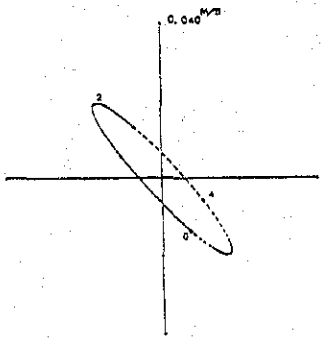
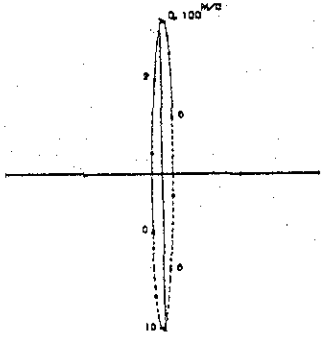
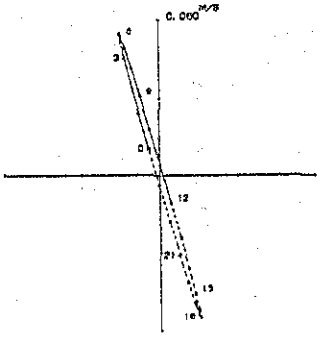
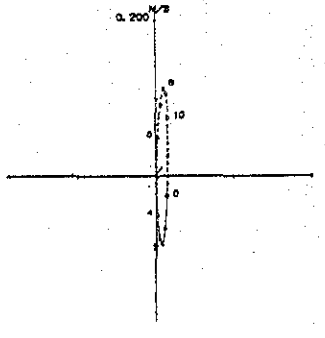
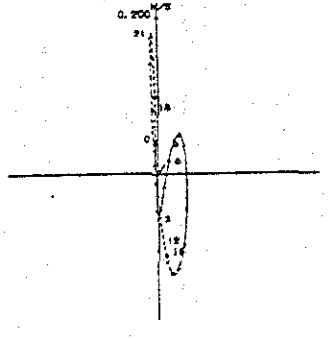
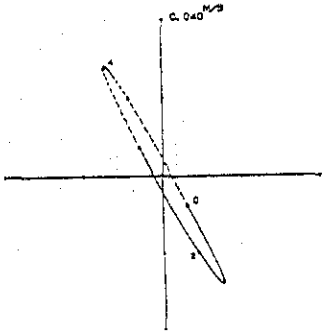
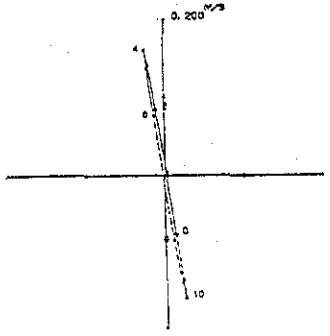
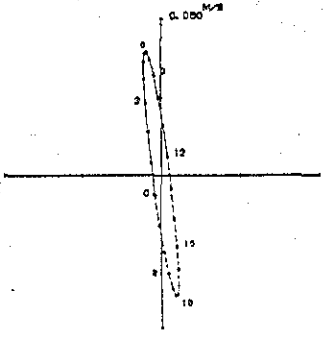
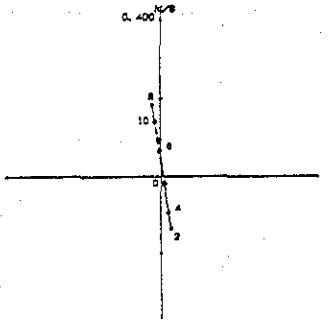
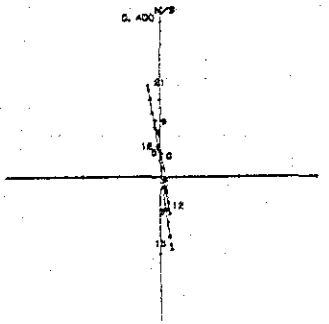
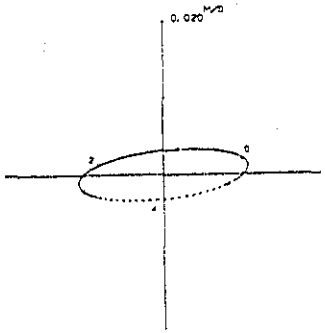
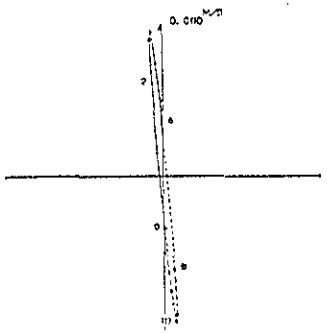
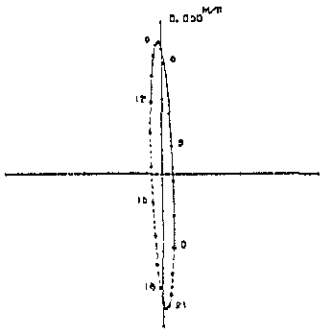
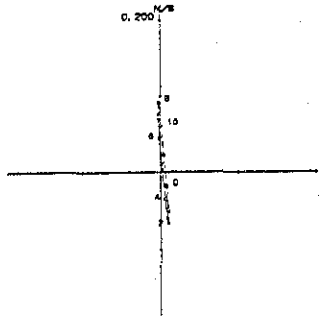
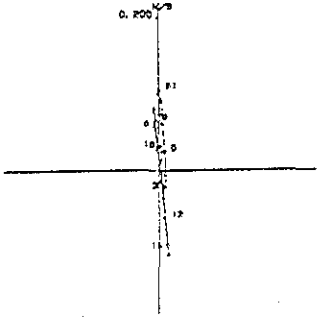
## results of harmonic analysis of tide in a whole day and night

| layer (m) | componrent tide | component velocity in Northern direction | | component velocity in Eastern direction | | elements of current ellipse | | | | | | principal current direction | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Maximum radius | | | Minimum radius | | | | |
| | | velocity (cm/sec) | lag (°) | velocity (cm/sec) | lag (°) | direction (°) | velocity (cm/sec) | lag (°) | direction (°) | velocity (cm/sec) | lag (°) | velocity (cm/sec) | lag (°) |
| -1.0 | | | | | | | | | | | | 353° | |
| | M2 | 7.2 | 100 | 0.5 | 176 | 1 | 7.2 | 100 | 91 | 0.5 | 190 | 7.2 | 100 |
| | S2 | 3.0 | 137 | 0.2 | 213 | 1 | 3.0 | 137 | 91 | 0.2 | 227 | 2.9 | 136 |
| | K2 | 0.8 | 137 | 0.1 | 213 | 1 | 0.8 | 137 | 91 | 0.1 | 227 | 0.8 | 136 |
| | K1 | 4.7 | 93 | 1.3 | 269 | 344 | 4.8 | 93 | 74 | 0.1 | 183 | 4.8 | 93 |
| | O1 | 2.8 | 66 | 0.8 | 241 | 344 | 2.9 | 66 | 74 | 0.1 | 156 | 2.9 | 66 |
| | P1 | 1.5 | 93 | 0.4 | 269 | 344 | 1.6 | 93 | 74 | 0.1 | 183 | 1.6 | 93 |
| | A0 | 1.3 | | 0.9 | | | 1.5 | | 34 | | | 1.1 | |
| -5.0 | | | | | | | | | | | | 352° | |
| | M2 | 11.8 | 107 | 1.7 | 292 | 352 | 11.9 | 107 | 82 | 0.2 | 17 | 11.9 | 107 |
| | S2 | 4.8 | 143 | 0.7 | 328 | 352 | 4.8 | 143 | 82 | 0.1 | 53 | 4.8 | 143 |
| | K2 | 1.3 | 143 | 0.2 | 328 | 352 | 1.3 | 143 | 82 | 0.0 | 53 | 1.3 | 143 |
| | K1 | 4.0 | 114 | 0.6 | 264 | 353 | 4.1 | 113 | 83 | 0.3 | 203 | 4.1 | 113 |
| | O1 | 2.4 | 86 | 0.3 | 237 | 353 | 2.4 | 86 | 83 | 0.2 | 176 | 2.4 | 86 |
| | P1 | 1.3 | 114 | 0.2 | 264 | 353 | 1.3 | 113 | 83 | 0.1 | 203 | 1.3 | 113 |
| | A0 | 2.4 | | 0.2 | | | 2.5 | | 6 | | | 2.4 | |
| -10.0 | | | | | | | | | | | | 357° | |
| | M2 | 5.6 | 99 | 0.5 | 262 | 355 | 5.6 | 99 | 85 | 0.1 | 189 | 5.6 | 99 |
| | S2 | 2.3 | 135 | 0.2 | 298 | 355 | 2.3 | 135 | 85 | 0.1 | 225 | 2.3 | 135 |
| | K2 | 0.6 | 135 | 0.1 | 298 | 355 | 0.6 | 135 | 85 | 0.0 | 225 | 0.6 | 135 |
| | K1 | 2.8 | 137 | 0.2 | 29 | 358 | 2.8 | 137 | 88 | 0.2 | 47 | 2.8 | 137 |
| | O1 | 1.7 | 110 | 0.1 | 1 | 358 | 1.7 | 110 | 88 | 0.1 | 20 | 1.7 | 110 |
| | P1 | 0.9 | 137 | 0.1 | 29 | 358 | 0.9 | 137 | 88 | 0.1 | 47 | 0.9 | 137 |
| | A0 | 1.3 | | 0.3 | | | 1.4 | | 14 | | | 1.3 | |

current ellipses

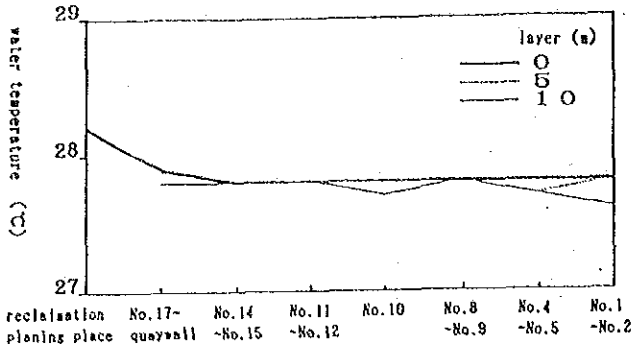
observation period : 1990.2.9 ～ 1990.2.10

| layer | M4 | M2 | M1 | SPRING | TROPIC |
|---|---|---|---|---|---|
| -1.0 m |  |  |  |  |  |
| -5.0 m |  |  |  |  |  |
| -10.0m |  |  |  |  |  |

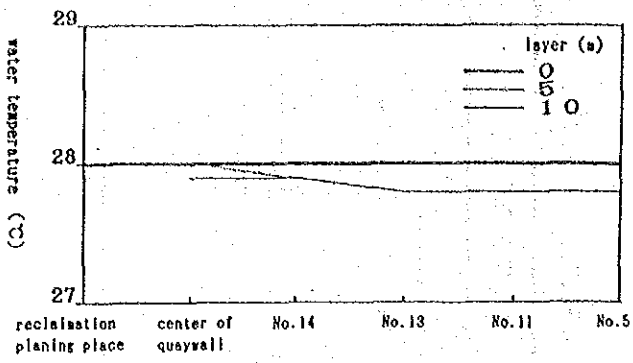
0 a.m. on current ellipse means transit of the moon.

