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	pebble nodule
<b>Petrography</b>	diatom ooze
<b>Mineralogy</b>	francolite collophane apatite

**COORDINATES**

Latitude	S	-15.210
(Decimal °)	S	-15.500
Longitude	W	75.350
	W	75.850
Z (in m)		-120 to -1000

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 2/17/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

1) Occurrences along the coast of Peru/Chile, parallel to the coast line on the ocean floor. The deposit is confined along two narrow sedimentary strips located on the shelf edge and the upper continental slope (-70 -160 m) (-360 -480 m).

2) Climate: Desertic. Mean annual average rain fall 41 mm.

3) Hydro: Peru current.

4) Works performed: Sampling (4) for fundamental scientific research: 15.5S 75.85W, 1000 m, phosphorite pebbles Present (Manheim, 1975); 15.21S 75.37W, 120 m and 15.30S 75.40W, 350-390 m phosphorite nodules Holocene (Burnett, 1974); 15.30S 75.35W 120 m phosphorite Pleistocene to Present (Veeh, 1973).

5) Characteristics of the deposit: phosphorite Pleistocene to Present (Veeh, 1973). The phosphorite occurs as scattered nodules in fine grained biogenic sediments (chiefly diatom oozes) in an area where surface waters are said to be biologically highly productive due to upwelling of coastal waters containing considerable organic matter. Burnett (1973, 74, 77) describes the phosphatic rocks as being irregular in shape with a hackly and pitted surface. Many nodules are flattened in one dimension; others are roughly equal in shape. The surfaces are dull with colors that vary from light to dark grey. Mineralization from Pleistocene to interglacial period is represented by pellets, particles, nodules of francolite and collophane composition. All investigators of the Peru/Chile deposits believe that the deposits are, for the most part, recent in origin. Manheim and others postulate that the deposits are the result of replacement of carbonate tests in the interstitial waters of organic-rich sediments. Burnett thinks that the apatite has chemically precipitated out of solution rather than replaced previously existing materials. One onshore deposit in the Secura Desert in northern Peru: bed 1-1.5 m thick with 20% P2O5.

**References:**

1) Garrand L., 1977. Ocean phosphorite world occurrences. 2) Anonymous. Les phosphates sédimentaires sous-marins, Ifremer internal report. 3) Burnett W.C., 1974. 4) Veeh H.H., 1973.



Occurrence   
 Deposit   
 Deposit/File

**NAME: PISAGUA**

**Commodities:** phosphate      **Type of deposit:** phosphorite upwelling  
**Country:** Chile      CL      **District:** Chile N

**Marine area:** Pacific SE

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	outer shelf slope
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	nodule
<b>Petrography</b>	diatom ooze
<b>Mineralogy</b>	francolite collophane apatite

**COORDINATES**

Latitude	S	-18.500
(Decimal °)	S	-19.610
Longitude	W	70.330
	W	70.650
Z (in m)		-130 to -430

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 2/17/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

1) Occurrences along the coast of Peru/Chile, parallel to the coast line on the ocean floor. The deposit is confined along two narrow sedimentary strips located on the shelf edge and the upper continental slope (-70 -160 m) (-360 -480 m).  
 2) Climate: Desertic. Mean annual average rain fall 41 mm.  
 3) Hydro: Peru current.  
 4) Works performed: Sampling (7) for fundamental scientific research: 18.50S 70.61W 350-425 m, 19.50S 70.33W 130 m, 19.56S 70.38W 340-370 m and 19.61S 70.43W 430 m, phosphorite nodules Holocene (Burnett, 1974); 19S 70.40W, 19S 70.65W, 19.50S 70.65W, 200 m phosphorite Pleistocene-Present (Veeh, 1973);  
 5) Characteristics of the deposit: phosphorite Pleistocene to Present (Veeh, 1973). The phosphorite occurs as scattered nodules in fine grained biogenic sediments (chiefly diatom oozes) in an area where surface waters are said to be biologically highly productive due to upwelling of coastal water containing considerable organic matter. Burnett (1973, 74, 77) describes the phosphatic rocks as being irregular in shape with a hackly and pitted surface. Many nodules are flattened in one dimension; others are roughly equal in shape. The surfaces are dull with colors that vary from light to dark grey. Mineralization from Pleistocene to interglacial period is represented by pellets, particles, nodules of francolite and collophane composition. All investigators of the Peru/Chile deposits believe that the deposits are, for the most part, recent in origin. Manheim and others postulate that the deposits are the result of replacement of carbonate tests in the interstitial waters of organic-rich sediments. Burnett thinks that the apatite has chemically precipitated out of solution rather than replaced previously existing materials. One onshore deposit in the Sechura Desert in northern Peru: bed 1-1.5 m thick with 20% P2O5.

**References:**

1) Garrand L., 1977. Ocean phosphorite world occurrences. 2) Anonymous. Les phosphates sédimentaires sous-marins, Ifremer internal report. 3) Burnett W.C., 1974. 4) Veeh H.H., 1973.

Occurrence   
 Deposit   
 Deposit/File

**NAME: KANNIYAKUMARI MANAVALAKURICHI**

**Commodities:** Ti Zr Th      **Type of deposit:** placer beach paleobeach  
**Country:** India      IN      **District:** India S, Tamil Nadu state

**Marine area:** Indian N, Laccadive sea

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	on land foreshore
<b>Morpho. 1</b>	beach
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	ilmenite rutile zircon monazite garnet

**COORDINATES**

Latitude	N	8.200
(Decimal °)		0.000
Longitude	E	-78.500
		0.000
Z (in m)		

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/3/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

1) The deposit is located around the village of Manavalakurichi in the Kanniyakumari district of Tamil Nadu state in the S point of India near Cape Comorin.  
 2) Climate: Tropical equatorial forest. Annual average rainfall 2500-3000 mm, maxi. from SW monsoon, June to September. In January, NE monsoon.  
 3) Hydro: Tide (1-2 m). SW monsoon is also the period of maxi. sea turbulence. The predominant direction of waves is from SW, W-SW, W, W-NW, with periods ranging from 5-14 s. (For waves from the SW the tendency of sediment transport is mostly NE and for waves from W-SW and W several directions. For W-NW, the transport tendency is toward the S).  
 4) Works performed: Sampling.  
 5) Characteristics of the deposit: The deposit is situated in a cove with cliffs over 15m high. It is approximately 8 km long, and consists of buried seams of rich black sand at or just above the present sea level. Mining also occurs on the beach surface which is replenished annually with 50,000 t of black sand by monsoon storms. The grade of this material is 75 to 80% HM. Dunes which also contain HM concentrations occur behind the beach and rise to a height of over 10m. The grade of the older beach deposits varies from 17 to 23% HM. The average composition of HM suite is as follows: ilmenite 70%, rutile 5%, zircon 9%, monazite 5%, sillimanite 2%, garnet 9%. IRE estimates that the deposits contain some 4.7 Mt of ilmenite and 0.08 Mt of rutile. Separation plant with a capacity of 65,000 t/y ilmenite, 1,500 t/y rutile, 5,000 t/y zircon, 3,500 t/y monazite, and 4,500 t/y garnet.

**References:**

Anonymous, 1989. India, a major ilmenite producer, Petromin.

Occurrence   
 Deposit   
 Deposit/File

**NAME: CHATRAPUR**

**Commodities:** Ti Zr Th      **Type of deposit:** placer paleobeach  
**Country:** India      IN      **District:** India NE, Orissa State

**Marine area:** Indian N, Bengal bay

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	on land
<b>Morpho. 1</b>	paleobeach
<b>Morpho. 2</b>	dune
<b>Petrography</b>	sand
<b>Mineralogy</b>	ilmenite rutile zircon monazite sillim.

**COORDINATES**

Latitude	N	19.350
(Decimal °)		0.000
Longitude	E	-84.980
		0.000
Z (in m)		+17 to 0

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

1) This deposit is located at the small village of Gopalpur, 22 km east of the large town of Berhampur, in the Ganjam district of Orissa state, NE India.  
 2) Climate: Tropical equatorial forest. Annual average rainfall 2500-3000 mm, maxi. from SW monsoon, June to September. In January, NE monsoon.  
 3) Hydro: Tide (1-2 m). SW monsoon is also the period of maxi. sea turbulence. The predominant direction of waves is from SW, W-SW, W, W-NW, with periods ranging from 5-14 s. (For waves from the SW the tendency of sediment transport is mostly NE and for waves from W-SW and W several directions. For W-NW, the transport tendency is toward the S).  
 4) Works performed: Sampling.  
 5) Characteristics of the deposit: It consists of Quaternary aeolian sand dunes which form a belt of fixed dunes 1500 m wide and 19 km long; the maximum elevation of the dunes is 17 m above sea level. The high-grade heavy mineral sands are generally above the water table which is approximately at sea level. Below this level, lower grade sands occur but are not mined. The average grade of HM in the sand is 14%, lower than the Southwest Indian deposits, and consists of ilmenite 9.5%, rutile 0.5%, zircon 0.4%. monazite 0.64% and sillimanite 3.3%. The major gangue minerals are quartz (80%), garnet and amphiboles. The ilmenite assays 50.8% TiO<sub>2</sub>, the rutile 96.2% TiO<sub>2</sub> and the zircon 65.6% ZrO<sub>2</sub>. Proven resources of the deposit over an area of 2850 ha total 240 Mt of ore containing approximately 23 Mt ilmenite, 1.2 Mt rutile, 1 Mt zircon, 1.5 Mt monazite and 7.9 Mt sillimanite. An additional 4000 ha of mineralised dune sand has been identified and assuming similar grades as in the proven area, a further 350 Mt of inferred recoverable resources are available. The deposit is owned by IRE (Indian rare earths). Production capacity of the plant: 220,000 t/y ilmenite, 10,000 t/y rutile, 2,000 t/y zircon, 4,000 t/y monazite, and 30,000 t/y sillimanite.

**References:**

Anonymous, 1989. India, a major ilmenite producer, Petromin.

Occurrence   
 Deposit   
 Deposit/File

**NAME: INDIAN ARABIAN SEA**

**Commodities:** phosphate      **Type of deposit:** phosphorite upwelling  
**Country:** India      IN      **District:**

**Marine area:** Indian N, Arabian sea

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	slope
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	
<b>Mineralogy</b>	phosphate

**COORDINATES**

Latitude	N	17.960
(Decimal °)		0.000
Longitude	E	-70.760
		0.000
Z (in m)		-650

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

1) Setty (1972) reports on five sediment cores from the Arabian sea collected by the R.V. Oceanographer during June 1967.  
 2) Climate: Tropical equatorial forest. Annual average rainfall 2500-3000 mm, maxi. from SW monsoon, June to September. In January, NE monsoon.  
 3) Hydro: Tide (1-2 m). SW monsoon is also the period of maxi. sea turbulence. The predominant direction of waves is from SW, W-SW, W, W-NW, with periods ranging from 5-14 s. (For waves from the SW the tendency of sediment transport is mostly NE and for waves from W-SW and W several directions. For W-NW, the transport tendency is toward the S).  
 4) Works performed: Sampling.  
 5) Characteristics of the deposit: Three of the cores were from outer shelf, one from the slope, and one from the Arabian basin. Analyses were made for phosphorus. The content was found to be high from the slope core but low uniform from the other cores. In the upper 7.5 cm of the slope core the P<sub>2</sub>O<sub>5</sub> content ranged from 1.04-0.84%. In general, phosphate content was higher in the oolitic fractions of the cores. The organic carbon values were found to fluctuate with corresponding increases and decreases in phosphate content.

**References:**

Garrand L., 1977. Offshore phosphorite world occurrences.

Occurrence   
 Deposit   
 Deposit/File

**NAME: ASAN MAN**

**Commodities:** Au **Type of deposit:** placer paleochannel  
**Country:** Korea **KR** **District:** Kyongi Do

**Marine area:** Pacific NW, China E Yellow sea Huanghai

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	bay
<b>Morpho. 1</b>	paleochannel
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	gold

**COORDINATES**

Latitude	N	36.560
(Decimal °)		0.000
Longitude	E	-126.510
		0.000
Z (in m)		

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

- 1) Bay of Asan (Asan Man), 60 km SW of Seoul.
- 4) Works performed: no intensive survey.
- 5) Characteristics of the deposit: Gold occurrences have been reported.

**References:**

Kim S.G., 1993. The development state of ocean non-living resources in Korea. Unido workshop (Madras-India) 27-30/9/93.

Occurrence   
 Deposit   
 Deposit/File

**NAME: CHUNSU**

**Commodities:** Au **Type of deposit:** placer paleochannel  
**Country:** Korea **KR** **District:** Chungchong Namdo

**Marine area:** Pacific NW, China E Yellow sea Huanghai

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	bay
<b>Morpho. 1</b>	paleochannel
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	gold

**COORDINATES**

Latitude	N	36.500
(Decimal °)		0.000
Longitude	E	-127.600
		0.000
Z (in m)		

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 2/17/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

- 1) Bay of Chunsu between main land and Anmyon Do island.
- 4) Works performed: no intensive survey.
- 5) Characteristics of the deposit: Gold occurrences have been reported.

**References:**

Kim S.G., 1993. The development state of ocean non-living resources in Korea. Unido workshop (Madras-India) 27-30/9/93.

Occurrence   
 Deposit   
 Deposit/File

**NAME: MOKPO**

**Commodities:** Th Rare-Earth      **Type of deposit:** placer paleochannel  
**Country:** Korea      KR      **District:** Cholla Namdo

**Marine area:** Pacific NW, China E Yellow sea Huanghai

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	bay
<b>Morpho. 1</b>	paleochannel
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	monazite

**COORDINATES**

Latitude	N	34.700
(Decimal °)		0.000
Longitude	E	-127.700
		0.000
Z (in m)		

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

- 1) SW of Korea, offshore the city of Mokpo.
- 4) Works performed: no intensive survey.
- 5) Characteristics of the deposit: monazite occurrences have been reported.

**References:**

Kim S.G., 1993. The development state of ocean non-living resources in Korea. Unido workshop (Madras-India) 27-30/9/93.

Occurrence   
 Deposit   
 Deposit/File

**NAME: WANDO ISLAND**

**Commodities:** Th Rare-Earth      **Type of deposit:** placer paleochannel  
**Country:** Korea      KR      **District:** Cholla Namdo

**Marine area:** Pacific NW, Korean strait

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	bay
<b>Morpho. 1</b>	paleochannel
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	monazite

**COORDINATES**

Latitude	N	34.300
(Decimal °)		0.000
Longitude	E	-127.200
		0.000
Z (in m)		

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

- 1) SW of Korea.
- 4) Works performed: no intensive survey.
- 5) Characteristics of the deposit: monazite occurrences have been reported.

**References:**

Kim S.G., 1993. The development state of ocean non-living resources in Korea. Unido workshop (Madras-India) 27-30/9/93.



Occurrence   
 Deposit   
 Deposit/File

**NAME: KANGWHA**

**Commodities:** Ti **Type of deposit:** placer paleochannel  
**Country:** Korea **KR** **District:** Kyongi Do

**Marine area:** Pacific NW, China E Yellow sea Huanghai

**ADMINISTRATION**

**TYOLOGY**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

<b>Zone type</b>	bay
<b>Morpho. 1</b>	paleochannel
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	ilmenite rutile

**COORDINATES**

Latitude	N	37.550
(Decimal °)		0.000
Longitude	E	-127.700
		0.000
Z (in m)		

**STAGE**

**MINING RIGHTS**

Exploration:  Free:   
 Mining:  Under control:   
 Processing:  Unknown:

Up-dated on: 2/17/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

- 1) NW of Korea near N Korean border.
- 4) Works performed: no intensive survey.
- 5) Characteristics of the deposit: ilmenite occurrences have been reported.