0 a.m. on current ellipse (in SPRING) means high water at YAP.

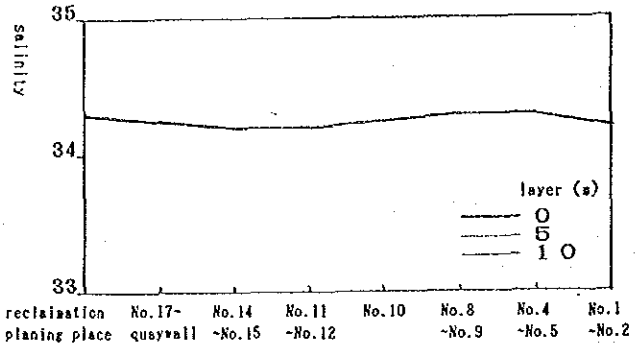
0 a.m. on current ellipse (in TROPIC) means high water at YAP.



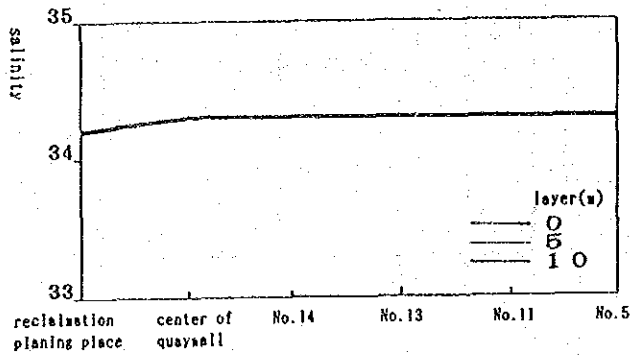

(1) water temperature



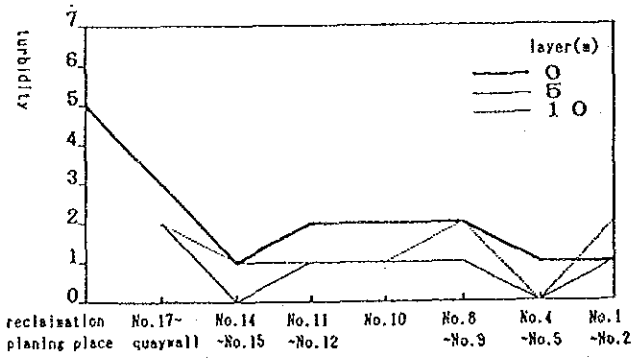

(5) water temperature



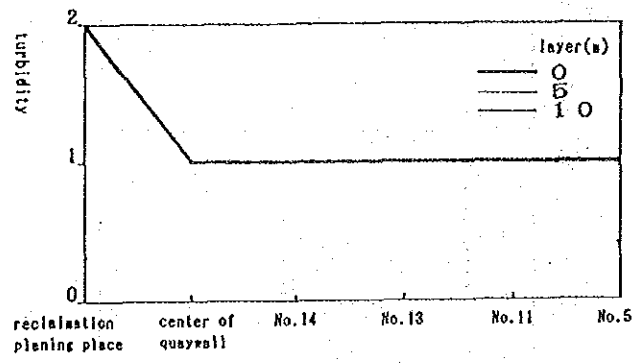

(2) salinity



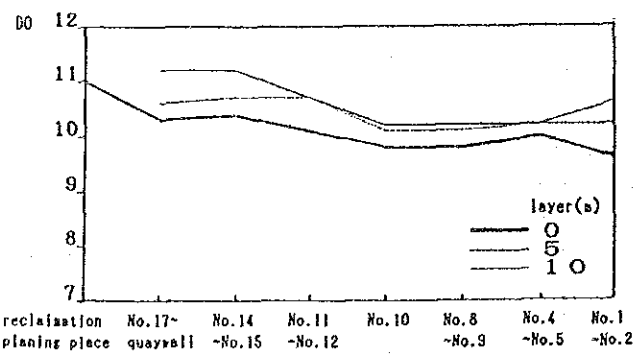

(6) salinity



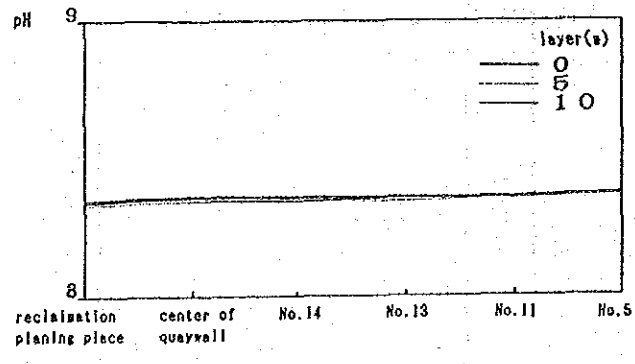

(3) turbidity




(7) turbidity

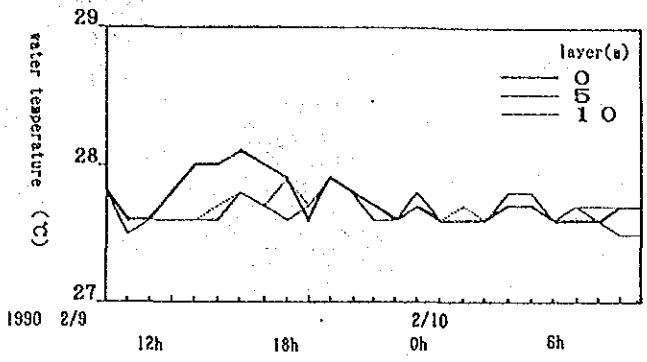



(4) DO

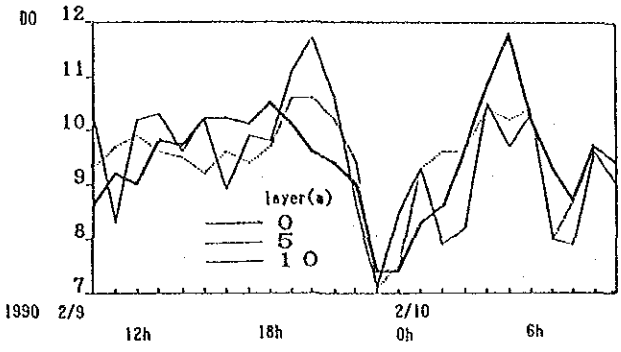



(8) pH

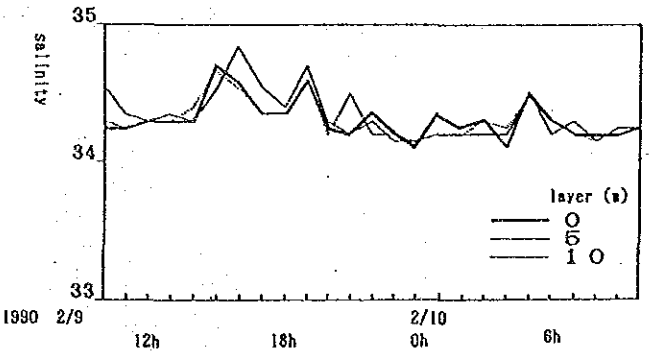
water quarity horizontal distribution



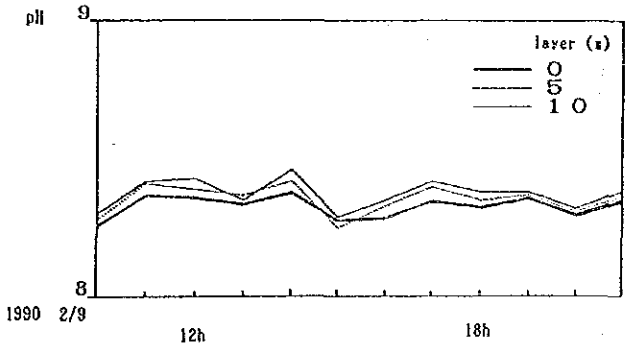

(1) water temperature



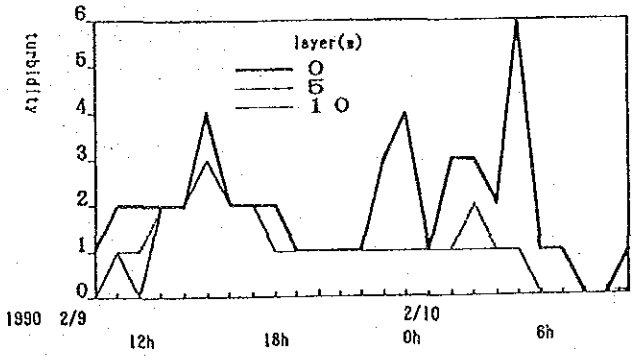

(4) DO




(2) salinity

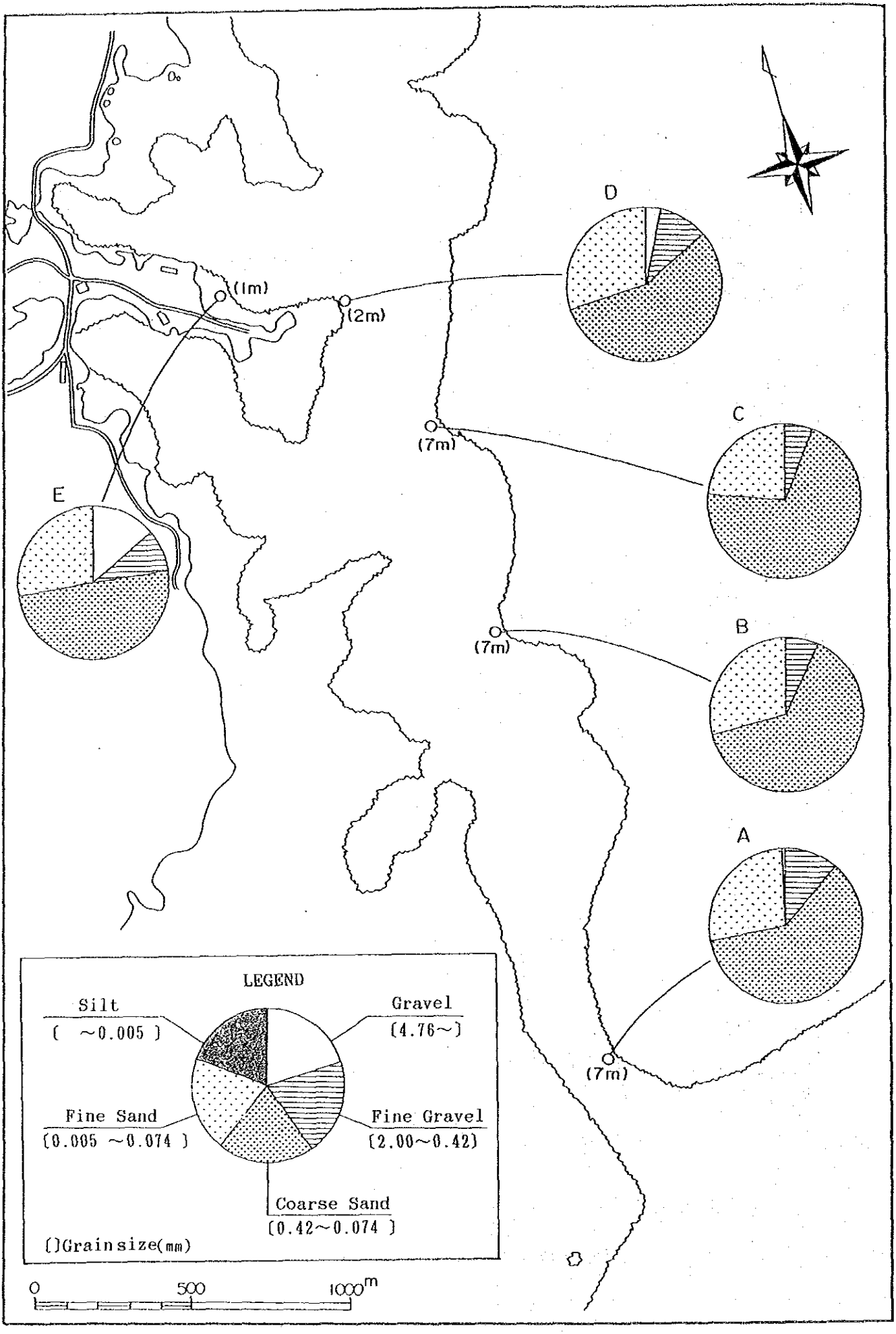



(5) pH




(3) turbidity

variance of water quality in time history


D
(1m)
(2m)
C
(7m)
E
B
(7m)
A
(7m)
LEGEND
Silt
( ~0.005 )
Gravel
(4.76~)
Fine Sand
(0.005 ~0.074 )
Fine Gravel
(2.00~0.42)
Coarse Sand
(0.42~0.074 )
()Grainsize(mm)
0
500
1000m

Result of Initial Assessment

INITIAL ASSESSMENT ENVIRONMENTAL CHECKLIST

Environmental Impacts

| | YES | MAYBE | NO |
|---|---|---|---|
| 1. EARTH. Will the proposed project result in: | | | |
| a. Destruction, covering or modification of any unique geologic or physical features? | | | V |
| b. Creation of steep slopes or other unstable earth conditions? | | | V |
| c. Any potential for increased wind or water erosion of soils, either on or off the site? | | | V |
| d. Changes in the channel of a stream, or the bed of the ocean, lagoon? | V | | |
| e. Exposure of people or property to geological hazards such as land-slides, ground failure, or similar hazards? | | | V |
| 2. AIR. Will the proposed project result in: | | | |
| a. Substantial air emissions or deteri-oration of existing air quality? | | | V |
| b. Creation of objectionable odors? | | | V |
| 3. WATER. Will the proposed project result in: | | | |
| a. Changes in currents, or the course or direction of water movements, in either marine or fresh waters? | V | | |

| | YES | MAYBE | NO |
|---|---|---|---|
| 4. PLANT LIFE. Will the proposed project result in: | | | |
| a. Destruction of any upland or mangrove forest communities? | | | V |
| b. Destruction of other important plant communities, such as sea grasses or plants having potential commercial value? | | | V |
| c. Reduction of the numbers of any unique, rare or endangered plant species? | | | V |
| d. Introduction of new species of plants into an area or result in a barrier to the normal replenishment of existing species? | | | V |
| e. Reduction in acreage of any agriculture crop? | | | V |
| 5. ANIMAL LIFE. Will proposed project result in: | | | |
| a. Destruction of any coral reef areas? | V | | |
| b. Reduction of the numbers of any unique, rare, or endangered animal species? | | | V |
| c. Introduction of new animal species into an area, or result in a barrier to the migration or movement of animals? | | | V |
| d. Substantial deterioration of fish or wildlife habitat? | | | V |

| | YES | MAYBE | NO |
|---|---|---|---|
| 6. NOISE. Will the proposed project result in: | | | |