**References:**

Kim S.G., 1993. The development state of ocean non-living resources in Korea. Unido workshop (Madras-India) 27-30/9/93.

Occurrence   
 Deposit   
 Deposit/File

**NAME: LABIBJET SEAMOUNT**

**Commodities:** Co Mn **Type of deposit:** crust  
**Country:** Marshall Islands **RM** **District:**

**Marine area:** Pacific W

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	seamount
<b>Morpho. 1</b>	crust
<b>Morpho. 2</b>	nodule
<b>Petrography</b>	Fe-Mn crust
<b>Mineralogy</b>	

**COORDINATES**

Latitude	N	10.000
(Decimal °)		0.000
Longitude	E	-160.500
		0.000
Z (in m)		

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/16/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

- 1) W of Marshall Islands.
- 2) Climate: Tropical, heavy rains. prevalent wind E to SE.
- 3) Hydro: Sea sometimes rough; strong swell associated with E to SE trade winds.
- 5) Characteristics of the deposit: 10-15 cm thick Fe-Mn crust with high Co (3%?).

**References:**

Masuda Y. & Cruickshank M.J., 1993. CLB mining and its adaptability for developing countries (Marshall Islands), Unido Workshop (Madras-India) 27-30/9/93.

Occurrence   
 Deposit   
 Deposit/File

**NAME: SYLVANIA SEAMOUNT 2**

**Commodities:** Co Mn      **Type of deposit:** crust  
**Country:** Marshall Islands      RM      **District:**

**Marine area:** Pacific W

**ADMINISTRATION**

**TYOLOGY**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

<b>Zone type</b>	seamount
<b>Morpho. 1</b>	crust
<b>Morpho. 2</b>	nodule
<b>Petrography</b>	Fe-Mn crust
<b>Mineralogy</b>	

**COORDINATES**

Latitude	N	12.000
(Decimal °)		0.000
Longitude	E	-165.000
		0.000
Z (in m)		

**STAGE**

**MINING RIGHTS**

Exploration:       Free:   
 Mining:       Under control:   
 Processing:       Unknown:

Up-dated on: 3/16/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

- 1) NW of Marshall Islands.
- 2) Climate: Tropical, heavy rains. prevalent wind E to SE.
- 3) Hydro: Sea sometimes rough; strong swell associated with E to SE trade winds.
- 5) Characteristics of the deposit: Fe-Mn crust with high Co (3%?).

**References:**

Masuda Y. & Cruickshank M.J., 1993. CLB mining and its adaptability for developing countries (Marshall Islands), Unido Workshop (Madras-India) 27-30/9/93.

Occurrence   
 Deposit   
 Deposit/File

**NAME: JEBRO SEAMOUNT**

**Commodities:** Co Mn      **Type of deposit:** crust  
**Country:** Marshall Islands      RM      **District:**

**Marine area:** Pacific W

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**TYOLOGY**

<b>Zone type</b>	seamount
<b>Morpho. 1</b>	crust
<b>Morpho. 2</b>	nodule
<b>Petrography</b>	Fe-Mn crust
<b>Mineralogy</b>	

**COORDINATES**

Latitude	N	7.500
(Decimal °)		0.000
Longitude	E	-170.000
		0.000
Z (in m)		

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 3/16/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

- 1) SE of Marshall Islands.
- 2) Climate: tropical, heavy rains. prevalent wind E to SE.
- 3) Hydro: sea sometimes rough; strong swell associated with E to SE trade winds.
- 5) Characteristics of the deposit: Fe-Mn crust with high Co (3%?).

**References:**

Masuda Y. & Cruickshank M.J., 1993. CLB mining and its adaptability for developing countries (Marshall Islands), Unido Workshop (Madras-India) 27-30/9/93.

Occurrence   
 Deposit   
 Deposit/File

**NAME: TAKUYOU 5th SEAMOUNT**

**Commodities:** Co Mn      **Type of deposit:** crust  
**Country:** Japan      JP      **District:** Minami-Tori islands, Marcus Isl.

**Marine area:** Pacific NW

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**TYOLOGY**

<b>Zone type</b>	seamount
<b>Morpho. 1</b>	crust
<b>Morpho. 2</b>	nodule
<b>Petrography</b>	Fe-Mn crust
<b>Mineralogy</b>	

**COORDINATES**

Latitude	N	34.000
(Decimal °)		0.000
Longitude	E	-153.600
		0.000
Z (in m)		

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 2/17/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

- 2) Climate: tropical, heavy rains. prevalent wind E to SE.
- 3) Hydro: sea sometimes rough; strong swell associated with E to SE trade winds.
- 5) Characteristics of the deposit: crust with high Co (3%?).

**References:**

Masuda Y. & Cruickshank M.J., 1993. CLB mining and its adaptability for developing countries (Marshall Islands), Unido Workshop (Madras-India) 27-30/9/93.

Occurrence   
 Deposit   
 Deposit/File

**NAME: PALMYRA SEAMOUNT**

**Commodities:** Co Mn      **Type of deposit:** crust  
**Country:** USA      US      **District:** Christmas Island ridge NW

**Marine area:** Pacific central, Line Islands

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	seamount
<b>Morpho. 1</b>	crust
<b>Morpho. 2</b>	nodule
<b>Petrography</b>	Fe-Mn crust
<b>Mineralogy</b>	

**COORDINATES**

Latitude	N	5.520
(Decimal °)		0.000
Longitude	W	162.060
		0.000
Z (in m)		

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

- 2) Climate: tropical, heavy rains. prevalent wind E to SE.
- 3) Hydro: sea sometimes rough; strong swell associated with E to SE trade winds.
- 5) Characteristics of the deposit: Fe-Mn crust with high Co (3%?).

**References:**

Masuda Y. & Cruickshank M.J., 1993. CLB mining and its adaptability for developing countries (Marshall Islands), Unido Workshop (Madras-India) 27-30/9/93.

Occurrence   
 Deposit   
 Deposit/File

**NAME: NIAU COBALT**

**Commodities:** Co Mn      **Type of deposit:** crust  
**Country:** French Polynesia      FR      **District:** Tuamotu archipelago

**Marine area:** Pacific S

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	plateau
<b>Morpho. 1</b>	submerged coralian platier
<b>Morpho. 2</b>	crust
<b>Petrography</b>	phosphatic limestone
<b>Mineralogy</b>	MnFe hydroxides

**COORDINATES**

Latitude	S	-16.300
(Decimal °)	S	-16.500
Longitude	W	146.500
	W	146.700
Z (in m)		-1100

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:** Ifremer

	Ore	Heavy minerals	Commodities
<b>Grades</b>	Co 1.2%		
<b>Tonnage</b>	1.5-2 Mt		15 kt Co

**Description:**

1) 50 km SW of Niau Atoll.  
 2) Climate: Tropical, heavy rains. Prevalent wind E to SE.  
 3) Hydro: Around the atoll of Niau to the North, the sea, sometimes rough (strong swell associated with E to SE trade winds), allows refilling of the lagoon. Inside the lagoon, the current velocity remains weak.  
 4) Works performed: NODCO 1, 1bis and 2 cruises in 1986-87 by R/V J. Charcot (Ifremer): multibeam echosounding (1000 km<sup>2</sup>), side scan sonar (37 km SAR), photos Epaulard, 19 dredgings, rock cores.  
 5) Characteristics of the deposit: The Niau plateau is lying at 1000 to 1200 m deep and corresponds to an old submerged lagoon or coralian platier, bordered on S by steep 400 m slopes. Black crust 2-5 cm thick and covering 80 km<sup>2</sup> is formed by FeMn hydroxides with Co. Specific weight 1.4 g/cm<sup>3</sup>, Co 1.2%, Mn 26%, Ni 0.6%, Cu 0.1%.  
 Possible tonnage: 1.5-2 Mt dry.

**References:**

Lenoble J.P., 1987. Croûtes cobaltifères, Ifremer internal report.

Occurrence   
 Deposit   
 Deposit/File

**NAME: ANAA**

**Commodities:** Co Mn **Type of deposit:** crust  
**Country:** French Polynesia **FR** **District:** Tuamotu archipelago

**Marine area:** Pacific S

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**TYOLOGY**

<b>Zone type</b>	plateau
<b>Morpho. 1</b>	submerged coralian platier
<b>Morpho. 2</b>	crust
<b>Petrography</b>	phosphatic limestone
<b>Mineralogy</b>	MnFe hydroxides

**COORDINATES**

Latitude	S	-17.200
(Decimal °)		0.000
Longitude	W	145.700
		0.000
Z (in m)		-1350

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

- 1) 50 km NW of Anaa Atoll.
- 2) Climate: Tropical, heavy rains. Prevalent wind E to SE.
- 3) Hydro: Around the atoll of Anaa, the sea, sometimes rough (strong swell associated with E to SE trade winds), allows refilling of the lagoon. Inside the lagoon, the current velocity remains weak.
- 4) Works performed: NODCO 2 in 1986 by R/V J. Charcot (Ifremer): multibeam echosounding (800 km<sup>2</sup>), sampling.
- 5) Characteristics of the deposit: The Anaa plateau is lying at 1000 to 1500 m deep and corresponds to an old submerged coralian platier, bordered by steep slopes. Crust has been detected covering 70 km<sup>2</sup> and is formed by FeMn hydroxides with Co. Specific weight 1.4 g/cm<sup>3</sup>, Co could be 1%, Mn 26%, Ni 0.6%, Cu 0.1%. Possible tonnage: 1.5-2 Mt dry.

**References:**

Lenoble J.P., 1987. Croûtes cobaltifères, Ifremer internal report.



Occurrence   
 Deposit   
 Deposit/File

**NAME: MATAIVA N**

**Commodities:** Co Mn **Type of deposit:** crust  
**Country:** French Polynesia **FR** **District:** Tuamotu archipelago

**Marine area:** Pacific S

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**TYOLOGY**

<b>Zone type</b>	seamount
<b>Morpho. 1</b>	volcano
<b>Morpho. 2</b>	crust
<b>Petrography</b>	volcanic ashes & lava
<b>Mineralogy</b>	MnFe hydroxides

**COORDINATES**

Latitude	S	-14.000
(Decimal °)	S	-14.200
Longitude	W	149.100
	W	149.300
Z (in m)		-1300

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

- 1) 100 km NNW of Mataiva Atoll.
- 2) Climate: Tropical, heavy rains. Prevalent wind E to SE.
- 3) Hydro: Around the atoll of Mataiva, the sea, sometimes rough (strong swell associated with E to SE trade winds), allows refilling of the lagoon. Inside the lagoon, the current velocity remains weak with a general water movement from the south inlets to the NW outlets.
- 4) Works performed: NODCO 2 in 1986 by R/V J. Charcot (Ifremer): multibeam echosounding (750 km<sup>2</sup>), side scan sonar (46 x 1.5 km), 4 dredgings, 4 km photos, 5 pyrotechnic rock samplings.
- 5) Characteristics of the deposit: The Mataiva N area is lying at 1000 to 1500 m deep and corresponds to an old volcanic, rather flat, but conic summit, bordered by steep slopes, with a steeper S flank. Dimensions of the flat cone is 30 km EW and 17 NS. Crust has been detected covering possibly 200 km<sup>2</sup> and is formed by FeMn hydroxides with Co on volcanic ashes and lavas. Specific weight 1.4 g/cm<sup>3</sup>, Co could be 1%, Mn 26%, Ni 0.6%, Cu 0.1%. Possible tonnage: 4-5 Mt dry.

**References:**

Lenoble J.P., 1987. Croûtes cobaltifères, Ifremer internal report.

Occurrence   
 Deposit   
 Deposit/File

**NAME: MATAIVA NW**

**Commodities:** Co Mn      **Type of deposit:** crust  
**Country:** French Polynesia      FR      **District:** Tuamotu archipelago

**Marine area:** Pacific S

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	seamount
<b>Morpho. 1</b>	volcano
<b>Morpho. 2</b>	crust
<b>Petrography</b>	volcanic ashes & lava
<b>Mineralogy</b>	MnFe hydroxides

**COORDINATES**

Latitude	S	-14.250
(Decimal °)	S	-14.500
Longitude	W	149.850
	W	150.000
Z (in m)		-1000

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:** G.I.E. Raro Moana

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

- 1) 150 km WNW of Mataiva Atoll.
- 2) Climate: Tropical, heavy rains. Prevalent wind E to SE.
- 3) Hydro: Around the atoll of Mataiva, the sea, sometimes rough (strong swell associated with E to SE trade winds), allows refilling of the lagoon. Inside the lagoon, the current velocity remains weak with a general water movement from the south inlets to the NW outlets.
- 4) Works performed: NODCO 2 in 1986 by R/V J. Charcot (Ifremer): multibeam echosounding (700 km<sup>2</sup>), side scan sonar (24 km x 1.5 km), 5 dredgings, 3.5 km photos, 3 pyrotechnic rock samplings.
- 5) Characteristics of the deposit: The Mataiva NW area is lying at 600 to 1800 m deep and corresponds to an old submerged volcanic summit, rather flat, bordered by steep slopes. Dimensions of the flat cone elongated NNW-SSE are 35 km on 10 km. Crust has been detected covering possibly 200 km<sup>2</sup> and is formed by FeMn hydroxides with Co on volcanic ashes and lavas. Specific weight 1.4 g/cm<sup>3</sup>, Co could be 1%, Mn 26%, Ni 0.6%, Cu 0.1%. Possible tonnage: 4-5 Mt dry.

**References:**  
 Lenoble J.P., 1987. Croûtes cobaltifères, Ifremer internal report.

Occurrence   
 Deposit   
 Deposit/File

**NAME: HARAIKI**

**Commodities:** Co Mn      **Type of deposit:** crust  
**Country:** French Polynesia      FR      **District:** Tuamotu archipelago

**Marine area:** Pacific S

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	seamount
<b>Morpho. 1</b>	volcano
<b>Morpho. 2</b>	crust
<b>Petrography</b>	volcanic ashes & lava
<b>Mineralogy</b>	MnFe hydroxides

**COORDINATES**

Latitude	S	-17.100
(Decimal °)	S	-17.300
Longitude	W	143.650
	W	143.800
Z (in m)		-1500

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

- 1) 30 km NW of Haraiki Atoll.
- 2) Climate: Tropical, heavy rains. Prevalent wind E to SE.
- 3) Hydro: Around the atoll of Haraiki, the sea, sometimes rough (strong swell associated with E to SE trade winds), allows refilling of the lagoon. Inside the lagoon, the current velocity remains weak.
- 4) Works performed: NODCO 2 in 1986 by R/V J. Charcot (Ifremer): multibeam echosounding (500 km<sup>2</sup>), side scan sonar (25 km x 1.5 km SAR), 3 dredgings, 3 km photos, 6 pyrotechnic rock samplings.
- 5) Characteristics of the deposit: The Haraiki area is lying at 1000 to 1800 m deep and corresponds to an old volcanic cone rather flat, bordered by steep slopes. Diameter of the circular cone is 20 km. Crust has been detected covering possibly 200 km<sup>2</sup> and is formed by FeMn hydroxides with Co. Specific weight 1.4 g/cm<sup>3</sup>, Co could be 1%, Mn 26%, Ni 0.6%, Cu 0.1%. Possible tonnage: 4-5 Mt dry.

**References:**

Lenoble J.P., 1987. Croûtes cobaltifères, Ifremer internal report.