| a. Increase in existing noise levels or exposure of people to severe noise levels? | ____ | ____ | V |
| 7. LAND USE. Will the proposed project resultin: | | | |
| a. Substantial altetnantion of the present or planned land use of an area? | ____ | ____ | V |
| 8. NATURAL RESOURCES. Will the proposed project result in: | | | |
| a. A noticeable increase in the rate of use of any natural resources? | ____ | ____ | V |
| b. Substantial depletion of any nonrehewable natural resources? | ____ | ____ | V |
| 9. RISK OF UPSET. Will the proposed project result in: | | | |
| a. Arisk of an explosion or the release of hazardous substances including but not limited to oil,pesticides, chemicals or radiation,in the event of an accident or upset conditions? | ____ | ____ | V |
| b. Possible interference with an emergency response plan? | ____ | ____ | V |
| 10. POPULATION. Will the proposed project result in: | | | |
| a. Changes in existing housing or create a demand for additional housing? | ____ | ____ | V |

| | YES | MAYBE | NO |
|---|---|---|---|
| 11. HOUSING. Will the proposed project result in: | | | |
| a. Changes in existing housing or create a demand for additional housing? | ____ | ____ | V |
| 12. TRANSPORTATION. Will the proposed project result in: | | | |
| a. Generation of substantial additional vehicular movement? | ____ | ____ | V |
| b. Substantial impact on roads and existing transportation system? | ____ | ____ | V |
| c. Alteration to present patterns of movement of people and/or goods? | ____ | ____ | V |
| 13. PUBLIC SERVICES. Will the proposed project effect or result in the need for new or altered services in the following areas: | | | |
| a. Police or fire protection? | ____ | ____ | V |
| b. Schools? | ____ | ____ | V |
| c. Parks or other recreational facilities? | ____ | ____ | V |
| d. Hospital? | ____ | ____ | V |
| e. Other government services? | ____ | ____ | V |
| 14. UTILITIES. Will the proposed project result in the need for new systems,or substantial changes in the following: | | | |
| a. Power? | ____ | ____ | V |
| b. Communications? | ____ | ____ | V |
| c. Water? | ____ | ____ | V |
| d. Sewage Disposal? | ____ | ____ | V |
| e. Solid water disposal? | ____ | ____ | V |

| | YES | MAYBE | NO |
|---|---|---|---|
| 15. HUMAN HEALTH. Will the proposed project result in: | | | |
| a. Creation of any health hazard or potential health hazard? | | | V |
| b. Improvement of human health? | | | V |
| 16. AESTHETICS. Will the proposed result in: | | | |
| a. Obstruction of any scenic vista? | | | V |
| 17. RECREATION. Will the proposed project result in: | | | |
| a. Changes in the quality or amount of existing recreational opportunities? | | | V |
| 18. CULTURAL RESOURCES. Will the proposed project result in: | | | |
| a. Alteration or destruction of archaeolgical sites? | | | V |
| b. Adverse physical or aesthetic effects to a historic site? | | | V |
| c. Potential to cause a physical change which would affect unique cultural values? | | | V |
| d. Restriction of existing religious or sacred uses within the affected area? | | | V |

19. Others(please specify)

Be in need of protect ection of (turbidity) during the dreding.

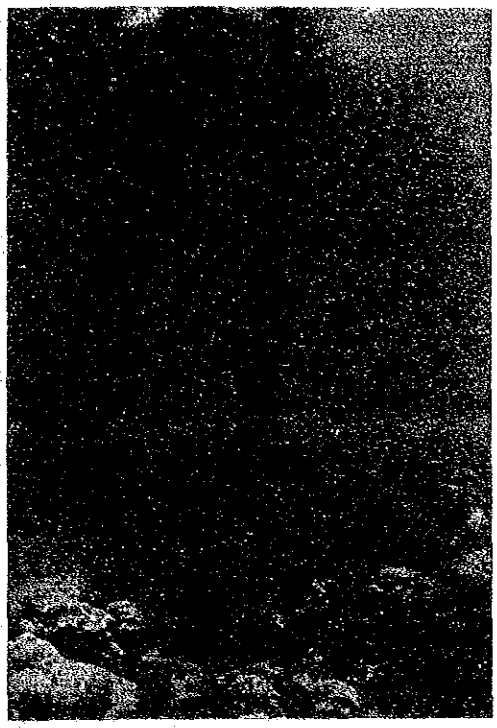
Results of Heavy Metal Analysis for Seabed Materials

Unit : ng/l (Migration Test)

| Heavy Metal | St.A | St.B |
|---|---|---|
| Cd | N.D. | N.D. |
| CN | N.D. | N.D. |
| O-P | N.D. | N.D. |
| Pb | N.D. | N.D. |
| Cr | N.D. | N.D. |
| As | N.D. | N.D. |
| T-Hg | N.D. | N.D. |
| R-Hg | N.D. | N.D. |
| PCB | N.D. | N.D. |
| Cu | N.D. | N.D. |
| Zn | N.D. | N.D. |
| F | N.D. | N.D. |

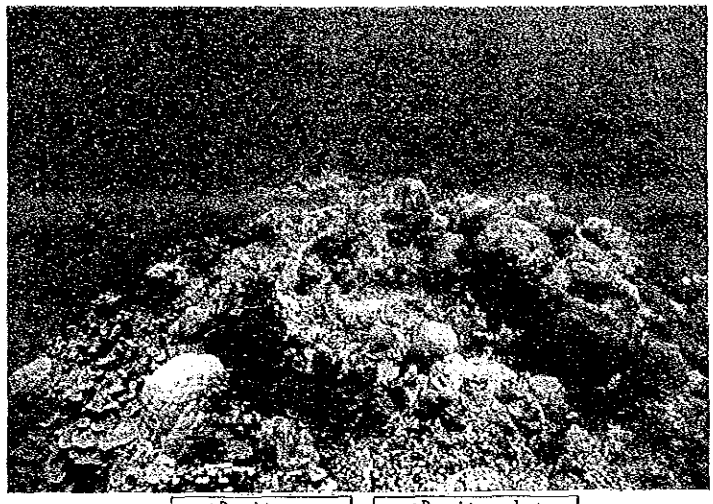
*N.D. means under the Critical Value

St. 1 cover degree : 90%



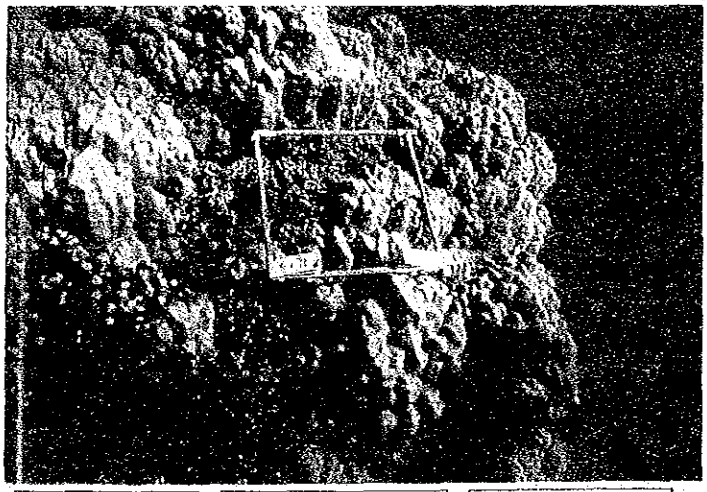
↑:THE UPPER PART
↓:THE LOWER PART
○:THE CENTER
←:THE LEFT SIDE
→:THE RIGHT SIDE

[2m depth]

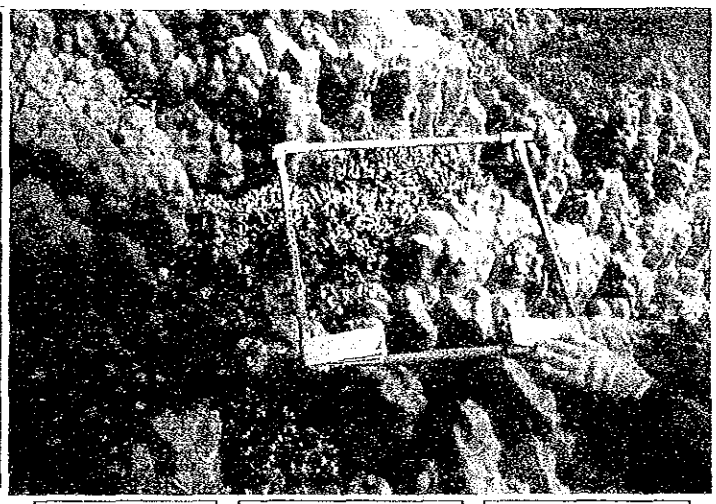


←:Porites rus →:Porites lutea

[4m depth]



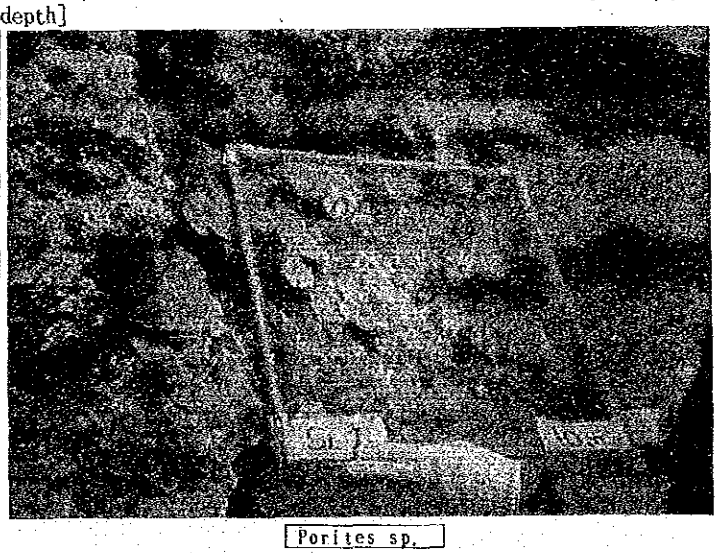
←:Porites rus ○:Acroporidae sp. →:Porites lutea



←:Porites rus ○:Acroporidae sp. →:Porites lutea

[10m depth]

Porites sp.

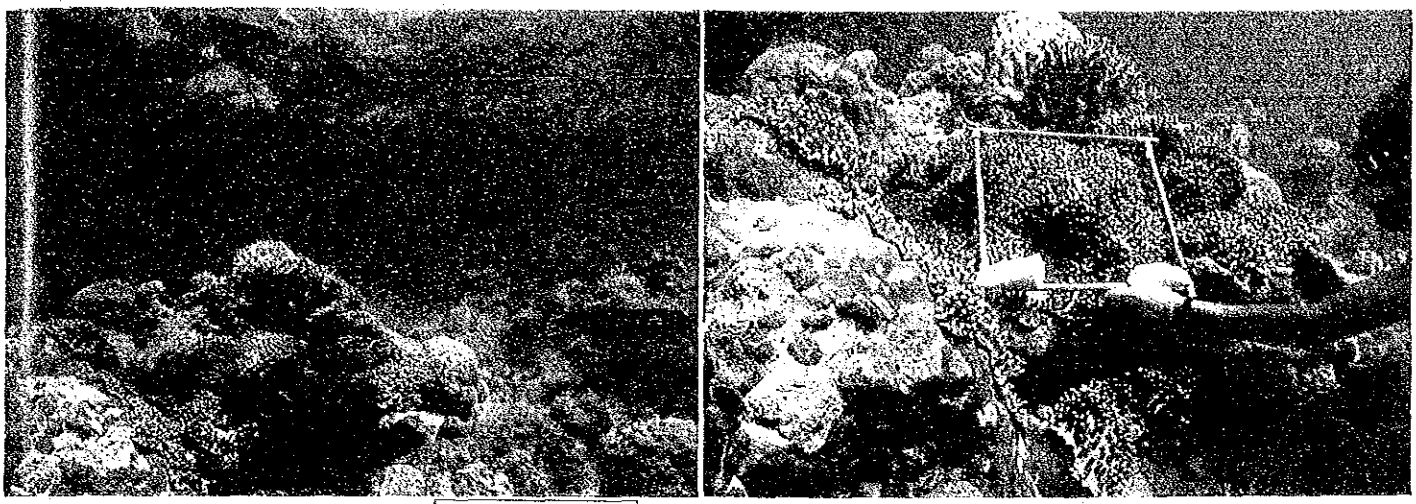


Porites sp.

Fig. (1) The observation results of living corals [St.1]
(cover degree and main dominant species of living corals at station 1.)

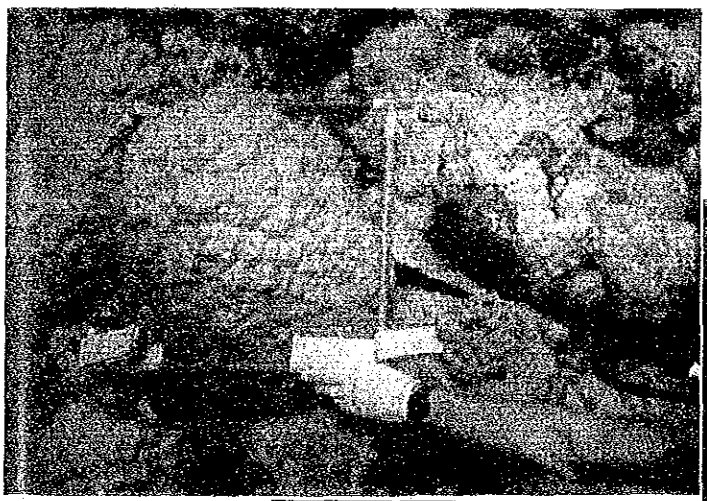
St. 5　　cover degree : 60%

[2m depth]



→:Porites lutea

[4m depth]