- Occurrence
- Deposit
- Deposit/File

**NAME: A 1**

<b>Commodities:</b> Zr	<b>Type of deposit:</b> placer
<b>Country:</b> China	CN <b>District:</b> Moyedao

**Marine area:** Pacific NW, China E Yellow sea Huanghai

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**COORDINATES**

Latitude	N	37.000
(Decimal °)		0.000
Longitude	E	-122.500
		0.000
Z (in m)		

**TYOLOGY**

<b>Zone type</b>	
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	zircon

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 2/15/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

**References:**  
 Anonymous, 1990. Map of offshore mineral occurrences of China. Institute of marine geology, Ministry of geology and mineral resources, Qingdao, China.

- Occurrence
- Deposit
- Deposit/File

**NAME: A 2**

<b>Commodities:</b> Zr Si	<b>Type of deposit:</b> placer
<b>Country:</b> China	CN <b>District:</b> Dingzigang

**Marine area:** Pacific NW, China E Yellow sea Huanghai

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**TYOLOGY**

<b>Zone type</b>	
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	silice zircon

**COORDINATES**

Latitude	N	36.500
(Decimal °)		0.000
Longitude	E	-121.100
		0.000
Z (in m)		

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 2/15/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

**References:**

Anonymous, 1990. Map of offshore mineral occurrences of China. Institute of marine geology, Ministry of geology and mineral resources, Qingdao, China.

- Occurrence
- Deposit
- Deposit/File

**NAME: A 3**

<b>Commodities:</b> Zr	<b>Type of deposit:</b> placer	
<b>Country:</b> China	CN	<b>District:</b> Jiaonan

**Marine area:** Pacific NW, China E Yellow sea Huanghai

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**TYOLOGY**

<b>Zone type</b>	
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	zircon

**COORDINATES**

Latitude	N	35.750
(Decimal °)		0.000
Longitude	E	-120.100
		0.000
Z (in m)		

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 2/15/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

**References:**

Anonymous, 1990. Map of offshore mineral occurrences of China. Institute of marine geology, Ministry of geology and mineral resources, Qingdao, China.

- Occurrence
- Deposit
- Deposit/File

**NAME: A 4**

<b>Commodities:</b> Si	<b>Type of deposit:</b> placer
<b>Country:</b> China	<b>CN</b> <b>District:</b> Qingdao E

**Marine area:** Pacific NW, China E Yellow sea Huanghai

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**TYOLOGY**

<b>Zone type</b>	
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	silice

**COORDINATES**

Latitude	N	36.000
(Decimal °)	N	35.900
Longitude	E	-121.000
	E	-121.500
Z (in m)		

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 2/15/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

**References:**

Anonymous, 1990. Map of offshore mineral occurrences of China. Institute of marine geology, Ministry of geology and mineral resources, Qingdao, China.

- Occurrence
- Deposit
- Deposit/File

**NAME: A 5**

<b>Commodities:</b> Zr Si	<b>Type of deposit:</b> placer	
<b>Country:</b> China	CN	<b>District:</b> Shijiusuo NE

**Marine area:** Pacific NW, China E Yellow sea Huanghai

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**TYOLOGY**

<b>Zone type</b>	
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	silice zircon

**COORDINATES**

Latitude	N	35.500
(Decimal °)		0.000
Longitude	E	-119.900
		0.000
Z (in m)		

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 2/15/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

**References:**

Anonymous, 1990. Map of offshore mineral occurrences of China. Institute of marine geology, Ministry of geology and mineral resources, Qingdao, China.



- Occurrence
- Deposit
- Deposit/File

**NAME: A 6**

**Commodities:** Zr Si      **Type of deposit:** placer  
**Country:** China      CN      **District:** Shijiusuo NE 2

**Marine area:** Pacific NW, China E Yellow sea Huanghai

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**COORDINATES**

Latitude	N	35.500
(Decimal °)		0.000
Longitude	E	-120.000
		0.000
Z (in m)		

**TYOLOGY**

<b>Zone type</b>	
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	silice zircon

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 2/15/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

**References:**

Anonymous, 1990. Map of offshore mineral occurrences of China. Institute of marine geology, Ministry of geology and mineral resources, Qingdao, China.

- Occurrence
- Deposit
- Deposit/File

**NAME: A 7**

**Commodities:** Zr TiFe Si      **Type of deposit:** placer

**Country:** China      CN      **District:** Shijiusuo SE

**Marine area:** Pacific NW, China E Yellow sea Huanghai

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**COORDINATES**

Latitude	N	34.800
(Decimal °)	N	35.400
Longitude	E	-119.100
	E	-120.200
Z (in m)		

**TYOLOGY**

<b>Zone type</b>	
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	silice zircon titanomagnetite

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 2/15/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

**References:**

Anonymous, 1990. Map of offshore mineral occurrences of China. Institute of marine geology, Ministry of geology and mineral resources, Qingdao, China.

- Occurrence
- Deposit
- Deposit/File

**NAME: A 8**

<b>Commodities:</b> Zr	<b>Type of deposit:</b> placer	
<b>Country:</b> China	CN	<b>District:</b> Shijiusuo SE

**Marine area:** Pacific NW, China E Yellow sea Huanghai

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**COORDINATES**

Latitude	N	35.000
(Decimal °)		0.000
Longitude	E	-120.200
		0.000
Z (in m)		

**TYOLOGY**

<b>Zone type</b>	
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	zircon

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 2/15/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

**References:**

Anonymous, 1990. Map of offshore mineral occurrences of China. Institute of marine geology, Ministry of geology and mineral resources, Qingdao, China.

- Occurrence
- Deposit
- Deposit/File

**NAME: A 9**

<b>Commodities:</b> Zr TiFe Ti Si		<b>Type of deposit:</b> placer	
<b>Country:</b> China		CN	<b>District:</b>

**Marine area:** Pacific NW, China E Yellow sea Huanghai

**ADMINISTRATION**

**TYOLOGY**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

<b>Zone type</b>	
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	zircon titanomagnetite ilmenite

**COORDINATES**

Latitude	N	33.500
(Decimal °)	N	35.700
Longitude	E	-120.500
	E	-122.150
Z (in m)		

**STAGE**

**MINING RIGHTS**

- |  |  |
|--|--|
| Exploration: <input checked="" type="checkbox"/> | Free: <input type="checkbox"/>               |
| Mining: <input type="checkbox"/>                 | Under control: <input type="checkbox"/>      |
| Processing: <input type="checkbox"/>             | Unknown: <input checked="" type="checkbox"/> |

Up-dated on: 2/15/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

**References:**

Anonymous, 1990. Map of offshore mineral occurrences of China. Institute of marine geology, Ministry of geology and mineral resources, Qingdao, China.

- Occurrence
- Deposit
- Deposit/File

**NAME: A 10**

**Commodities:** TiFe **Type of deposit:** placer

**Country:** China **CN** **District:**

**Marine area:** Pacific NW, China E Yellow sea Huanghai

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**COORDINATES**

Latitude	N	34.400
(Decimal °)		0.000
Longitude	E	-122.000
		0.000
Z (in m)		

**TYOLOGY**

<b>Zone type</b>	
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	titanomagnetite

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 2/15/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

**References:**  
 Anonymous, 1990. Map of offshore mineral occurrences of China. Institute of marine geology, Ministry of geology and mineral resources, Qingdao, China.

Occurrence   
 Deposit   
 Deposit/File

**NAME: A 12**

**Commodities:** Zr TiFe Ti Si      **Type of deposit:** placer  
**Country:** China      CN      **District:**

**Marine area:** Pacific NW, China E Yellow sea Huanghai

**ADMINISTRATION**

**TYOLOGY**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

<b>Zone type</b>	
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	zircon titanomagnetite ilmenite

**COORDINATES**

Latitude	N	33.400
(Decimal °)	N	33.900
Longitude	E	-121.900
		0.000
Z (in m)		

**STAGE**

**MINING RIGHTS**

Exploration:       Free:   
 Mining:       Under control:   
 Processing:       Unknown:

Up-dated on: 2/15/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

**References:**

Anonymous, 1990. Map of offshore mineral occurrences of China. Institute of marine geology, Ministry of geology and mineral resources, Qingdao, China.

- Occurrence
- Deposit
- Deposit/File

**NAME: A13**

<b>Commodities:</b> Zr	<b>Type of deposit:</b> placer
<b>Country:</b> China	<b>CN</b> <b>District:</b>

**Marine area:** Pacific NW, China E Yellow sea Huanghai

**ADMINISTRATION**

**TYOLOGY**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

<b>Zone type</b>	
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	zircon

**COORDINATES**

Latitude	N	33.600
(Decimal °)		0.000
Longitude	E	-120.900
		0.000
Z (in m)		

**STAGE**

**MINING RIGHTS**

- |  |  |
|--|--|
| Exploration: <input checked="" type="checkbox"/> | Free: <input type="checkbox"/>               |
| Mining: <input type="checkbox"/>                 | Under control: <input type="checkbox"/>      |
| Processing: <input type="checkbox"/>             | Unknown: <input checked="" type="checkbox"/> |

Up-dated on: 2/15/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

**References:**

Anonymous, 1990. Map of offshore mineral occurrences of China. Institute of marine geology, Ministry of geology and mineral resources, Qingdao, China.

Occurrence   
 Deposit   
 Deposit/File

**NAME: A 14**

**Commodities:** TiFe **Type of deposit:** placer  
**Country:** China **CN** **District:**

**Marine area:** Pacific NW, China E Yellow sea Huanghai

**ADMINISTRATION**

**TYOLOGY**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

<b>Zone type</b>	
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	titanomagnetite

**COORDINATES**

Latitude	N	33.200
(Decimal °)		0.000
Longitude	E	-122.000
		0.000
Z (in m)		

**STAGE**

**MINING RIGHTS**

Exploration:   
 Mining:   
 Processing:

Free:   
 Under control:   
 Unknown:

Up-dated on: 2/15/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

**References:**

Anonymous, 1990. Map of offshore mineral occurrences of China. Institute of marine geology, Ministry of geology and mineral resources, Qingdao, China.



Occurrence   
 Deposit   
 Deposit/File

**NAME: A15**

**Commodities:** TiFe Zr Si      **Type of deposit:** placer  
**Country:** China      CN      **District:**

**Marine area:** Pacific NW, China E Yellow sea Huanghai

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**TYOLOGY**

<b>Zone type</b>	
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	titanomagnetite zircon

**COORDINATES**

Latitude	N	32.800
(Decimal °)	N	33.100
Longitude	E	-121.200
	E	-122.100
Z (in m)		

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 2/15/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

**References:**

Anonymous, 1990. Map of offshore mineral occurrences of China. Institute of marine geology, Ministry of geology and mineral resources, Qingdao, China.



- Occurrence
- Deposit
- Deposit/File

**NAME: A 17**

<b>Commodities:</b> TiFe Si		<b>Type of deposit:</b> placer	
<b>Country:</b> China		CN	<b>District:</b>

**Marine area:** Pacific NW, China E Yellow sea Huanghai

**ADMINISTRATION**

**TYOLOGY**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

<b>Zone type</b>	
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	titanomagnetite

**COORDINATES**

Latitude	N	32.700
(Decimal °)		0.000
Longitude	E	-121.000
	E	-121.500
Z (in m)		

**STAGE**

**MINING RIGHTS**

- Exploration:
- Mining:
- Processing:
- Free:
- Under control:
- Unknown:

Up-dated on: 2/15/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

**References:**

Anonymous, 1990. Map of offshore mineral occurrences of China. Institute of marine geology, Ministry of geology and mineral resources, Qingdao, China.

Occurrence   
 Deposit   
 Deposit/File

**NAME: A 18**

**Commodities:** TiFe Zr Si      **Type of deposit:** placer  
**Country:** China      CN      **District:**

**Marine area:** Pacific NW, China E Yellow sea Huanghai

**ADMINISTRATION**

**TYOLOGY**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

<b>Zone type</b>	
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	titanomagnetite zircon

**COORDINATES**

Latitude	N	32.500
(Decimal °)		0.000
Longitude	E	-121.800
		0.000
Z (in m)		

**STAGE**

**MINING RIGHTS**

Exploration:       Free:   
 Mining:       Under control:   
 Processing:       Unknown:

Up-dated on: 2/15/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

**References:**  
 Anonymous, 1990. Map of offshore mineral occurrences of China. Institute of marine geology, Ministry of geology and mineral resources, Qingdao, China.

- Occurrence
- Deposit
- Deposit/File

**NAME: A19**

<b>Commodities:</b> TiFe Zr Ti	<b>Type of deposit:</b> placer
<b>Country:</b> China	CN <b>District:</b> Lusi N

**Marine area:** Pacific NW, China E Yellow sea Huanghai

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**COORDINATES**

Latitude	N	32.200
(Decimal °)	N	32.400
Longitude	E	-121.600
	E	-121.800
Z (in m)		

**TYOLOGY**

<b>Zone type</b>	
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	titanomagnetite zircon ilmenite

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 2/15/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

**References:**

Anonymous, 1990. Map of offshore mineral occurrences of China. Institute of marine geology, Ministry of geology and mineral resources, Qingdao, China.

Occurrence   
 Deposit   
 Deposit/File

**NAME: A 20**

**Commodities:** Zr Ti      **Type of deposit:** placer  
**Country:** China      CN      **District:** Gangkouzhen

**Marine area:** Pacific W, China S sea, Nanhai

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**COORDINATES**

Latitude	N	22.400
(Decimal °)		0.000
Longitude	E	-114.800
		0.000
Z (in m)		

**TYOLOGY**

<b>Zone type</b>	
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	zircon ilmenite

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

**References:**

Anonymous, 1990. Map of offshore mineral occurrences of China. Institute of marine geology, Ministry of geology and mineral resources, Qingdao, China.

- Occurrence
- Deposit
- Deposit/File

**NAME: A21**

<b>Commodities:</b> TiFe Zr	<b>Type of deposit:</b> placer
<b>Country:</b> China	CN <b>District:</b>

**Marine area:** Pacific W, China S sea, Nanhai

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**COORDINATES**

Latitude	N	21.000
(Decimal °)		0.000
Longitude	E	-114.000
		0.000
Z (in m)		

**TYOLOGY**

<b>Zone type</b>	
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	titanomagnetite zircon

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

**References:**

Anonymous, 1990. Map of offshore mineral occurrences of China. Institute of marine geology, Ministry of geology and mineral resources, Qingdao, China.

- Occurrence
- Deposit
- Deposit/File

**NAME: A 22**

**Commodities:** Ti TiFe **Type of deposit:** placer

**Country:** China **CN** **District:**

**Marine area:** Pacific W, China S sea, Nanhai

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**COORDINATES**

Latitude	N	21.800
(Decimal °)		0.000
Longitude	E	-113.800
		0.000
Z (in m)		

**TYOLOGY**

<b>Zone type</b>	
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	ilmenite titanomagnetite

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

**References:**

Anonymous, 1990. Map of offshore mineral occurrences of China. Institute of marine geology, Ministry of geology and mineral resources, Qingdao, China.



- Occurrence
- Deposit
- Deposit/File

**NAME: A 23**

<b>Commodities:</b> Ce Ti	<b>Type of deposit:</b> placer
<b>Country:</b> China	CN <b>District:</b>

**Marine area:** Pacific W, China S sea, Nanhai

**ADMINISTRATION**

**TYOLOGY**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

<b>Zone type</b>	
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	ilmenite

**COORDINATES**

Latitude	N	21.500
(Decimal °)		0.000
Longitude	E	-113.200
		0.000
Z (in m)		

**STAGE**

**MINING RIGHTS**

- |  |  |
|--|--|
| Exploration: <input checked="" type="checkbox"/> | Free: <input type="checkbox"/>               |
| Mining: <input type="checkbox"/>                 | Under control: <input type="checkbox"/>      |
| Processing: <input type="checkbox"/>             | Unknown: <input checked="" type="checkbox"/> |

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

**References:**

Anonymous, 1990. Map of offshore mineral occurrences of China. Institute of marine geology, Ministry of geology and mineral resources, Qingdao, China.

- Occurrence
- Deposit
- Deposit/File

**NAME: A 24**

<b>Commodities:</b> Ti Zr	<b>Type of deposit:</b> placer	
<b>Country:</b> China	CN	<b>District:</b>

**Marine area:** Pacific W, China S sea, Nanhai

**ADMINISTRATION**

**TYOLOGY**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

<b>Zone type</b>	
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	ilmenite zircon

**COORDINATES**

Latitude	N	21.000
(Decimal °)	N	21.400
Longitude	E	-113.000
		0.000
Z (in m)		

**STAGE**

**MINING RIGHTS**

- Exploration:
- Mining:
- Processing:
- Free:
- Under control:
- Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

**References:**

Anonymous, 1990. Map of offshore mineral occurrences of China. Institute of marine geology, Ministry of geology and mineral resources, Qingdao, China.

- Occurrence
- Deposit
- Deposit/File

**NAME: A26**

**Commodities:** Ti Zr      **Type of deposit:** placer

**Country:** China      CN      **District:**

**Marine area:** Pacific W, China S sea, Nanhai

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**COORDINATES**

Latitude	N	21.000
(Decimal °)		0.000
Longitude	E	-112.500
	E	-112.800
Z (in m)		

**TYOLOGY**

<b>Zone type</b>	
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	ilmenite zircon

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

**References:**

Anonymous, 1990. Map of offshore mineral occurrences of China. Institute of marine geology, Ministry of geology and mineral resources, Qingdao, China.



- Occurrence
- Deposit
- Deposit/File

**NAME: A 28**

<b>Commodities:</b> Ti TiFe	<b>Type of deposit:</b> placer
<b>Country:</b> China	CN <b>District:</b>

**Marine area:** Pacific W, China S sea, Nanhai

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**TYOLOGY**

<b>Zone type</b>	
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	ilmenite titanomagnetite

**COORDINATES**

Latitude	N	20.300
(Decimal °)		0.000
Longitude	E	-111.900
		0.000
Z (in m)		

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

**References:**

Anonymous, 1990. Map of offshore mineral occurrences of China. Institute of marine geology, Ministry of geology and mineral resources, Qingdao, China.

- Occurrence
- Deposit
- Deposit/File

**NAME: A29**

<b>Commodities:</b> Ce		<b>Type of deposit:</b> placer	
<b>Country:</b> China		CN	<b>District:</b>

**Marine area:** Pacific W, China S sea, Nanhai

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**TYOLOGY**

<b>Zone type</b>	
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	

**COORDINATES**

Latitude	N	21.600
(Decimal °)	N	21.800
Longitude	E	-111.800
	E	-112.100
Z (in m)		

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

**References:**

Anonymous, 1990. Map of offshore mineral occurrences of China. Institute of marine geology, Ministry of geology and mineral resources, Qingdao, China.

Occurrence   
 Deposit   
 Deposit/File

**NAME: A30**

**Commodities:** Ce **Type of deposit:** placer  
**Country:** China **CN** **District:** Shuidong

**Marine area:** Pacific W, China S sea, Nanhai

**ADMINISTRATION**

**TYOLOGY**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

<b>Zone type</b>	
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	

**COORDINATES**

Latitude	N	21.500
(Decimal °)	N	21.700
Longitude	E	-111.100
	E	-111.700
Z (in m)		

**STAGE**

**MINING RIGHTS**

Exploration:  Free:   
 Mining:  Under control:   
 Processing:  Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

**References:**

Anonymous, 1990. Map of offshore mineral occurrences of China. Institute of marine geology, Ministry of geology and mineral resources, Qingdao, China.

- Occurrence
- Deposit
- Deposit/File

**NAME: A31**

**Commodities:** Ce **Type of deposit:** placer  
**Country:** China CN **District:** Quangdong E 1

**Marine area:** Pacific W, China S sea, Nanhai

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**TYOLOGY**

<b>Zone type</b>	
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	

**COORDINATES**

Latitude	N	21.300
(Decimal °)		0.000
Longitude	E	-110.700
		0.000
Z (in m)		

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

**References:**  
 Anonymous, 1990. Map of offshore mineral occurrences of China. Institute of marine geology, Ministry of geology and mineral resources, Qingdao, China.



- Occurrence
- Deposit
- Deposit/File

**NAME: A32**

<b>Commodities:</b> Ce Zr		<b>Type of deposit:</b> placer	
<b>Country:</b> China		CN	<b>District:</b> Quangdong E 2

**Marine area:** Pacific W, China S sea, Nanhai

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**TYOLOGY**

<b>Zone type</b>	
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	zircon

**COORDINATES**

Latitude	N	21.000
(Decimal °)		0.000
Longitude	E	-110.700
		0.000
Z (in m)		

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

**References:**

Anonymous, 1990. Map of offshore mineral occurrences of China. Institute of marine geology, Ministry of geology and mineral resources, Qingdao, China.

- Occurrence
- Deposit
- Deposit/File

**NAME: A33**

<b>Commodities:</b> Ce Zr	<b>Type of deposit:</b> placer	
<b>Country:</b> China	CN	<b>District:</b> Quangdong E 3

**Marine area:** Pacific W, China S sea, Nanhai

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**TYOLOGY**

<b>Zone type</b>	
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	zircon

**COORDINATES**

Latitude	N	21.600
(Decimal °)		0.000
Longitude	E	-110.500
	E	-110.800
Z (in m)		

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

**References:**  
 Anonymous, 1990. Map of offshore mineral occurrences of China. Institute of marine geology, Ministry of geology and mineral resources, Qingdao, China.

- Occurrence
- Deposit
- Deposit/File

**NAME: A 34**

<b>Commodities:</b> Ce Zr		<b>Type of deposit:</b> placer	
<b>Country:</b> China		CN	<b>District:</b> Hai Nandao N 1

**Marine area:** Pacific W, China S sea, Nanhai

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**TYOLOGY**

<b>Zone type</b>	
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	zircon

**COORDINATES**

Latitude	N	20.100
		0.000
(Decimal °)	E	-110.500
	E	-110.700
Longitude		
Z (in m)		

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

**References:**

Anonymous, 1990. Map of offshore mineral occurrences of China. Institute of marine geology, Ministry of geology and mineral resources, Qingdao, China.

- Occurrence
- Deposit
- Deposit/File

**NAME: A35**

<b>Commodities:</b> Zr	<b>Type of deposit:</b> placer	
<b>Country:</b> China	CN	<b>District:</b> Hai Nandao N 2

**Marine area:** Pacific W, China S sea, Nanhai

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**TYOLOGY**

<b>Zone type</b>	
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	zircon

**COORDINATES**

Latitude	N	20.000
(Decimal °)		0.000
Longitude	E	-110.800
		0.000
Z (in m)		

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

**References:**

Anonymous, 1990. Map of offshore mineral occurrences of China. Institute of marine geology, Ministry of geology and mineral resources, Qingdao, China.

- Occurrence
- Deposit
- Deposit/File

**NAME: A36**

<b>Commodities:</b> Zr	<b>Type of deposit:</b> placer	
<b>Country:</b> China	CN	<b>District:</b> Hai Nandao NE

**Marine area:** Pacific W, China S sea, Nanhai

**ADMINISTRATION**

**TYOLOGY**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

<b>Zone type</b>	
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	zircon

**COORDINATES**

Latitude	N	19.100
(Decimal °)	N	19.700
Longitude	E	-111.000
		0.000
Z (in m)		

**STAGE**

**MINING RIGHTS**

- Exploration:
- Mining:
- Processing:
- Free:
- Under control:
- Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

**References:**

Anonymous, 1990. Map of offshore mineral occurrences of China. Institute of marine geology, Ministry of geology and mineral resources, Qingdao, China.

- Occurrence
- Deposit
- Deposit/File

**NAME: A37**

**Commodities:** Zr TiFe Ti      **Type of deposit:** placer  
**Country:** China      CN      **District:** Hai Nandao E

**Marine area:** Pacific W, China S sea, Nanhai

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**TYOLOGY**

<b>Zone type</b>	
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	zircon titanomagnetite ilmenite

**COORDINATES**

Latitude	N	18.500
(Decimal °)	N	18.800
Longitude	E	-110.200
	E	-110.500
Z (in m)		

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

**References:**

Anonymous, 1990. Map of offshore mineral occurrences of China. Institute of marine geology, Ministry of geology and mineral resources, Qingdao, China.

- Occurrence
- Deposit
- Deposit/File

**NAME: A 38**

<b>Commodities:</b> Zr	<b>Type of deposit:</b> placer
<b>Country:</b> China	CN <b>District:</b> Hai Nandao SE

**Marine area:** Pacific W, China S sea, Nanhai

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**COORDINATES**

Latitude	N	18.200
(Decimal °)		0.000
Longitude	E	-109.800
		0.000
Z (in m)		

**TYOLOGY**

<b>Zone type</b>	
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	zircon

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

**References:**

Anonymous, 1990. Map of offshore mineral occurrences of China. Institute of marine geology, Ministry of geology and mineral resources, Qingdao, China.

- Occurrence
- Deposit
- Deposit/File

**NAME: A 39**

<b>Commodities:</b> Zr	<b>Type of deposit:</b> placer
<b>Country:</b> China	CN <b>District:</b> Hai Nandao SW 1

**Marine area:** Pacific W, China S sea, Nanhai

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**COORDINATES**

Latitude	N	18.500
(Decimal °)		0.000
Longitude	E	-108.500
		0.000
Z (in m)		

**TYOLOGY**

<b>Zone type</b>	
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	zircon

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

**References:**

Anonymous, 1990. Map of offshore mineral occurrences of China. Institute of marine geology, Ministry of geology and mineral resources, Qingdao, China.



- Occurrence
- Deposit
- Deposit/File

**NAME: A 40**

**Commodities:** Ti TiFe      **Type of deposit:** placer  
**Country:** China      CN      **District:** Hai Nandao SW 2

**Marine area:** Pacific W, China S sea, Nanhai

**ADMINISTRATION**

**TYOLOGY**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

<b>Zone type</b>	
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	ilmenite titanomagnetite

**COORDINATES**

Latitude	N	19.000
(Decimal °)		0.000
Longitude	E	-108.500
		0.000
Z (in m)		

**STAGE**

**MINING RIGHTS**

- Exploration:
- Mining:
- Processing:
- Free:
- Under control:
- Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

**References:**

Anonymous, 1990. Map of offshore mineral occurrences of China. Institute of marine geology, Ministry of geology and mineral resources, Qingdao, China.

- Occurrence
- Deposit
- Deposit/File

**NAME: A 41**

**Commodities:** Ce Ti Zr      **Type of deposit:** placer  
**Country:** China      CN      **District:** Hai Nandao W

**Marine area:** Pacific W, China S sea, Nanhai

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**TYOLOGY**

<b>Zone type</b>	
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	ilmenite zircon

**COORDINATES**

Latitude	N	19.400
(Decimal °)		0.000
Longitude	E	-108.600
	E	-108.800
Z (in m)		

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

**References:**

Anonymous, 1990. Map of offshore mineral occurrences of China. Institute of marine geology, Ministry of geology and mineral resources, Qingdao, China.

- Occurrence
- Deposit
- Deposit/File

**NAME: A42**

**Commodities:** Zr      **Type of deposit:** placer  
**Country:** China      CN      **District:** Hai Nandao NW 1

**Marine area:** Pacific W, China S sea, Nanhai

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**TYOLOGY**

<b>Zone type</b>	
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	zircon

**COORDINATES**

Latitude	N	19.800
(Decimal °)		0.000
Longitude	E	-109.000
		0.000
Z (in m)		

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

**References:**

Anonymous, 1990. Map of offshore mineral occurrences of China. Institute of marine geology, Ministry of geology and mineral resources, Qingdao, China.

Occurrence   
 Deposit   
 Deposit/File

**NAME: A43**

**Commodities:** Zr      **Type of deposit:** placer  
**Country:** China      CN      **District:** Hai Nandao NW2

**Marine area:** Pacific W, China S sea, Nanhai

**ADMINISTRATION**

**TYOLOGY**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

<b>Zone type</b>	
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	zircon

**COORDINATES**

Latitude	N	19.700
(Decimal °)	N	20.100
Longitude	E	-108.100
		0.000
Z (in m)		

**STAGE**

**MINING RIGHTS**

Exploration:       Free:   
 Mining:       Under control:   
 Processing:       Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

**References:**  
 Anonymous, 1990. Map of offshore mineral occurrences of China. Institute of marine geology, Ministry of geology and mineral resources, Qingdao, China.

- Occurrence
- Deposit
- Deposit/File

**NAME: A 44**

<b>Commodities:</b> Zr Ti	<b>Type of deposit:</b> placer
<b>Country:</b> China	CN <b>District:</b> Quangdong W

**Marine area:** Pacific W, China S sea, Nanhai

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**TYOLOGY**

<b>Zone type</b>	
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	zircon ilmenite

**COORDINATES**

Latitude	N	20.800
(Decimal °)		0.000
Longitude	E	-109.800
		0.000
Z (in m)		

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

**References:**

Anonymous, 1990. Map of offshore mineral occurrences of China. Institute of marine geology, Ministry of geology and mineral resources, Qingdao, China.

- Occurrence
- Deposit
- Deposit/File

**NAME: A 45**

**Commodities:** Ti Zr      **Type of deposit:** placer  
**Country:** China      CN      **District:**

**Marine area:** Pacific W, China S sea, Nanhai

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**TYOLOGY**

<b>Zone type</b>	
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	ilmenite zircon

**COORDINATES**

Latitude	N	21.000
(Decimal °)		0.000
Longitude	E	-109.700
		0.000
Z (in m)		

**STAGE**

**MINING RIGHTS**

- Exploration:
- Mining:
- Processing:
- Free:
- Under control:
- Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

**References:**

Anonymous, 1990. Map of offshore mineral occurrences of China. Institute of marine geology, Ministry of geology and mineral resources, Qingdao, China.

- Occurrence
- Deposit
- Deposit/File

**NAME: A46**

<b>Commodities:</b> Zr Ce	<b>Type of deposit:</b> placer
<b>Country:</b> China	CN <b>District:</b>

**Marine area:** Pacific W, China S sea, Nanhai

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**TYOLOGY**

<b>Zone type</b>	
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	zircon

**COORDINATES**

Latitude	N	21.200
(Decimal °)	N	21.400
Longitude	E	-109.100
	E	-109.800
Z (in m)		

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

**References:**

Anonymous, 1990. Map of offshore mineral occurrences of China. Institute of marine geology, Ministry of geology and mineral resources, Qingdao, China.

- Occurrence
- Deposit
- Deposit/File

**NAME: A47**

<b>Commodities:</b> Zr Ce	<b>Type of deposit:</b> placer
<b>Country:</b> China	CN <b>District:</b>

**Marine area:** Pacific W, China S sea, Nanhai

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**TYOLOGY**

<b>Zone type</b>	
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	zircon

**COORDINATES**

Latitude	N	21.500
(Decimal °)	N	21.600
Longitude	E	-108.700
	E	-109.100
Z (in m)		

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

**References:**

Anonymous, 1990. Map of offshore mineral occurrences of China. Institute of marine geology, Ministry of geology and mineral resources, Qingdao, China.