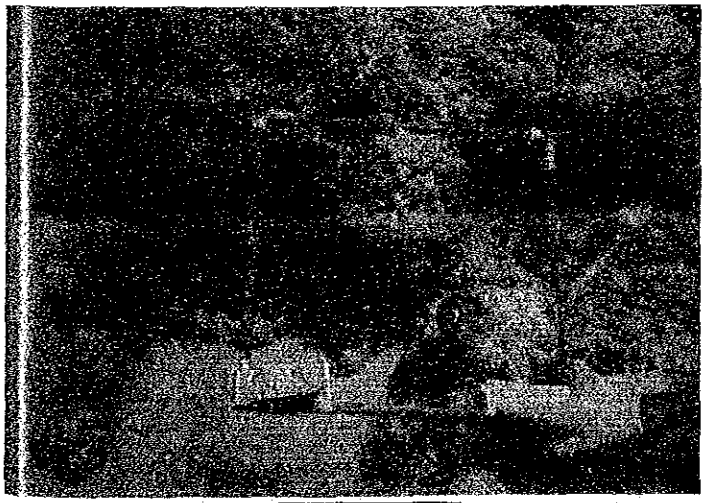


Porites lutea

[6m depth]

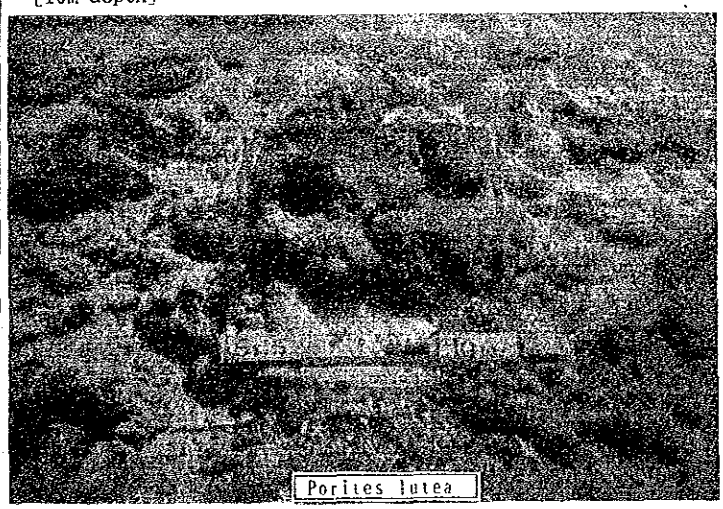
Porites lutea

[8m depth]



Porites lutea

[10m depth]



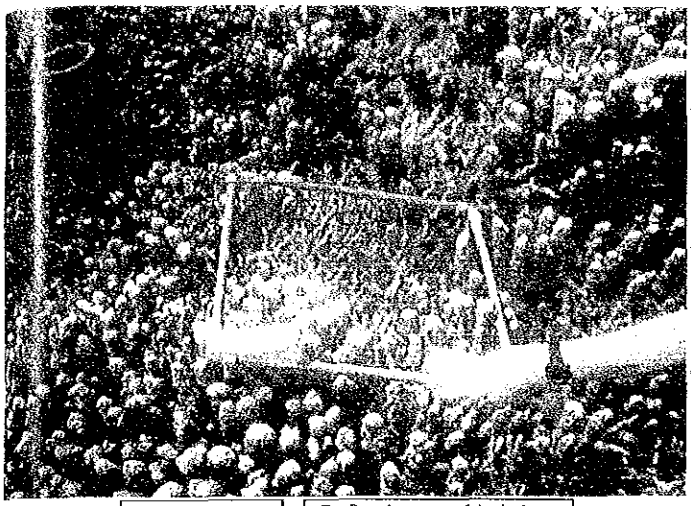
Porites lutea

Fig.　(2) The observation results of living corals [St.5]

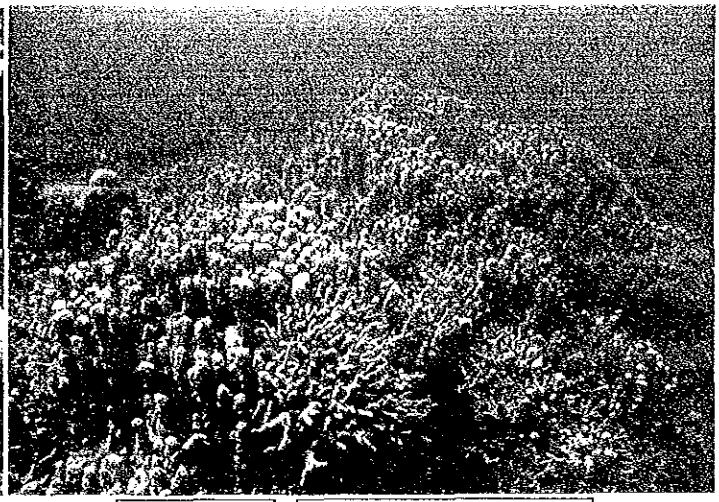
(cover degree and main dominant species of living corals at station 5.)

St. 8　　cover degree : 70%

[2m depth]

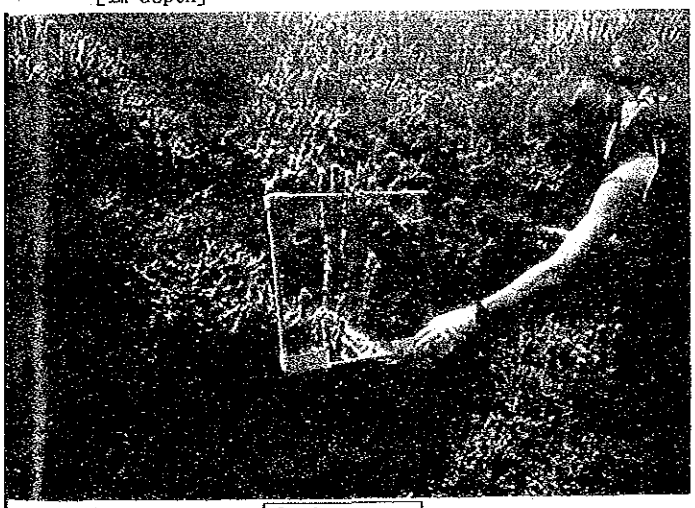


Porites rus　○:Porites cylindrica



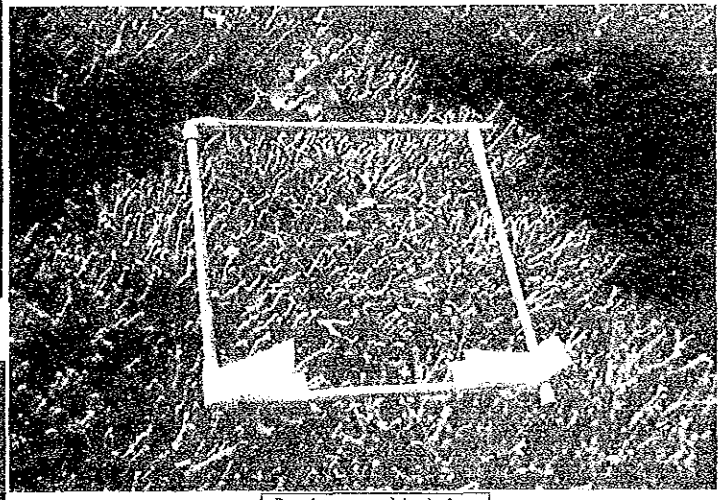
Porites rus　○:Porites cylindrica

[4m depth]



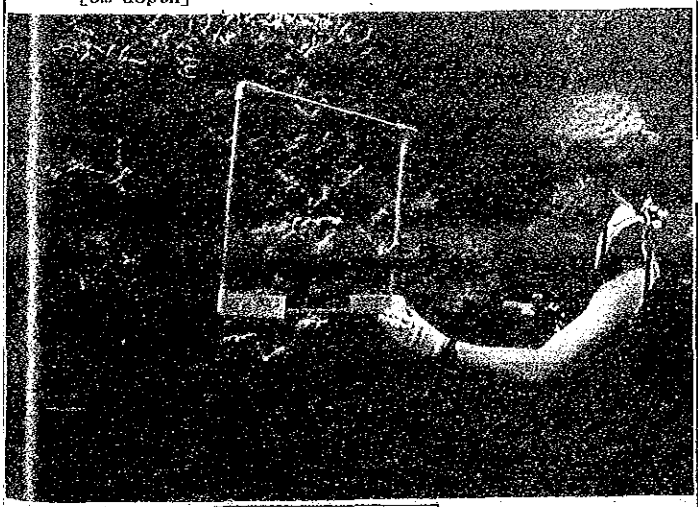
Porites rus

[6m depth]



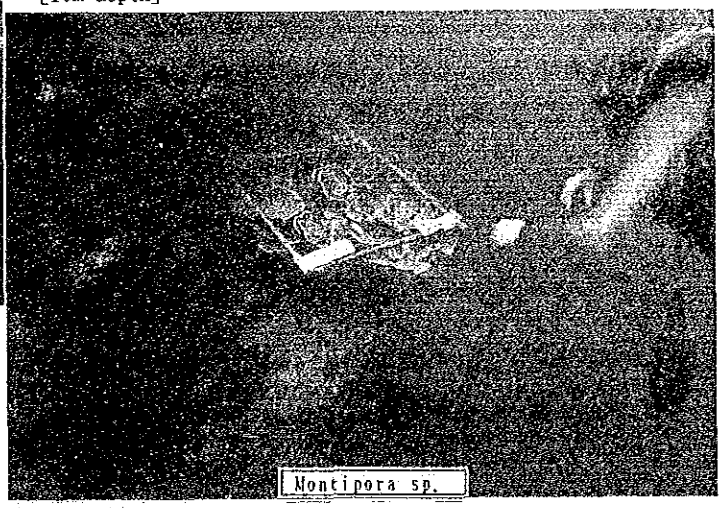
Porites cylindrica

[8m depth]



Porites cylindrica

[10m depth]



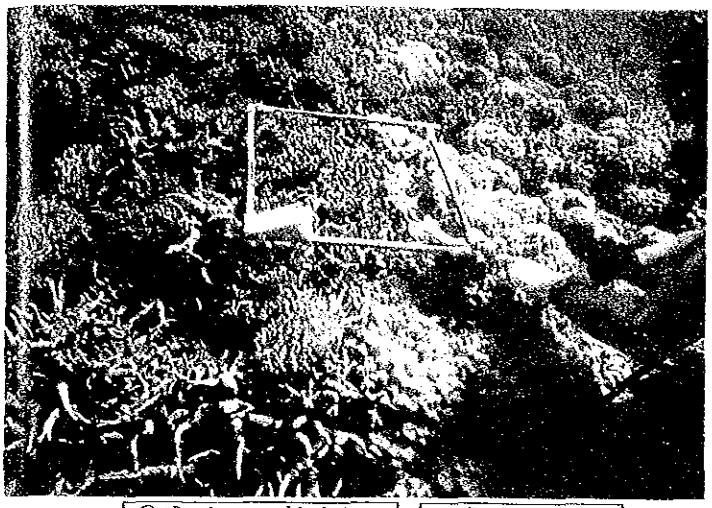
Montipora sp.