- Occurrence
- Deposit
- Deposit/File

**NAME: A48**

<b>Commodities:</b> TiFe Zr Ti		<b>Type of deposit:</b> placer	
<b>Country:</b> China		CN	<b>District:</b>

**Marine area:** Pacific W, China S sea, Nanhai

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**TYOLOGY**

<b>Zone type</b>	
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	titanomagnetite zircon ilmenite

**COORDINATES**

Latitude	N	21.600
(Decimal °)		0.000
Longitude	E	-108.600
		0.000
Z (in m)		

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

**References:**

Anonymous, 1990. Map of offshore mineral occurrences of China. Institute of marine geology, Ministry of geology and mineral resources, Qingdao, China.

- Occurrence
- Deposit
- Deposit/File

**NAME: A49**

<b>Commodities:</b> Zr Ti	<b>Type of deposit:</b> placer	
<b>Country:</b> China	CN	<b>District:</b> Beihai

**Marine area:** Pacific W, China S sea, Nanhai

**ADMINISTRATION**

**TYOLOGY**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

<b>Zone type</b>	
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	zircon ilmenite

**COORDINATES**

Latitude	N	21.500
(Decimal °)		0.000
Longitude	E	-108.200
		0.000
Z (in m)		

**STAGE**

**MINING RIGHTS**

- Exploration:
- Mining:
- Processing:
- Free:
- Under control:
- Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

**References:**

Anonymous, 1990. Map of offshore mineral occurrences of China. Institute of marine geology, Ministry of geology and mineral resources, Qingdao, China.

- Occurrence
- Deposit
- Deposit/File

**NAME: B1**

**Commodities:** TiFe Si      **Type of deposit:** placer  
**Country:** China      CN      **District:** Liaodongwan W

**Marine area:** Pacific NW, China N sea, Bohai

**ADMINISTRATION**

**TYOLOGY**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

<b>Zone type</b>	
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	titanomagnetite

**COORDINATES**

Latitude	N	39.800
(Decimal °)	N	40.800
Longitude	E	-120.200
	E	-121.100
Z (in m)		

**STAGE**

**MINING RIGHTS**

- Exploration:       Free:   
 Mining:       Under control:   
 Processing:       Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

**References:**

Anonymous, 1990. Map of offshore mineral occurrences of China. Institute of marine geology, Ministry of geology and mineral resources, Qingdao, China.

Occurrence   
 Deposit   
 Deposit/File

**NAME: B2**

**Commodities:** Zr TiFe Si      **Type of deposit:** placer  
**Country:** China      CN      **District:** Liaodongwan E

**Marine area:** Pacific NW, China N sea, Bohai

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**COORDINATES**

Latitude	N	39.400
(Decimal °)	N	40.300
Longitude	E	-121.000
	E	-122.000
Z (in m)		

**TYOLOGY**

<b>Zone type</b>	
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	zircon titanomagnetite silice

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

**References:**

Anonymous, 1990. Map of offshore mineral occurrences of China. Institute of marine geology, Ministry of geology and mineral resources, Qingdao, China.

- Occurrence
- Deposit
- Deposit/File

**NAME: B3**

**Commodities:** Fe Zr Si TiFe      **Type of deposit:** placer  
**Country:** China      CN      **District:** Qinhuangdo

**Marine area:** Pacific NW, China N sea, Bohai

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**TYOLOGY**

<b>Zone type</b>	
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	magnetite zircon titanomagnetite

**COORDINATES**

Latitude	N	39.000
(Decimal °)	N	40.000
Longitude	E	-118.400
	E	-119.800
Z (in m)		

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

**References:**

Anonymous, 1990. Map of offshore mineral occurrences of China. Institute of marine geology, Ministry of geology and mineral resources, Qingdao, China.



- Occurrence
- Deposit
- Deposit/File

**NAME: B5**

<b>Commodities:</b> Au	<b>Type of deposit:</b> placer	
<b>Country:</b> China	CN	<b>District:</b> Huanshanguan

**Marine area:** Pacific NW, China N sea, Bohai

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**COORDINATES**

Latitude	N	37.500
(Decimal °)	N	37.800
Longitude	E	-119.900
	E	-120.300
Z (in m)		

**TYOLOGY**

<b>Zone type</b>	
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	gold

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

**References:**

Anonymous, 1990. Map of offshore mineral occurrences of China. Institute of marine geology, Ministry of geology and mineral resources, Qingdao, China.

- Occurrence
- Deposit
- Deposit/File

**NAME: B6**

<b>Commodities:</b> TiFe	<b>Type of deposit:</b> placer	
<b>Country:</b> China	CN	<b>District:</b> Lushuu

**Marine area:** Pacific NW, China N sea, Bohai

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**COORDINATES**

Latitude	N	38.400
(Decimal °)	N	38.700
Longitude	E	-121.000
	E	-121.800
Z (in m)		

**TYOLOGY**

<b>Zone type</b>	
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	titanomagnetite

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

**References:**

Anonymous, 1990. Map of offshore mineral occurrences of China. Institute of marine geology, Ministry of geology and mineral resources, Qingdao, China.



- Occurrence
- Deposit
- Deposit/File

**NAME: B7**

<b>Commodities:</b> Zr	<b>Type of deposit:</b> placer
<b>Country:</b> China	CN <b>District:</b> Luda S

**Marine area:** Pacific NW, China N sea, Bohai

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**TYOLOGY**

<b>Zone type</b>	
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	zircon

**COORDINATES**

Latitude	N	38.500
(Decimal °)		0.000
Longitude	E	-122.000
		0.000
Z (in m)		

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

**References:**

Anonymous, 1990. Map of offshore mineral occurrences of China. Institute of marine geology, Ministry of geology and mineral resources, Qingdao, China.

- Occurrence
- Deposit
- Deposit/File

**NAME: B8**

**Commodities:** Zr **Type of deposit:** placer  
**Country:** China CN **District:** Dawangjiadao

**Marine area:** Pacific NW, Korean bay

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**TYOLOGY**

<b>Zone type</b>	
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	zircon

**COORDINATES**

Latitude	N	39.200
(Decimal °)	N	39.500
Longitude	E	-122.100
	E	-123.500
Z (in m)		

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

**References:**

Anonymous, 1990. Map of offshore mineral occurrences of China. Institute of marine geology, Ministry of geology and mineral resources, Qingdao, China.

- Occurrence
- Deposit
- Deposit/File

**NAME: B10**

<b>Commodities:</b> TiFe Si	<b>Type of deposit:</b> placer	
<b>Country:</b> China	CN	<b>District:</b> Korean Bay center

**Marine area:** Pacific NW, Korean bay

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**TYOLOGY**

<b>Zone type</b>	
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	titanomagnetite

**COORDINATES**

Latitude	N	37.900
(Decimal °)	N	38.800
Longitude	E	-123.200
	E	-124.000
Z (in m)		

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

**References:**

Anonymous, 1990. Map of offshore mineral occurrences of China. Institute of marine geology, Ministry of geology and mineral resources, Qingdao, China.

- Occurrence
- Deposit
- Deposit/File

**NAME: B11**

<b>Commodities:</b> Zr	<b>Type of deposit:</b> placer	
<b>Country:</b> China	CN	<b>District:</b> Weihai E

**Marine area:** Pacific NW, Korean bay

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**COORDINATES**

Latitude	N	37.000
(Decimal °)	N	37.800
Longitude	E	-122.400
	E	-123.500
Z (in m)		

**TYOLOGY**

<b>Zone type</b>	
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	zircon

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

**References:**

Anonymous, 1990. Map of offshore mineral occurrences of China. Institute of marine geology, Ministry of geology and mineral resources, Qingdao, China.

- Occurrence
- Deposit
- Deposit/File

**NAME: B12**

<b>Commodities:</b> Zr TiFe Fe		<b>Type of deposit:</b> placer	
<b>Country:</b> China		CN	<b>District:</b>

**Marine area:** Pacific NW, China E Yellow sea Huanghai

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**COORDINATES**

Latitude	N	31.000
(Decimal °)	N	33.000
Longitude	E	-123.000
	E	-125.000
Z (in m)		

**TYPOLGY**

<b>Zone type</b>	
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	magnetite zircon titanomagnetite

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 2/15/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

**References:**

Anonymous, 1990. Map of offshore mineral occurrences of China. Institute of marine geology, Ministry of geology and mineral resources, Qingdao, China.

Occurrence   
 Deposit   
 Deposit/File

NAME: **B13**

Commodities: Zr TiFe Fe      Type of deposit: placer  
 Country: China      CN      District: Shanghai NE

Marine area: Pacific NW, China E Yellow sea Huanghai

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**TYOLOGY**

Zone type	
Morpho. 1	
Morpho. 2	
Petrography	sand
Mineralogy	magnetite zircon titanomagnetite

**COORDINATES**

Latitude	N	32.000
(Decimal °)		0.000
Longitude	E	-122.300
		0.000
Z (in m)		

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 2/15/95

Company:

	Ore	Heavy minerals	Commodities
Grades			
Tonnage			

**Description:**

**References:**

Anonymous, 1990. Map of offshore mineral occurrences of China. Institute of marine geology, Ministry of geology and mineral resources, Qingdao, China.

- Occurrence
- Deposit
- Deposit/File

NAME: **B14**

Commodities: TiFe Fe      Type of deposit: placer  
 Country: China      CN      District: Shanghai

Marine area: Pacific NW, China E Yellow sea Huanghai

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**TYOLOGY**

Zone type	
Morpho. 1	
Morpho. 2	
Petrography	sand
Mineralogy	magnetite titanomagnetite

**COORDINATES**

Latitude	N	31.000
(Decimal °)		0.000
Longitude	E	-122.200
		0.000
Z (in m)		

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 2/15/95

Company:

	Ore	Heavy minerals	Commodities
Grades			
Tonnage			

**Description:**

**References:**  
 Anonymous, 1990. Map of offshore mineral occurrences of China. Institute of marine geology, Ministry of geology and mineral resources, Qingdao, China.

- Occurrence
- Deposit
- Deposit/File

**NAME: B15**

<b>Commodities:</b> Zr TiFe Fe		<b>Type of deposit:</b> placer	
<b>Country:</b> China		CN	<b>District:</b> Shanghai E

**Marine area:** Pacific NW, China E Yellow sea Huanghai

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**COORDINATES**

Latitude	N	31.000
(Decimal °)		0.000
Longitude	E	-123.100
		0.000
Z (in m)		

**TYOLOGY**

<b>Zone type</b>	
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	magnetite zircon titanomagnetite

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 2/15/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

**References:**

Anonymous, 1990. Map of offshore mineral occurrences of China. Institute of marine geology, Ministry of geology and mineral resources, Qingdao, China.



- Occurrence
- Deposit
- Deposit/File

**NAME: B16**

<b>Commodities:</b> Zr TiFe Fe		<b>Type of deposit:</b> placer	
<b>Country:</b> China		CN	<b>District:</b>

**Marine area:** Pacific NW, China E Yellow sea Huanghai

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**COORDINATES**

Latitude	N	29.000
(Decimal °)	N	29.400
Longitude	E	-124.200
		0.000
Z (in m)		

**TYOLOGY**

<b>Zone type</b>	
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	magnetite zircon titanomagnetite

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 2/15/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

**References:**

Anonymous, 1990. Map of offshore mineral occurrences of China. Institute of marine geology, Ministry of geology and mineral resources, Qingdao, China.

- Occurrence
- Deposit
- Deposit/File

**NAME: B17**

<b>Commodities:</b> Zr	<b>Type of deposit:</b> placer
<b>Country:</b> China	CN <b>District:</b>

**Marine area:** Pacific NW, China E Yellow sea Huanghai

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**COORDINATES**

Latitude	N	28.200
(Decimal °)	N	29.800
Longitude	E	-124.600
	E	-125.800
Z (in m)		

**TYOLOGY**

<b>Zone type</b>	
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	zircon

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 2/15/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

**References:**

Anonymous, 1990. Map of offshore mineral occurrences of China. Institute of marine geology, Ministry of geology and mineral resources, Qingdao, China.

Occurrence   
 Deposit   
 Deposit/File

**NAME: OREGON UN**

**Commodities:** Fe Zr      **Type of deposit:** placer paleobeach paleochannel  
**Country:** USA      US      **District:** Oregon

**Marine area:** Pacific NE

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	outer shelf
<b>Morpho. 1</b>	paleobeach
<b>Morpho. 2</b>	paleochannel
<b>Petrography</b>	sand
<b>Mineralogy</b>	magnetite zircon

**COORDINATES**

Latitude	N	46.200
(Decimal °)	N	48.410
Longitude	W	124.120
	W	124.840
Z (in m)		-6 to -134

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/15/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

1) West coast of USA, Oregon State.  
 2) Climate: Marine, West Coast. Annual average rainfall 243 mm; maxi from Oct. to Feb.. Prevailing surface winds: NW, 48 km/h from April to June; SW, 78 km/h Oct.; SE direction, 70 km/h Jan. T= 5-20°C.  
 3) Hydro: Sea calm in summer, rough in winter (tempest 16%). Water T= 10-15°. Tide slight, maxi. 1.8 m. Currents: South California (0.25-1 m/s) in summer; North Davidson in winter (0.25-1 m/s) and up-welling in summer 0.0001 m/s. Swell magnitude 3-6 m in winter, 5 m (16%) Nov. to March, 0.90 m in summer.  
 4) Works performed: samplings: 34.  
 5) Characteristics of the deposit: Occurrence of magnetite (0.03 to 5.4, aver. 1.15 %) and zircon (0 to 0.43, aver. 0.08) in total heavy minerals (0.4 to 32.9 %, aver. 10.11%).

**References:**

Anonymous, 1992. Marine geological and geophysical data from NGDC, compact disk data set, Oct. 1992.

Occurrence   
 Deposit   
 Deposit/File

**NAME: KOREAN OCCUR**

**Commodities:** Ti **Type of deposit:** placer  
**Country:** Korea **KR** **District:**

**Marine area:** Pacific NW, China E Yellow sea Huanghai

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**TYOLOGY**

<b>Zone type</b>	bay
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	rutile

**COORDINATES**

Latitude	N	33.000
(Decimal °)	N	33.833
Longitude	E	-126.000
	E	-127.000
Z (in m)		

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 2/15/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

1) NW of Korea near N Korean border.  
 4) Works performed: 13 samples.  
 5) Characteristics of the deposit: amphibole (0.35 to 2.3 %, aver.1.29), apatite (0.04 to 0.77, aver. 0.23), epidote (0.05 to 0.86, aver. 0.22), garnet (0,01 to 0.17, aver. 0.08), kyanite (0.01 to 0,06, aver. 0.03), leucoxene (0.1 to 1.29, aver.0.61), mica (0.01 to 0.1, aver. 0.03), monazite (0.02 to 0.24, aver. 0.09), olivine (0.42 to 2.5, aver. 1.49), rutile (0.25 to 1.23, aver. 0.8), sillimanite (0.01 to 0.23, aver. 0.04), staurotite (0.03), spinel (0.01 to 0.13, aver. 0.05).

**References:**

Anonymous, 1992. Marine geological and geophysical data from NGDC. compact disk data set, Oct. 1992.

Occurrence   
 Deposit   
 Deposit/File

**NAME: CHILE**

**Commodities:** phosphate      **Type of deposit:** phosphorite upwelling  
**Country:** Chile      CL      **District:**

**Marine area:** Pacific SE

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	outer shelf slope
<b>Morpho. 1</b>	sedimentary bed
<b>Morpho. 2</b>	nodule pellet
<b>Petrography</b>	diatom ooze
<b>Mineralogy</b>	francolite collophane apatite

**COORDINATES**

Latitude	S	-18.000
(Decimal °)	S	-22.500
Longitude	W	70.000
	W	71.000
Z (in m)		-70 to -480

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 2/17/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>	17-35 % P2O5		
<b>Tonnage</b>			

**Description:**

1) Occurrences along the coast of Peru/Chile, parallel to the coast line on the ocean floor. The deposit is confined along two narrow sedimentary strips located on the shelf edge and the upper continental slope (-70 -160 m) (-360 -480 m).