Fig.　(3)　The observation results of living corals [St.8]

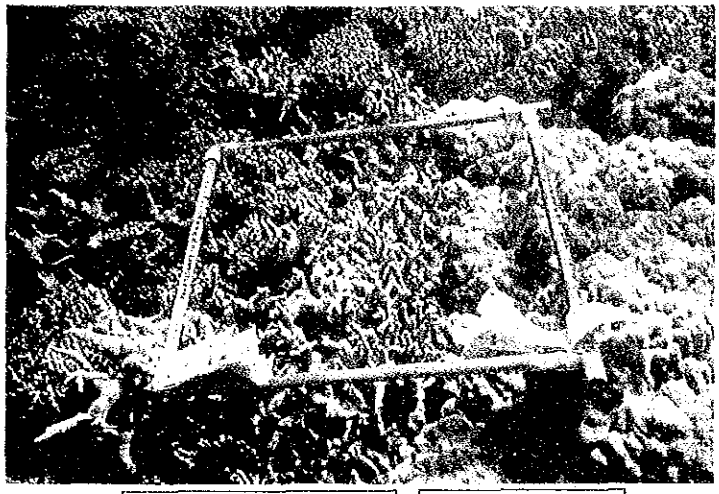
(cover degree and main dominant species of living corals at station 8.)

St. 11　　cover degree : 90%

[2m depth]

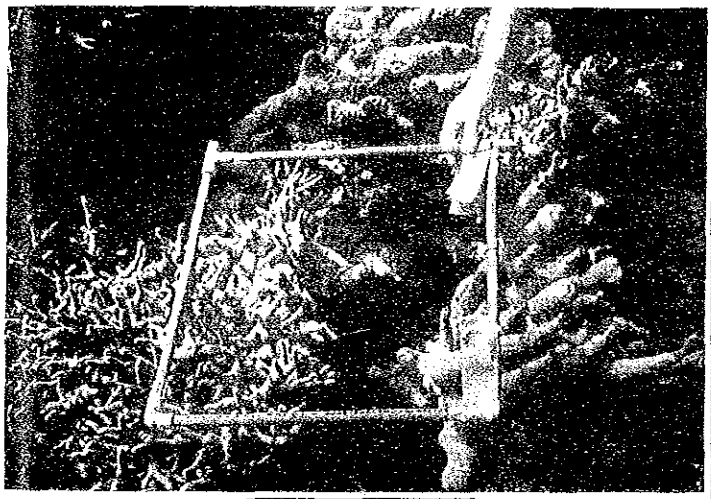


○:Porites cylindrica　→:Porites lutea



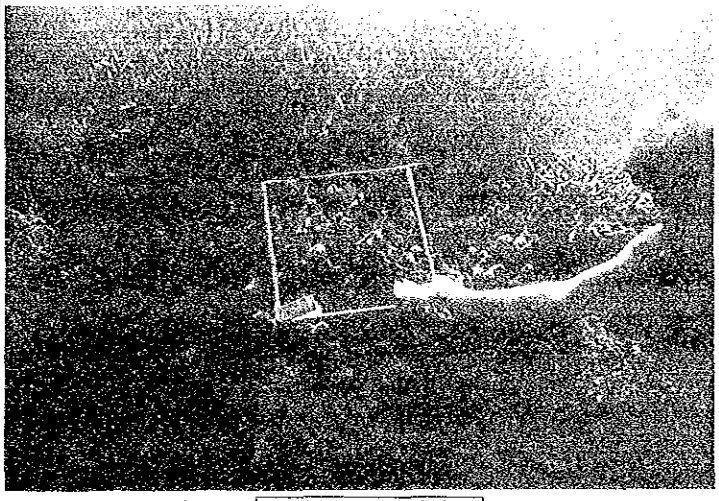
○:Porites cylindrica　→:Porites lutea

[4m depth]



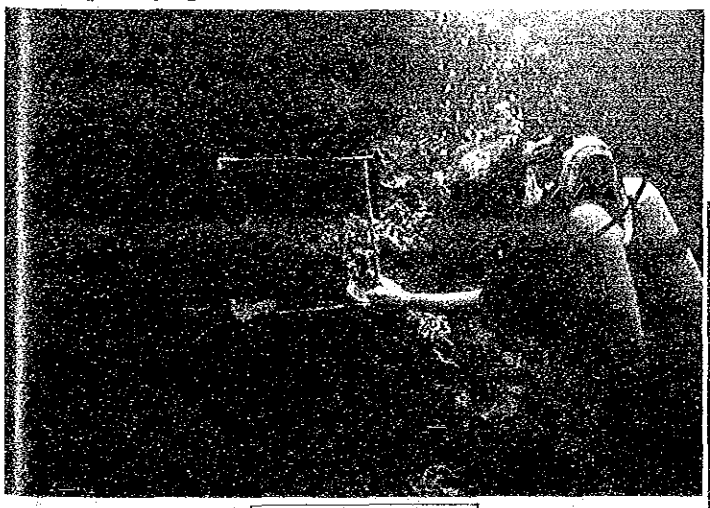
Porites cylindrica

[6m depth]



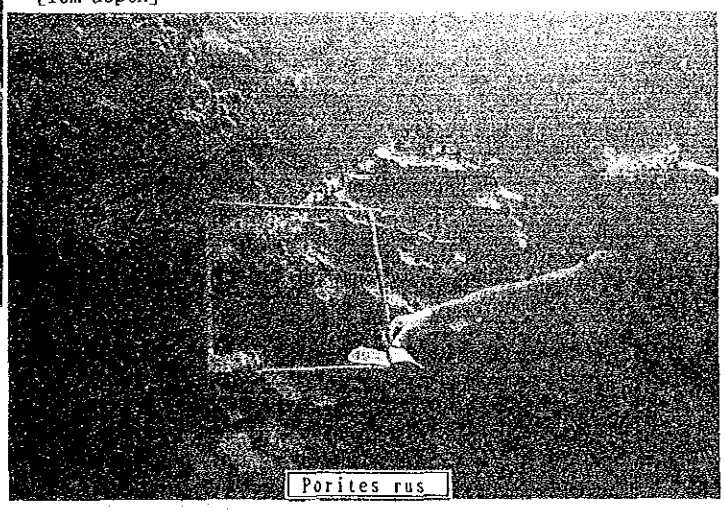
Porites cylindrica

[8m depth]



Porites cylindrica

[10m depth]



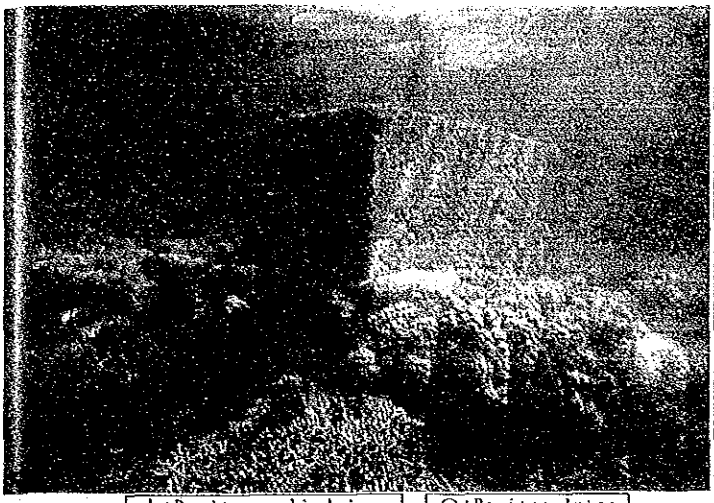
Porites rus

Fig.　(4)　The observation results of living corals [St.11]

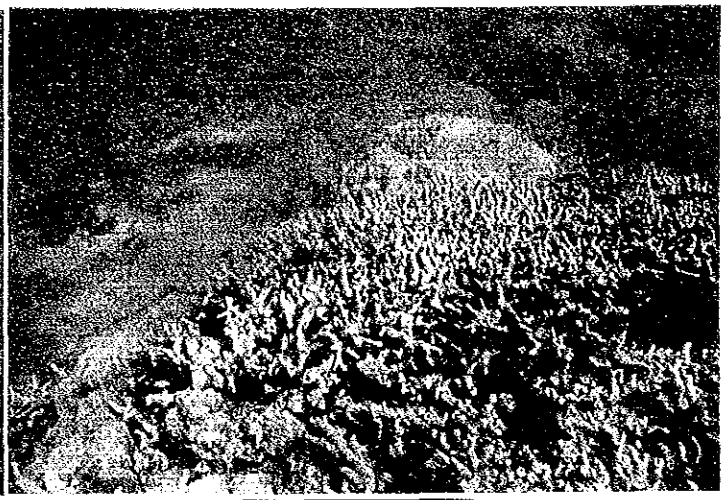
(cover degree and main dominant species of living corals at station 11.)