2) Climate: Desertic. Mean annual average rain fall 41 mm.

3) Hydro: Peru current.

4) Works performed: Sampling (24) for fundamental scientific research: see Chile & Peru.

5) Characteristics of the deposit: The phosphorite occurs as scattered nodules in fine grained biogenic sediments (chiefly diatom oozes) in an area where surface waters are said to be biologically highly productive due to upwelling of coastal waters containing considerable organic matter. Burnett (1973, 74, 77) describes the phosphatic rocks as being irregular in shape with a hackly and pitted surface. Many nodules are flattened in one dimension; others are roughly equal in shape. The surfaces are dull with colors that vary from light to dark grey. Mineralization from Pleistocene to interglacial period is represented by pellets, particles, nodules of francolite and collophane composition. All investigators of the Peru/Chile deposits believe that the deposits are, for the most part, recent in origin. Manheim and others postulate that the deposits are the result of replacement of carbonate tests in the interstitial waters of organic-rich sediments. Burnett thinks that the apatite has chemically precipitated out of solution rather than replaced previously existing materials. One onshore deposit in the Sechura Desert in northern Peru: bed 1-1.5 m thick with 20% P2O5.

**References:**

1) Garrand L., 1977. Ocean phosphorite world occurrences. 2) Anonymous. Les phosphates sédimentaires sous-marins, Ifremer internal report.

Occurrence   
 Deposit   
 Deposit/File

**NAME: MAYUMBA Congo**

**Commodities:** phosphate      **Type of deposit:** phosphorite clastic  
**Country:** Congo      CG      **District:**

**Marine area:** Atlantic E

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	outer shelf
<b>Morpho. 1</b>	lenticular
<b>Morpho. 2</b>	granule
<b>Petrography</b>	argilaceous limestone
<b>Mineralogy</b>	phosphate carbonate

**COORDINATES**

Latitude	S	-3.660
(Decimal °)	S	-4.160
Longitude	E	-10.000
	E	-11.000
Z (in m)		-50 to -100

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 2/20/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

- 1) The area covers 150 km offshore along the coast of Gabon from the Congo border. The investigated area is limited offshore to the isobath 100-110 m.
- 2) Climate: Tropical, equatorial forest type. Average annual rainfall 1200-1700 mm, maxi. July-August. Winds to NE (January), NW (July).
- 3) Hydro: Sea clear. Tide semidiurnal, maxi magnitude 2 m. Area of water mixing between the cold Benguela current running north parallel to the coast and the warm South-Equatorial going south. Swell, with magnitude and directions depending on wind directions.
- 4) Works performed: Geophysical survey 1979 (seismic reflexion: 1350 km); sampling (400) (grab); drilling 82 vibracores.
- 5) Characteristics of the deposit: Phosphatic coprolites were found near paleo-coastlines associated with outcrops of Eocene and Miocene age. No accumulation of significant economic interest.

**References:**

BRGM, 1979. Recherche de gravelles phosphatées au droit des côtes du Gabon, BRGM 79 SGN 318 MAR, unpublished.

Occurrence   
 Deposit   
 Deposit/File

**NAME: CASUARINA PROSPECT**

**Commodities:** diamond **Type of deposit:** placer  
**Country:** Australia **AU** **District:** Western Australia NW

**Marine area:** Indonesia, Timor sea

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**COORDINATES**

Latitude	S	-14.400
(Decimal °)		0.000
Longitude	E	-127.780
		0.000
Z (in m)		-30

**TYOLOGY**

<b>Zone type</b>	lower offshore
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	siliceous sand & gravel
<b>Mineralogy</b>	diamond

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 3/17/95

**Company:** Capricorn Resources

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

- 1) Area located 150 km NW of Wyndnam. The region, a 45 km stretch of coast between Cape Whiskey and Buckle Head, is one of the most inaccessible regions in the country with no roads on the coast.
- 2) Climate: Cyclone season begins from November onwards.
- 4) Works performed: Exploitation done through cages specially constructed to be able to withstand crocodile and shark attacks. A giant underwater "vacuum cleaner" is used. Divers have recovered 156 diamonds.

**References:**

Anonymous, 1988. Survey of Foreign Development activities for offshore non fuel Mineral Resources. Canada.

Occurrence   
 Deposit   
 Deposit/File

**NAME: LARIMNA**

**Commodities:** Cr Ni Fe      **Type of deposit:** placer slags  
**Country:** Greece      GR      **District:** Euvoikos N bay

**Marine area:** Mediterranean, Aegean sea

**ADMINISTRATION**

**TYOLOGY**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

<b>Zone type</b>	lower offshore
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	calcium carbonate
<b>Mineralogy</b>	metal rich slag

**COORDINATES**

Latitude	N	38.500
(Decimal °)		0.000
Longitude	E	-23.350
		0.000
Z (in m)		-40

**STAGE**

**MINING RIGHTS**

Exploration:       Free:   
 Mining:       Under control:   
 Processing:       Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			3.26kt Ni 222t Co
<b>Tonnage</b>	7.66 Mt		50kt Cr2O3 5.5kt Mn

**Description:**

1) Located in the northern Euvoikos Bay. Shallow waters.  
 2) Climate: Good weather conditions are prevailing in the area.  
 4) Works performed: surveying consisted of 109 surface sediment samples which were taken at 0.1 m<sup>2</sup> van Veen grab samples and 15 core samples.  
 5) Characteristics of the deposit: Associated with calcium carbonate (biogenic origin), the main orebody is located at a water depth of about 40 m covering an area of about 45 km<sup>2</sup>. The chromium distribution in surface sediments show some high concentrations >15 % around the northern part of the Bay. The deposit was formed by the continuous 18 years discharge of metal rich slag from the Larymna Fe Ni alloy smelting plant. 7.66 Mt containing 3.26 kt Ni, 222 t Co, 49.84 kt Cr2O3, 5.47 kt Mn, 1.456 Mt Fe2O3.

**References:**

Anonymous, 1988. Survey of foreign development activities for offshore non fuel mineral resources, Energy, Mine and Resources Canada.



Occurrence   
 Deposit   
 Deposit/File

**NAME: AXIAL JUAN DE FUCA**

**Commodities:** Zn Cu Fe      **Type of deposit:** sulfides massive  
**Country:** Canada      CA      **District:** Juan de Fuca ridge, W coast

**Marine area:** Pacific NE

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	seamount
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	massive sulfide
<b>Mineralogy</b>	sphalerite chalc galena pyrite

**COORDINATES**

Latitude	N	45.980
(Decimal °)		0.000
Longitude	W	130.070
		0.000
Z (in m)		-2000

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/3/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

1) Axial Seamount is located on the central of the Juan de Fuca ridge at its intersection with the Cobb Eikeberg Seamount chain.  
 4) Works performed: In summer 1980 anomalous manganese concentrations were recorded at hydrographic station in the area. In 1982, samples of basalt coated with polymetallic gossan were recovered from Brown Bear Seamount. In 1983 photographs and submersible dives of the PISCUS IV discovered an active vent. In 1984, several polymetallic mounds were found.  
 5) Characteristics of the deposit: Axial Seamount 60 x 25 km at the base has a rectangular summit 3 km wide and up to 6 km long along N20°W. The caldera is breached at SE end and has a N vertical wall. The active spreading is done through fissures 2 to 10 cm wide, 1 to 20 m deep and occur in an area of at least 100 m wide. The vents are characterised by the presence of extensive communities composed of worms and other animals, by a "halo" of orange "coloured" low temperature hydrothermal precipitates and by black and white smokers emanating from chimneys up to 10 m high. The chimneys protrude from fissured sheet lavas and consist of extremely friable and porous zinc sulfides with chalcopyrite rich interiors. Particulates from the white smokers, in the range of 1 to 50 microns in diameter, consist mainly of bacteria, iron, sulfide minerals and elemental sulfur particles.

**References:**

Anonymous, 1985. Compilation of information on polymetallic sulfide deposits and occurrences off the west Coast of Canada, Canada Oil and Gas lands administration, Energy, Mine and Resources Canada.

Occurrence   
 Deposit   
 Deposit/File

**NAME: LAUCALA BAY**

**Commodities:** lime **Type of deposit:** coralian  
**Country:** Fiji **FJ** **District:** Viti Levu

**Marine area:** Pacific W

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**TYOLOGY**

<b>Zone type</b>	inner shelf
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	coral sand
<b>Mineralogy</b>	aragonite

**COORDINATES**

Latitude	S	-18.200
(Decimal °)		0.000
Longitude	E	-178.500
		0.000
Z (in m)		

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 3/2/95

**Company:** Fiji Industry Ltd

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

- 1) Close to Suva, Viti Levu Island.
- 2) Climate: Tropical, mean annual precipitation 2 000 mm. SE monsoon in July. NE to SW tropical storm tracks from November to May.
- 4) Works performed: In Laucala Bay, sand is mined principally for cement production, although some is used for lime production. In 1984, approximately 104,441 t of coral sand was mined in the Bay. Reserves are estimated to last a further 15 years (Glasby, 1986).

**References:**

- 1) Glasby G.P., 1986. Near shore mineral deposits in the SW Pacific, Ed. Cronan D.S., Academic Press, 149-181.
- 2) Anonymous, 1988. Survey of foreign development activities for offshore non fuel mineral resources, Energy, Mine and Resources Canada.

Occurrence   
 Deposit   
 Deposit/File

**NAME: BA**

**Commodities:** Cr Au Fe      **Type of deposit:** placer paleobeach  
**Country:** Fiji      FJ      **District:** Viti Levu NW

**Marine area:** Pacific W

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	inner shelf foreshore
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	magnetite chromite

**COORDINATES**

Latitude	S	-17.480
(Decimal °)		0.000
Longitude	E	-177.700
		0.000
Z (in m)		0 to -30

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:**

	<b>Ore</b>	<b>Heavy minerals</b>	<b>Commodities</b>
<b>Grades</b>	9.7% magn. 2.5 Cr203		
<b>Tonnage</b>		1.1 Mt magnetite	

**Description:**

1) Close to Ba, NW Viti Levu Island.  
 2) Climate: Tropical, mean annual precipitation 2000 mm, SE monsoon in July NE to SW, tropical storm tracks from November to May.  
 5) Characteristics of the deposit: Onshore sands were estimated to contain 0.5 to 1.1 Mt of magnetite. However the grade and volumes are too low to be economic, but they did warrant an investigation into adjacent near shore area. Subsequent surveying revealed that magnetite content varied from 4.5 to 17.3% with an average 9.7% and chromite 2 to 3% of the total sample. Minimal gold content 0.1 g/t (0.06 ppm maxi). Between the shore and 30 m depth contour, the volume of sand considerably exceeds the volume of onshore dunes.

**References:**

Anonymous, 1988. Survey of foreign development activities for offshore non fuel mineral resources, Energy, Mine and Resources Canada.

Occurrence   
 Deposit   
 Deposit/File

**NAME: FAXA BAY**

**Commodities:** lime **Type of deposit:** paleobeach  
**Country:** Iceland **IS** **District:** Faxa bay, W coast

**Marine area:** Atlantic N

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	inner shelf
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	shell
<b>Mineralogy</b>	aragonite

**COORDINATES**

Latitude	N	64.500
(Decimal °)		0.000
Longitude	W	22.500
		0.000
Z (in m)		-35

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:** Bjorgun HF

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

2) Climate: Marine with less than 4 months over 10°C, mean annual precipitation 1000 mm. Prevailing surface winds from SW in January and from N in July.  
 4) Works performed: During 1984, 100,000 m3 of offshore calcium carbonate as shells were dredged from Faxa Bay (De Groot, 1986). Shells were still being dredged in 1986 from deposits located at depths of 30 to 35 m with a calcium carbonate content in excess of 90%. The deposit has been mined since 1958 after building a state owned cement works. The deposit is dredged at a rate of about 115,000 m3/y and is expected to last until 2020 (Earny, 1986).

**References:**

1) Anonymous, 1988. Survey of foreign development activities for offshore non fuel mineral resources, Energy, Mine and Resources Canada. 2) De Groot, 1986. 3) Earny, 1986.

Occurrence   
 Deposit   
 Deposit/File

**NAME: VEMBANAD**

**Commodities:** lime **Type of deposit:** paleobeach  
**Country:** India **IN** **District:** Kerala coast

**Marine area:** Indian N, Arabian sea

**ADMINISTRATION**

**TYOLOGY**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

<b>Zone type</b>	inner shelf
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	shell
<b>Mineralogy</b>	aragonite

**COORDINATES**

Latitude	N	9.560
(Decimal °)		0.000
Longitude	E	-76.290
		0.000
Z (in m)		

**STAGE**

**MINING RIGHTS**

Exploration:  Free:   
 Mining:  Under control:   
 Processing:  Unknown:

Up-dated on: 3/3/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>	2 Mt		

**Description:**

2) Climate: Tropical rain forest with mean annual precipitation of 3000 mm. Prevailing surface winds from NE to SW during the winter (January) and from the SW to the NE during the summer.  
 4) Works performed: Calcareous shell layers off the Vembanad coast are used in the cement industry. Reserves are estimated at 2 Mt (Meyer, 1982).

**References:**

1) Anonymous, 1988. Survey of foreign development activities for off-shore non fuel mineral resources, Energy, Mine and Resources Canada. 2) Meyer, 1982.

Occurrence   
 Deposit   
 Deposit/File

**NAME: SULAWESI**

**Commodities:** Cr **Type of deposit:** placer  
**Country:** Indonesia **ID** **District:** Sulawesi center

**Marine area:** Indonesia, Molucca sea

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYPOLGY**

<b>Zone type</b>	
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	chromite

**COORDINATES**

Latitude	S	-2.000
(Decimal °)		0.000
Longitude	E	-121.500
		0.000
Z (in m)		

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:** Acorn Securities

	Ore	Heavy minerals	Commodities
<b>Grades</b>			43 % Cr2O3
<b>Tonnage</b>	1 Mt		

**Description:**

1) E coast of Central Sulawesi island.  
 2) Climate: Tropical rain forest with mean annual precipitation around 3000 mm. Prevailing surface winds from NE to SW in January and SE to NW in July. Tropical storm tracks from E (May-Nov.).  
 4) Works performed: In March 1988, Acorn Securities of Perth, should have started shipping high-grade low-silica chromite sand. The deposit has proven reserves >1 Mt and it was expected that up to 0.5 Mm<sup>3</sup>/y of chromite sands will be processed to recover 40,000 t/y of concentrate containing 43% chromium oxide and less than 1% silica. Acorn securities through its 92% owned subsidiary, Acorn Diamond Indonesia, has been heavily involved in bringing the project to fruition.

**References:**

1) Anonymous, 1988. Mining Journal, London, 310, February 12, 1988. 2) Anonymous, 1988. Survey of foreign development activities for offshore non fuel mineral resources, Energy, Mine and Resources Canada.