St. 13　　cover degree : 90%

[2m depth]

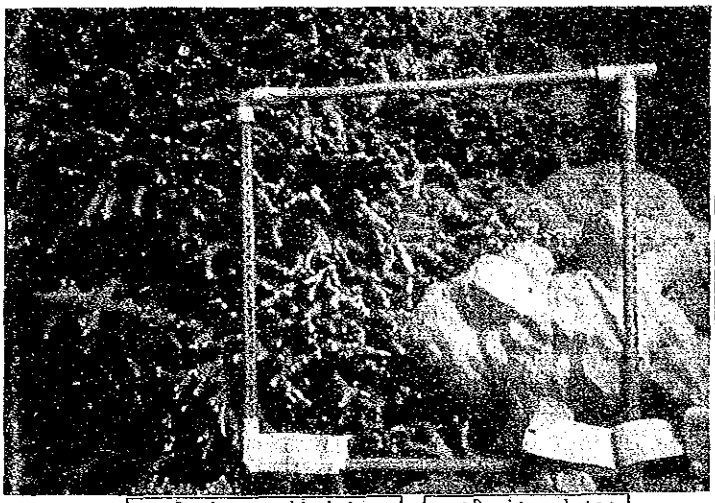


↓:Porites cylindrica　○:Porites lutea



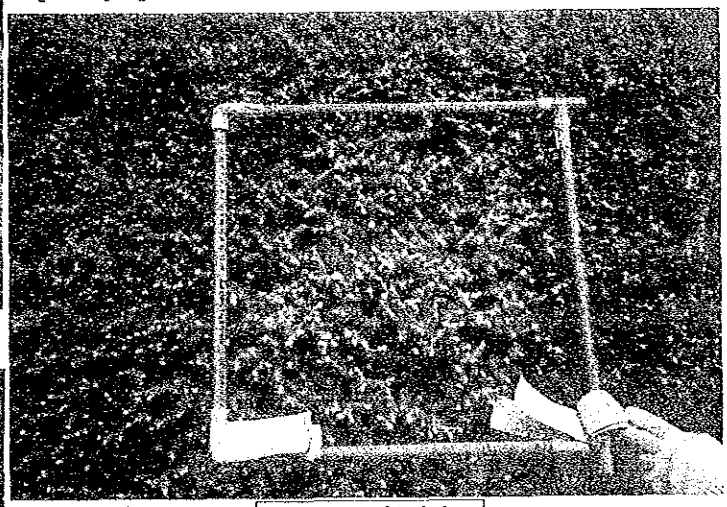
Porites cylindrica

[4m depth]



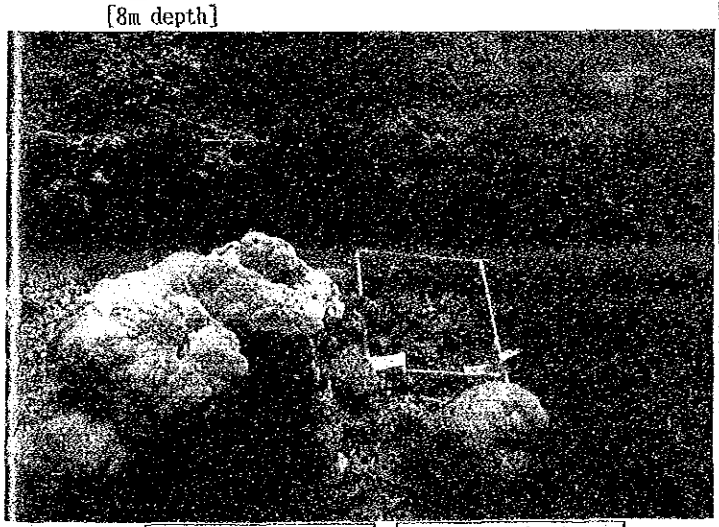
←:Porites cylindrica　→:Porites lutea

[6m depth]



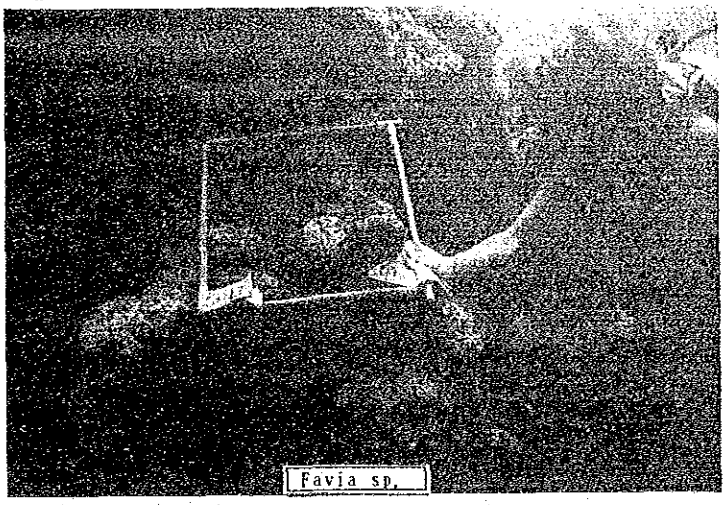
Porites cylindrica

[8m depth]



←↓:Porites lutea　Porites cylindrica

[10m depth]



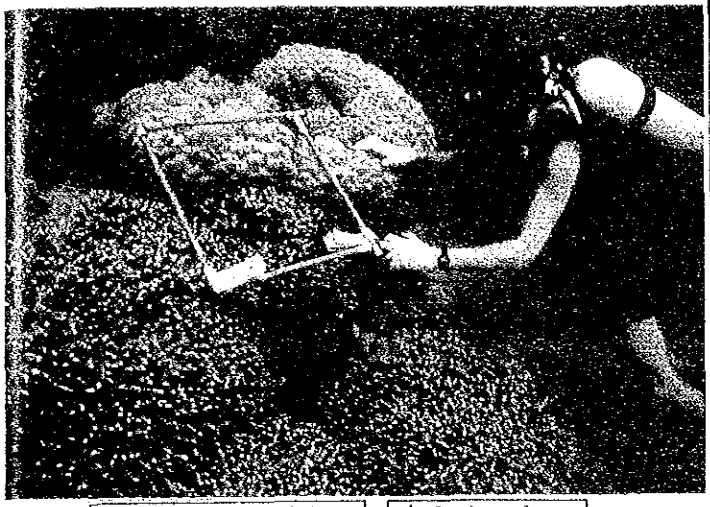
Favia sp.

Fig.　(5)　The observation results of living corals [St.13]

(cover degree and main dominant species of living corals at station 13.)

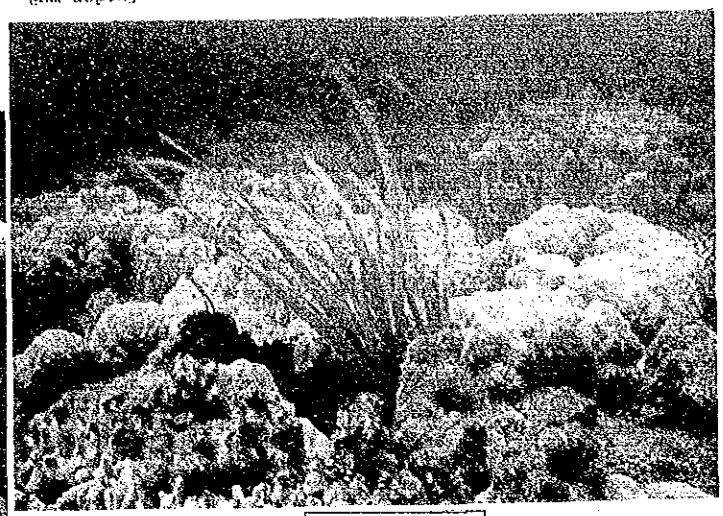
St. 14 cover degree : 60%

[2m depth]



↓:Porites cylindrica ↑:Porites lutea

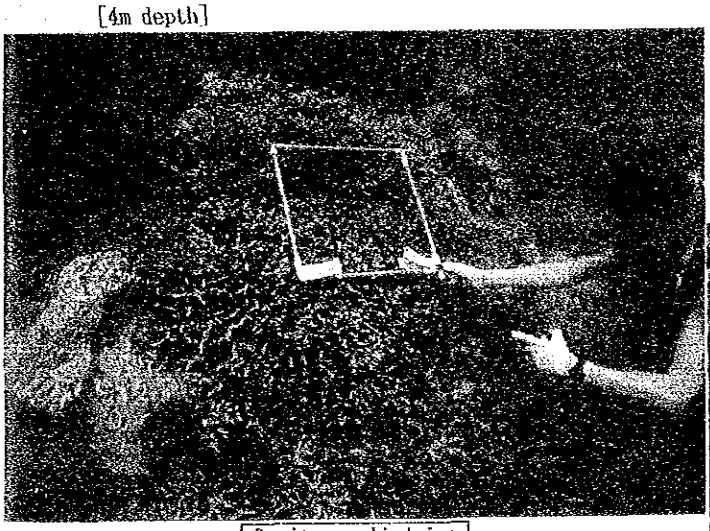
[2m depth]



Porites lutea

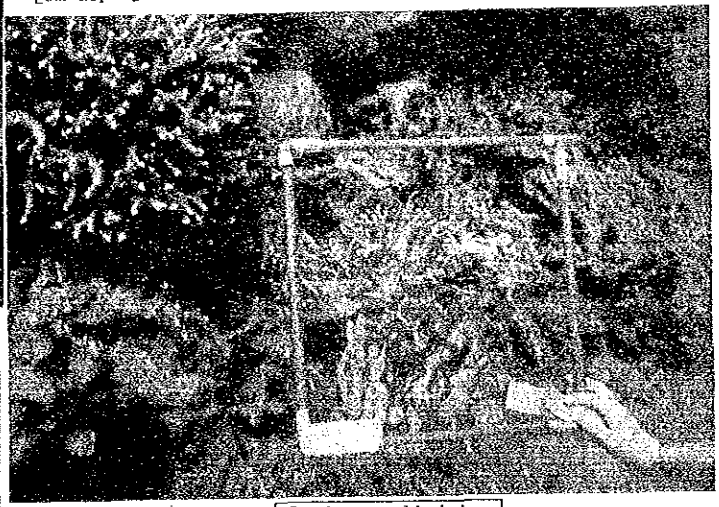
sea grass:Enhalus acoroides

[4m depth]



Porites cylindrica

[6m depth]