Occurrence   
 Deposit   
 Deposit/File

**NAME: HOKITIKA**

**Commodities:** Au **Type of deposit:** placer  
**Country:** New Zealand **NZ** **District:** New Zealand S Island, W coast

**Marine area:** Pacific SW, Tasman sea

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	inner shelf
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	gold

**COORDINATES**

Latitude	S	-42.680
(Decimal °)		0.000
Longitude	E	-170.950
		0.000
Z (in m)		-100

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:** CRA Exploration Pty

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

2) Climate: Marine west coast, with mean annual precipitation of 3000 mm. Prevailing surface winds from NW to SE.  
 4) Works performed: CRA Exploration PTY was granted a 2 year prospecting licence on an area off the W coast of S Island. A sea-floor survey by grab sampling and seismic profiling has been carried out and sediment samples collected in a 5x1 km grid up to 150 m water depth. The objective was to locate gold deposits which can be mined as high volume (5 Mm3/y) low grade ores (0.15 g/m3 Au). CRA spent 0.5 M\$ in 3 years and was intending similar levels of spending in the future (Glasby, 1986). CRA conducted a vibrocoreing survey.

**References:**

1) Glasby G.P., 1986. Near shore mineral deposits in the SW Pacific. Ed. Cronan D.S.. Academic Press, 149-181. 2) Anonymous, 1988. Survey of foreign development activities for offshore non fuel mineral resources, Energy, Mine and Resources Canada.

Occurrence   
 Deposit   
 Deposit/File

**NAME: LAE**

**Commodities:** Cr **Type of deposit:** placer  
**Country:** Papua New-Guinea **PG** **District:** Papua New-Guinea E

**Marine area:** Pacific W, Solomon sea

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	inner shelf
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	chromite

**COORDINATES**

Latitude	S	-7.730
(Decimal °)	S	-6.770
Longitude	E	-147.050
	E	-147.640
Z (in m)		

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/15/95

**Company:** CRA Exploration Pty

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			4.5 Mt chromite

**Description:**

2) Climate: Tropical rain forest. Mean annual precipitation 3000 mm. Prevailing winds from NW to SE during January and from SE to NW in July.  
 4) Works performed: CRA purchased a 100% interest in 3 exploration tenements covering deposits of alluvial chromite located in 3 bays on the Marobe coast south of Lae. Resources of 4.5 Mt of chromite have been established, and further evaluation, metallurgical and marketing studies have been initiated.

**References:**

Anonymous, 1988. Survey of foreign development activities for offshore non fuel mineral resources, Energy, Mine and Resources Canada.



Occurrence   
 Deposit   
 Deposit/File

**NAME: VANKINA BAY**

**Commodities:** Sn **Type of deposit:** placer  
**Country:** Russia RU **District:** Siberia N

**Marine area:** Arctic, Laptev sea

**ADMINISTRATION**

**TYOLOGY**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

<b>Zone type</b>	lower shoreface
<b>Morpho. 1</b>	lenticular
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	cassiterite

**COORDINATES**

Latitude	N	72.000
(Decimal °)		0.000
Longitude	E	-139.300
		0.000
Z (in m)		

**STAGE**

**MINING RIGHTS**

Exploration:  Free:   
 Mining:  Under control:   
 Processing:  Unknown:

Up-dated on: 3/2/95

**Company:** Sevmor Oluvo

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

2) Climate: Tundra.  
 4) Works performed: The Moscow Mining Institute drilled at 40 m into the placer deposit without reaching its lower limits. In 1974 attempts were made at mining the Vankina Bay deposit. The vessels were a clamshell dredge "Gorniack" with on board processing equipment and the submarine suction dredge "Malyutka". The mineral recovery operation was shut down in the fall and did not resume until spring. Nuclear powered dredge may be mining the deposit but this has yet to be substantiated.  
 5) Characteristics of deposit: The cassiterite lies directly on the bottom of Vankina Bay only several tens of meters from the shoreline and extends over a large area. Areas on the Soviet Artic Shelf rich in cassiterite are: Seliakhskaya Bay, Dimitry Laptev Strait, the Cape Sviatoi Nos area and the southern part of Bolshoi Liakhovsky Island.

**References:**

Anonymous, 1988. Survey of foreign development activities for offshore non fuel mineral resources, Energy, Mine and Resources Canada.

Occurrence   
 Deposit   
 Deposit/File

**NAME: CHUKOTSKIY**

**Commodities:** Au **Type of deposit:** placer  
**Country:** Russia **RU** **District:** Siberia E

**Marine area:** Arctic, Chukchi sea

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	sand
<b>Mineralogy</b>	gold

**COORDINATES**

Latitude	N	66.590
(Decimal °)		0.000
Longitude	W	171.140
		0.000
Z (in m)		

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

2) Climate: Tundra.  
 5) Characteristics of the deposit: The Chukotskiy region in eastern Siberia accounts for more than 57% of soviet gold production. The gold is generally derived from placer deposits, many of which are located along the Kolyma river, some also occur along the coast of the Chukchi sea. Gold is mined from deposits close to the coast.

**References:**

Anonymous, 1988. Survey of foreign development activities for offshore non fuel mineral resources, Energy, Mine and Resources Canada.

Occurrence   
 Deposit   
 Deposit/File

**NAME: PORT PATTESON**

**Commodities:** Fe **Type of deposit:** placer beach  
**Country:** Vanuatu **VA** **District:** Vanua Lava Island

**Marine area:** Pacific W

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**TYOLOGY**

<b>Zone type</b>	foreshore
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	medium sand
<b>Mineralogy</b>	magnetite olivine pyroxene

**COORDINATES**

Latitude	S	-13.830
(Decimal °)		0.000
Longitude	E	-167.530
		0.000
Z (in m)		

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 3/2/95

**Company:**

	<b>Ore</b>	<b>Heavy minerals</b>	<b>Commodities</b>
<b>Grades</b>	6 to 12% magnetite		
<b>Tonnage</b>			

**Description:**

- 1) The deposit is located on the island of Vanua Lava.
- 2) Climate: Tropical wet, mean annual precipitation 1500 to 2000 mm. Prevailing surface winds from SE to NW. Tropical storm tracks from N, Nov. to May.
- 3) Hydro: River action on the island is considerable.
- 4) Works performed: Sampling.
- 5) Characteristics of the deposit: Due to their "young" topography and predominantly wet climate, river action is big, leading to rapid erosion of volcanic rocks. This river action liberates magnetite and other minerals and transports them to the sea. On Port Patteson, beach sand contains 6 to 12% and up to 22% of magnetite with pyroxene and olivine. Magnetite enrichment also occurs offshore of Port Patteson. This is due to the deposition of fine grained magnetite which has by-passed entrapment on the beaches.

**References:**

Anonymous, 1988. Survey of foreign development activities for offshore non fuel mineral resources, Energy, Mine and Resources Canada.

Occurrence   
 Deposit   
 Deposit/File

**NAME: BAHIA COAST**

**Commodities:** lime **Type of deposit:** paleobeach  
**Country:** Brazil **BR** **District:** Bahia

**Marine area:** Atlantic W

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	shelf
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	shell
<b>Mineralogy</b>	aragonite

**COORDINATES**

Latitude	S	-13.000
(Decimal °)		0.000
Longitude	W	38.500
		0.000
Z (in m)		

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

2) Climate: Tropical rain forest, mean annual precipitation 1500 mm. Prevailing surface winds from SE to NW.  
 4) Works performed: During 1982, shell layers at the coast of Bahia were used in the cement industry.

**References:**

Anonymous, 1988. Survey of foreign development activities for offshore non fuel mineral resources, Energy, Mine and Resources Canada.

Occurrence   
 Deposit   
 Deposit/File

**NAME: SOLOMON ISLAND**

**Commodities:** coral | **Type of deposit:** coralian  
**Country:** Solomon | SB | **District:**

**Marine area:** Pacific W, Solomon sea

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	continental slope
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	
<b>Mineralogy</b>	Mg calcite

**COORDINATES**

Latitude	S	-7.500
(Decimal °)		0.000
Longitude	E	-157.500
		0.000
Z (in m)		-50 to -300

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

2) Climate: Tropical rain forest, mean annual precipitation 3000 mm. Prevailing surface winds from SE to NW. Tropical storm tracks from E (Nov.-May).  
 4) Works performed: In 1979, corallium, a species of coral was discovered which led to a detailed survey in the latter part of 1981 in cooperation with the Fisheries Division of the Solomon Islands government. The coral offers a source of income for the villagers, especially where there are artisans and craftsmen who can create coral carvings. Pink, red and gold corallium have been located, but while the colors are excellent, their size is too small to be commercially important. Commercially valuable corals may exist off the Solomon Islands in waters of 100-300 m. Black corals are common in many areas within 50 m of the sea surface. Small black coral industries in the Solomon Islands provide income from carvings sold to tourists, although some raw coral has been exported for carving elsewhere (Cruz & al.).

**References:**

1) Anonymous, 1988. Survey of foreign development activities for offshore non fuel mineral resources, Energy, Mine and Resources Canada. 2) Cruz & al.

Occurrence   
 Deposit   
 Deposit/File

**NAME: YAMATO RISE**

**Commodities:** phosphate      **Type of deposit:** phosphorite upwelling  
**Country:** Japan      JP      **District:**

**Marine area:** Pacific NW, Japan sea

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**TYOLOGY**

<b>Zone type</b>	seamount
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	nodule
<b>Petrography</b>	diatom ooze or rocks
<b>Mineralogy</b>	fluoro-apatite quartz feldspath mica

**COORDINATES**

Latitude	N	39.500
(Decimal °)	N	38.000
Longitude	E	-135.000
	E	-132.500
Z (in m)		-1500

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>	25 to 31% P2O5		
<b>Tonnage</b>			

**Description:**

- 1) Found on different sea-bed elevations (seamount, ridge, etc.) in the Japan sea.
- 2) Climate: Continental. Mean annual precipitation 1500 mm. Prevailing surface winds from NW to SE (January) and from S to N in July. Tropical storm tracks from SSW to NNE from May to November.
- 4) Works performed: Dredging and coring made from 1978 by the 30 R/V Pervenetz cruises organised by the Pacific Oceanological Inst. of the Far East branch of the USSR Academy of Sciences.
- 5) Characteristics of the deposit: Phosphorites mainly of upper Miocene age were discovered on underwater rises of the sea of Japan. High-quality phosphorites involve diatom and terrigenous- diatom rocks substituted by phosphate. Rich phosphorites containing up to 30% P2O5 were not known in marginal seas before. Connection between phosphatogenesis and inflow of cold oceanic waters rich in dissolved inorganic phosphate has been proved.

**References:**

Gusev V.V., 1989. Phosphorites of sea of Japan, composition and genesis, Pacific Oceanological Inst. USSR Academy of Sciences, 21° Annual OTC (Houston-Texas) 1-4 May 1989.

Occurrence   
 Deposit   
 Deposit/File

**NAME: DOME COUNTRY HARBOUR**

**Commodities:** Au **Type of deposit:** placer paleomoraine  
**Country:** Canada **CA** **District:** Nova Scotia

**Marine area:** Atlantic NW

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	lower offshore
<b>Morpho. 1</b>	glacial drift
<b>Morpho. 2</b>	
<b>Petrography</b>	silt to coarse gravel
<b>Mineralogy</b>	gold

**COORDINATES**

Latitude	N	45.900
(Decimal °)		0.000
Longitude	W	61.670
		0.000
Z (in m)		-30

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:** Seabright Resources Ltd

	Ore	Heavy minerals	Commodities
<b>Grades</b>	Au 2 g/m3		
<b>Tonnage</b>			

**Description:**

1) Located SW Nova Scotia. 2.5 km off the coast of Country Harbour.  
 2) Climate: Humid continental with annual precipitation of 1300 to 1500 mm, Nov. to Jan. being the wettest and Sept. the driest. Winds blow from westerly quadrants in all seasons.  
 3) Hydro: Sea ice 0.30 to 0.45 m in Jan. and Feb. during severe winter. Tide semi-diurnal averages 1.4 m. Major current is the Scotian from SW 0.08 m/s.  
 5) Characteristics of the deposit: The distribution of gold in this area is similar to that found in the northern Bering Sea where the highest gold content and coarsest particles are in the relict lag gravel which forms a veneer on the glacial drift. Placer gold found in the Country Harbour offshore varies from coarse gold (>1 mm in diameter) associated with lag gravel deposits to fine flour gold disseminated within the -230 mesh sediment fraction of silt units (Seabright, 1980-1981). Flour gold is often flattened, easily transported by water and may require 3 million colours to make one ounce (Boyle, 1979). Gold (2 g/m3 maxi) is found within the mud fraction 19% of the time, in the matrix of the gravel and pebble fraction 57% of the time and distributed throughout the sand fraction for the remaining 24%. The absence of gold in the fine sand class reflects the fact that this material is the most easily eroded and is not hydraulically equivalent to any gold particles found in this area (Seabright, 1981). The gold distribution is a result of glaciation stripping rich mineralized bedrock and pre-existing placer deposits from the land and depositing them as auriferous sediments. Reworking and winnowing of glacial drift and the subsequent concentration of the heavier gold particles leads to local enrichment of the sediment.

**References:**

1) Anonymous, 1985. Placer gold potential offshore of Country Harbour, Nova Scotia. Energy, Mines and Resources Canada. 2) Seabright, 1980-1981. 3) Boyle E.A., 1979

Occurrence   
 Deposit   
 Deposit/File

**NAME: ATLANTIS II DEEP**

**Commodities:** Cu Zn Ag Fe Co Au      **Type of deposit:** sulfides mud  
**Country:** Saudi Arabia      SA      **District:** Red Sea center

**Marine area:** Indian N, Red Sea

**ADMINISTRATION**

**TYOLOGY**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

<b>Zone type</b>	through
<b>Morpho. 1</b>	bed
<b>Morpho. 2</b>	
<b>Petrography</b>	argilaceous mud
<b>Mineralogy</b>	chalcopryrite sphalerite pyrite

**COORDINATES**

Latitude	N	21.500
(Decimal °)		0.000
Longitude	E	-38.000
		0.000
Z (in m)		-2000

**STAGE**

**MINING RIGHTS**

- Exploration:       Free:   
 Mining:       Under control:   
 Processing:       Unknown:

Up-dated on: 3/2/95

**Company:**

	<b>Ore</b>	<b>Heavy minerals</b>	<b>Commodities</b>
<b>Grades Tonnage</b>	Zn 6.05% Cu 0.8%		

**Description:**

1) The deposit is located in the central part of the Red Sea on the territories of Saudi Arabia, Sudan and Egypt.  
 2) Climate: Desertic.  
 5) Characteristics of the deposit: Hydrothermal sedimentation within the Atlantis II has been taking place for at least 25000 years and led to the deposition of various sediments facies. From bottom to top there are: 1) detrital oxydic pyritic zone (DOP) deposited directly above basement which contains detrital carbonates, clays and silicates with minor limonite and pyrite; 2) lower sulphide zone (SU1) which represents the first period of stable widespread hydrothermal activity and contains sphalerite, pyrite and chalcopryrite together with other minerals such as iron silicates, mangano-siderite and anhydrite; 3) central oxydic zone (CO) characterized by oxidised material as goethite, hematite, and silicates; 4) upper sulphide zone (SU2) which represents a return to reducing conditions and is similar to the lower sulphidic zone; 5) amorphous silicate zone (AM) which consists of poorly crystalline iron silicates together with sulphides and anhydrite. Zn 6.05%, Cu 0.84%, Ag 0.011%, Fe 26.4%.

**References:**

Pouit G. & al., 1983. Les minéralisations actuelles et anciennes, BRGM, unpublished.



Occurrence   
 Deposit   
 Deposit/File

**NAME: TORRE DEL GRECO**

**Commodities:** coral | **Type of deposit:** coralian  
**Country:** Italy | IT | **District:** Napoli bay

**Marine area:** Mediterranea, Napoli bay

**ADMINISTRATION**

- Territorial sea
- Continental Shelf
- Exclusive Economic Zone
- International Area

**TYOLOGY**

<b>Zone type</b>	continental slope & shelf
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	
<b>Mineralogy</b>	Mg calcite

**COORDINATES**

Latitude	N	40.770
(Decimal °)		0.000
Longitude	E	-14.480
		0.000
Z (in m)		-5 to -300

**STAGE**

- Exploration:
- Mining:
- Processing:

**MINING RIGHTS**

- Free:
- Under control:
- Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

2) Climate: Mediterranean, mean annual precipitation 600 mm. Prevailing surface winds from SE to NW (Ligure current).

5) Characteristics of the deposit: Precious corals are not minerals in the strict sense of the term, being living coelenterates prior to their recovery. Because they can be made into jewellery, like gold and platinum, it is not out of place to consider them in this data basis. They tend to grow on limestone or basalt substrates and are best developed on rises, seamounts or gently sloping current swept terraces which are free of sediment. Both high sedimentation rates and steep slopes are inhibitive to pink coral growth, the former by smothering the corals and the latter by permitting downslope transport of detritus that can abrade and topple the growth. Water 9-18° C, growth rate 1 cm/year to size ranging up to 1 m with base diameters 3 to 10 cm.

**References:**

Cronan, 1990. Marine mineral resources, Imperial college of Science.

Occurrence   
 Deposit   
 Deposit/File

**NAME: EASTERN MANUS BACK-ARC**

**Commodities:** Cu Zn Au      **Type of deposit:** sulfides massive  
**Country:** Papua New-Guinea      PG      **District:** Pual ridge

**Marine area:** Pacific W, Bismark sea

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	seamount
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	massive sulfides
<b>Mineralogy</b>	chalcopyrite sphalerite pyrite

**COORDINATES**

Latitude	S	-4.750
(Decimal °)		0.000
Longitude	E	-151.750
		0.000
Z (in m)		-1630

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/16/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

2) Climate: Tropical rain forest. Mean annual precipitation 4000 to 5000 mm. Prevailing surface winds from NE to SE (NE trades, Jan.), from SE (SE monsoon, July).  
 4) Works performed: Pacmanus I expedition (Papua New Guinea, Australia, Canada) with the R/V Franklin with 12 kHz echo sounding for detailed bathymetry, rock dredging, sediment coring, bottom photography with a towed 35 mm camera and recording color video system and development of a transmit sonometer rosette  
 5) Characteristics of the deposit: Hydrothermal activity and extensive sulfide deposits associated with submarine dacitic volcanism were discovered in the eastern Manus Basin in October 1991. By virtue of its location behind an active island arc and especially its felsic volcanic affiliation, the occurrence represents a close analogue for many ancient volcanogenic massive sulfide ore environments. that permitted sampling of the water column simultaneously with remote measurement of conductivity-temperature-depth and relative concentration of particulate matter for the detection of hydrothermal plumes. Some fragments recovered from the orifice inner wall show sulfide minerals essentially chalcopyrite sometimes replaced by tennantite overgrown by sphalerite rims.

**References:**

Binns R.A. & al., 1993. Actively forming polymetallic sulfide deposits associated with felsic volcanic rocks in the eastern Manus Back-arc Basin, Papua New Guinea, Economic geology.

Occurrence   
 Deposit   
 Deposit/File

**NAME: ENDEAVOUR SEGMENT**

**Commodities:** Zn Cu Ag Fe      **Type of deposit:** sulfides massive  
**Country:** Canada      CA      **District:** Canada W coast, N segment Juan de Fuca r

**Marine area:** Pacific NE

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	seamount ridge
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	massive sulfide
<b>Mineralogy</b>	sphalerite chalcopyrite pyrite galena

**COORDINATES**

Latitude	N	47.950
(Decimal °)		0.000
Longitude	W	129.100
		0.000
Z (in m)		-2000

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/3/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades Tonnage</b>	Cu 0.83% Zn 13.2%		

**Description:**

- 1) Northern segment Juan de Fuca ridge.
- 2) Climate: Marine west coast. Mean annual precipitation 1500 mm. Prevailing surface winds from SW in January and from NW in July.
- 3) Hydro: 2 unequal high waters and/or low waters each tidal day, direction of the tide progression from SW, maxi. 4 m. Prevailing cold California current from N in summer, warm Davidson current from S in winter.
- 4) Works performed: In 1982, 1983, 1984.
- 5) Characteristics of the deposit: 140 kg of fresh massive sulfides encrusted with living tube worms from the western wall of the axial ridge were recovered in 1982. Sample appears to be mostly marcasite with a coarsely crystalline pocket of wurtzite rich in Ag and Pb. Analysis: Cu 0.83%, Zn 13.2%, Ag 1.90 oz/t, Pb: 0.154%, Fe 32.3%. Detailed examination of the ridge segment permit the following observations: 1) the steep outward-facing flanks of the present ridge crest are composed of unfractured pillow basalt, with a moderate sediment cover; 2) the inner walls of the axial valley are intensively fractured, and fissured parallel to the ridge strike of N20°E; 3) the floor of the axial valley is thinly sedimented (covered up to 80%) and is composed of pillow and pahoehoe flows with few through-joint fractures; 4) evidence of very young volcanism was not observed; the ridge is probably several thousand years old; 5) active vents were observed only on the west margin of the valley floor, near the base of the fault scarp.

**References:**

Anonymous, 1985. Compilation of information on polymetallic sulfide deposits and occurrences off the west Coast of Canada, Canada Oil and Gas lands administration, Energy, Mine and Resources Canada.

Occurrence   
 Deposit   
 Deposit/File

**NAME: MAGIC MOUNTAIN SITE**

**Commodities:** Zn Cu Ag Fe      **Type of deposit:** sulfides massive  
**Country:** Canada      CA      **District:** Canada W coast, S segment Explorer ridge

**Marine area:** Pacific NE

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	seamount ridge
<b>Morpho. 1</b>	
<b>Morpho. 2</b>	
<b>Petrography</b>	massive sulfides
<b>Mineralogy</b>	sphalerite chalcopyrite pyrite galena

**COORDINATES**

Latitude	N	49.330
(Decimal °)		0.000
Longitude	W	130.270
		0.000
Z (in m)		-2000

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/2/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>	Zn 9% Cu 8.1%		
<b>Tonnage</b>			

**Description:**

1) Southern segment Explorer ridge.  
 2) Climate: Marine west coast. Mean annual precipitation 1500 mm. Prevailing surface winds from SW in January and from NW in July.  
 3) Hydro: 2 unequal high waters and/or low waters each tidal day, direction of the tide progression from SW, maxi. 4 m. Prevailing cold California current from N in summer, warm Davidson current from S in winter.  
 5) Characteristics of the deposit: Perhaps as many as 60 hydrothermal features including active and extinct vents, chimneys, and other massive sulfide structures have been discovered over a 9 km long segment. Major mineral species are barite, opal, sphalerite or wurtzite, marcasite and chalcopyrite, minor pyrite, Cu-Fe-Zn solid solution, galena, Fe-Si gel and covellite with very low anhydrite. The physical characteristics of the hydrothermal vents and deposits so far reported are highly variable. They range in size from a few tens m<sup>2</sup> to 200 m across and 10 m or more thick. Eight chemical analyses averaged 9.0% Zn, 8.1% Cu, 0.1% Pb, 10.8% Fe, 19.2% SiO<sub>2</sub>, 7.9% Ba, 112 ppm Ag and 0.8 ppm Au.

**References:**

Anonymous, 1985. Compilation of information on polymetallic sulfide deposits and occurrences off the west Coast of Canada, Canada Oil and Gas lands administration, Energy, Mine and Resources Canada.

Occurrence   
 Deposit   
 Deposit/File

**NAME: CLARION - CLIPPERTON**

**Commodities:** Mn Ni Cu Co      **Type of deposit:** polymetallic nodules  
**Country:** International Area      **District:** Clarion Clipperton zone

**Marine area:** Pacific central north

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	abyssal hills
<b>Morpho. 1</b>	surface layer
<b>Morpho. 2</b>	nodules
<b>Petrography</b>	ferromanganese hydroxides
<b>Mineralogy</b>	birnessite todorokite dMnO2

**COORDINATES**

Latitude	N	7.000
(Decimal °)	N	17.000
Longitude	W	115.000
	W	158.000
Z (in m)		-4 to 5,000

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/3/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>	Mn 30 Ni 1.4 Cu 1.2 Co 0.25 %		
<b>Tonnage</b>	200-500 Mt		

**Description:**

1) Between Hawaii and Clipperton Island. Bordered northward by Clarion fracture zone and southward by Clipperton fracture zone.  
 2) Climate: Tropical, heavy rains, prevalent wind E to SE.  
 3) Hydro: Sea sometimes rough, strong swell associated with E to SE trade winds.  
 4) Works performed: Intensive surveys in the 1970's by 4 international consortia registered in USA (Kennecott Consortium, KCON; Ocean Mining Associates, OMA; Ocean Management Inc., OMI; Ocean Minerals Company, OMCO) and the french group AFERNOD. During the 1980's and 1990's five other groups investigated the area: 1) Deep Ocean Resources Development Co. Ltd, DORD, Japan; 2) Yuzhmoregeologiya, Russia; 3) Inter Ocean Metal, group of organisations from Bulgaria, Cuba, Czech Republic, Poland and Russia; 4) China Ocean Mineral Resources Research and Development Association, COMRA, China People Republic; 5) KORDI, Korea.  
 Works included exploration by bathymetry, acoustic profiling, side-scan sonar, multifrequency acoustic (nodule detection), bottom photography and television, sampling; mining system studies and trials at sea; processing tests. In 1994 2.5 Mkm2 have been allocated to the above "pioneers" or reserved to the International Seabed Authority by the UN or by governments (USA, Germany, UK) in patches varying from 75,000 to 200,000 km2.  
 5) Characteristics of the deposit: The bottom topography (5,000 m) is formed by NS trending hills, several 10 km long, 2-5 km distant and 100-300 m high, often bordered by small 2-40 m cliffs. The sediment cover is a brown diatom ooze with low shear strength (5 kPa). Brown black nodules 5-10 cm wide are scattered on the ocean floor. Their abundance averages 5 kg/m2 on the area, with "mineable fields" 2-5 km wide and 10-30 km long, with more than 15 kg/m2. The nodules are formed by concentric layers of ferro-manganese hydroxides where nickel, copper and cobalt are disseminated inside the crystal network. A volcanic, clayey or phosphatic core is sometimes observed (low grade nodules). Chemical composition varies, but in large areas the grades are above Mn 25%, Ni and Cu 1%, Co 0.2%. Mining targets are 3,000 km2 "mineable flat fields" scattered in several 10,000 km2 with 30-40 Mt of nodules containing 30% Mn, 1.4% Ni, 1.2% Cu, 0.25% Co. At the present metal prices, mining will provide a very narrow margin.

**References:**

Lenoble J.P., 1994. The future of deep seabed mining: a changing economic and legal contingency. International advisory conference on deep seabed mining policy at KORDI (Seoul-Korea) 5-6/9/94.

Occurrence   
 Deposit   
 Deposit/File

**NAME: INDIAN CENTRAL BASSIN**

**Commodities:** Mn Ni Cu Co      **Type of deposit:** polymetallic nodules  
**Country:** International Area      **District:**

**Marine area:** Indian central bassin

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	abyssal hills
<b>Morpho. 1</b>	surface layer
<b>Morpho. 2</b>	nodules
<b>Petrography</b>	ferromanganese hydroxides
<b>Mineralogy</b>	birnessite todorokite dMnO2

**COORDINATES**

Latitude	S	-16.250
(Decimal °)	S	-10.000
Longitude	E	-81.750
	E	-72.750
Z (in m)		-4 to 5,000

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/3/95

**Company:**

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

1) South of the Indian peninsula and W of the Mid-indian Ridge.  
 2) Climate: Tropical, heavy rains, trade E to NE winds.  
 3) Hydro: Sea sometimes rough, strong swell associated with trade winds.  
 4) Works performed: Intensive surveys during the 1980's by several Indian institute coordinated by the Department of Ocean Development, DOD. Exploration continued in the 1990's with advanced methods (swath mapping) in order to delimit the best area. Works included exploration by bathymetry, acoustic profiling, bottom photography, sampling; mining system and process studies; processing tests. In 1987 150,000 km<sup>2</sup> were allocated to DOD that must be reduced to 75,000 km<sup>2</sup> in 1995 and 150,000 km<sup>2</sup> reserved for the International Seabed Authority by the UN.  
 5) Characteristics of the deposit: The bottom topography (5,000 m) is formed by NS trending hills, several 10 km long, 2-5 km distant and 100-300 m high. The sediment cover is mainly brown siliceous ooze with some strip of calcareous ooze. Brown black nodules 5-10 cm wide are scattered on the ocean floor. Their abundance averages 5-10 kg/m<sup>2</sup>. The nodules are formed by concentric layers of ferro-manganese hydroxides where nickel, copper and cobalt are disseminated inside the crystal network. A volcanic, clayey or phosphatic core is sometimes observed (low grade nodules). Chemical composition varies, but in large areas the grades are above Mn 25%, Ni and Cu 1%, Co 0.2%.

**References:**

Scharma R. & Rao A., 1991. Environmental considerations of nodule mining in the central Indian basin. OTC 6554, 23rd Offshore Technology Conference (Houston-USA) 6-9/5/1991, 481-490.

Occurrence   
 Deposit   
 Deposit/File

**NAME: PERU BASIN**

**Commodities:** Mn Ni Cu Co      **Type of deposit:** polymetallic nodules  
**Country:** International Area      **District:**

**Marine area:** Pacific SE, Peru basin

**ADMINISTRATION**

Territorial sea  
 Continental Shelf  
 Exclusive Economic Zone  
 International Area

**TYOLOGY**

<b>Zone type</b>	abyssal hills
<b>Morpho. 1</b>	surface layer
<b>Morpho. 2</b>	nodules
<b>Petrography</b>	ferromanganese hydroxydes
<b>Mineralogy</b>	birnessite todorokite dMnO2

**COORDINATES**

Latitude	S	-7.500
(Decimal °)	S	-11.000
Longitude	W	88.000
	W	93.000
Z (in m)		-4,000

**STAGE**

Exploration:   
 Mining:   
 Processing:

**MINING RIGHTS**

Free:   
 Under control:   
 Unknown:

Up-dated on: 3/3/95

**Company:** AMR

	Ore	Heavy minerals	Commodities
<b>Grades</b>			
<b>Tonnage</b>			

**Description:**

2) Climate: Tropical, heavy rains, trade winds.  
 3) Hydro: Sea sometimes rough, strong swell associated with trade winds.  
 4) Works performed: Exploration surveys during the 1980's by the German group Arbeitsgemeinschaft Meerestechnisch Gewinnbare Rohstoffe (AMR). Works included bathymetry, acoustic profiling, bottom photography and television, sampling. In the 1990's, environmental studies were carried on by Hamburg and Kiel Universities. In 1984 approx. 140,000 km2 were allocated to AMR by the German government.  
 5) Characteristics of the deposit: Few information is available. The nodules appeared larger but more discarded than in the N Pacific area.

**References:**

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**dépôt légal, 2ème trimestre 1995**



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*The data base – MARMIN – lists mineral indexes and deposits and mainly those of the exclusive economic zones (EEZ). The great range of data indicates the variety of potential exploration and exploitation sites of underwater mineral resources. Each occurrence is described according to the geographical location, the type of deposit, the geological characteristics, the substance(s), the administrative status, the operational stage and the conducted works. To date, 274 indexes throughout 50 countries have been recorded. MARMIN aims at international distribution to universities, mining companies and administrations.*

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