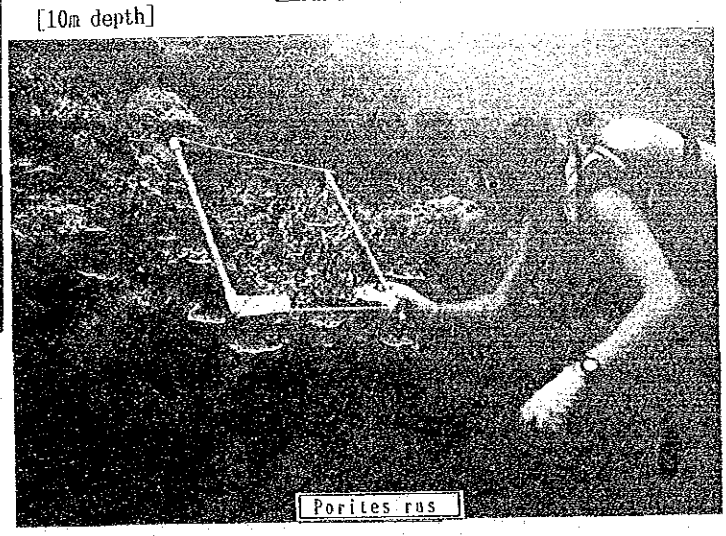


Porites cylindrica

[8m depth]

Porites lutea

[10m depth]



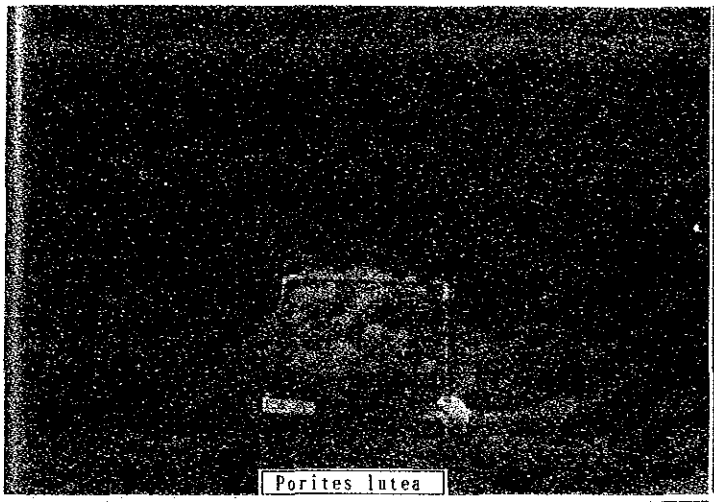
Porites sp.

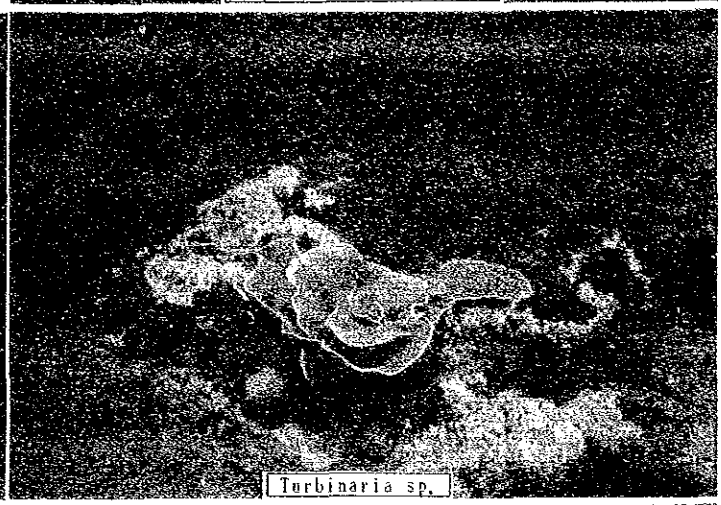
Fig. (6) The observation results of living corals [St.14]

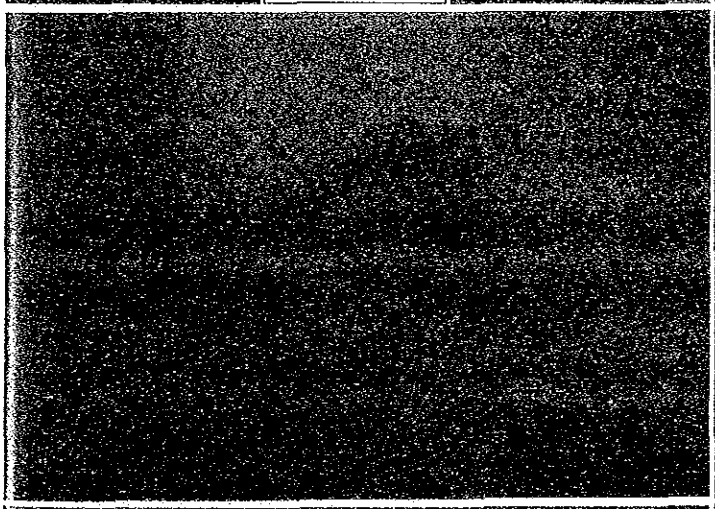
(cover degree and main dominant species of living corals at station 14.)

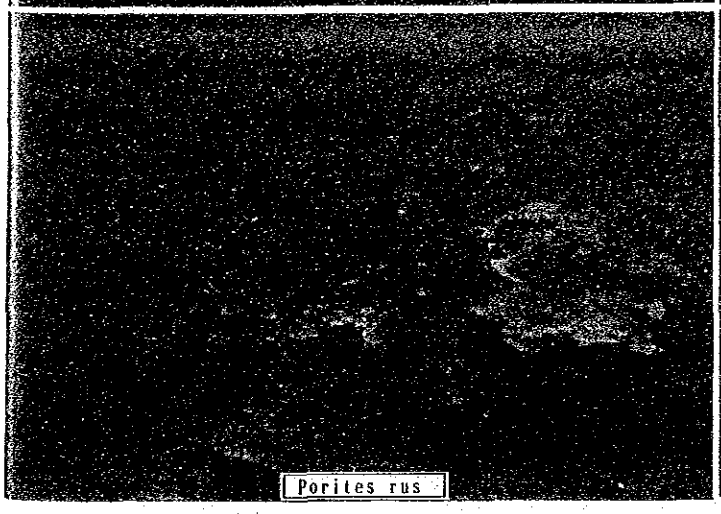
St. A　　cover degree : 90%

[The depth of the shallowest area is about 10-12m]



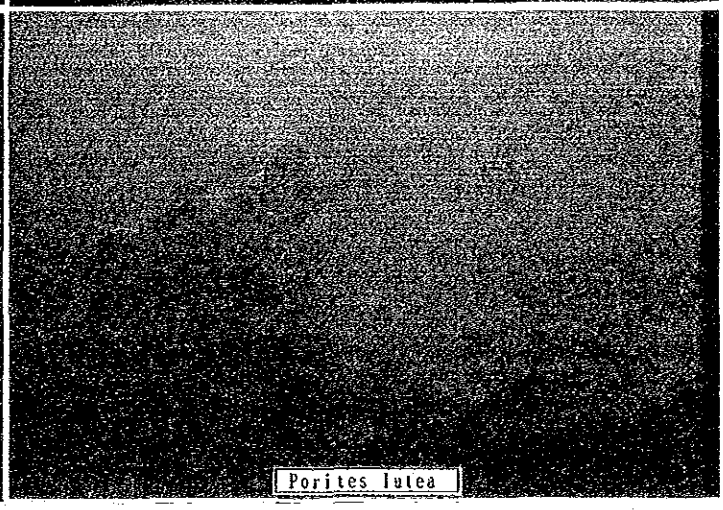




Fig.　(7)　The observation results of living corals [St.A]

(cover degree and main dominant species of living corals at station A.)

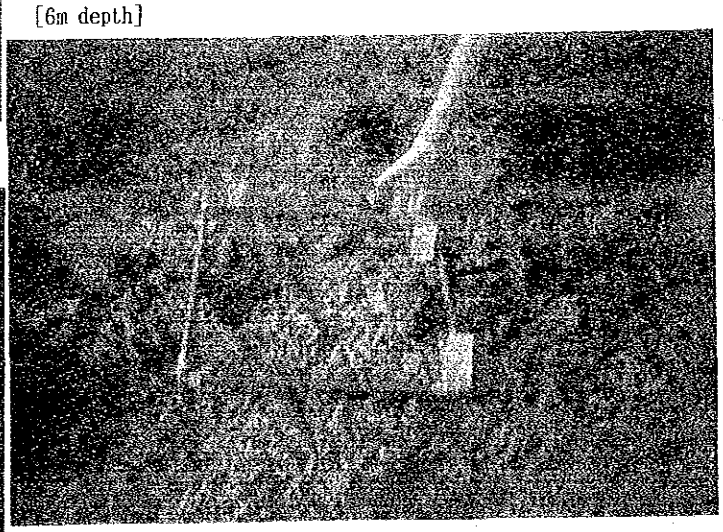
St. B　　cover degree : 10%

[2m depth]

sea grass:Thalassia hemprichii

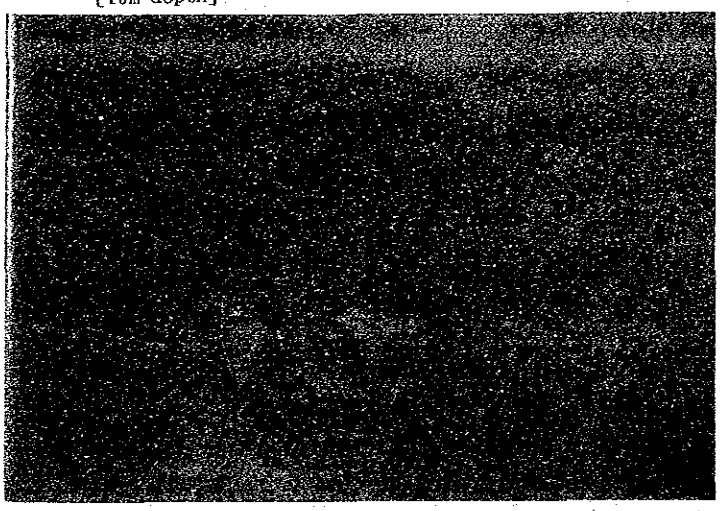
[4m depth]


[6m depth]



[8m depth]


[10m depth]



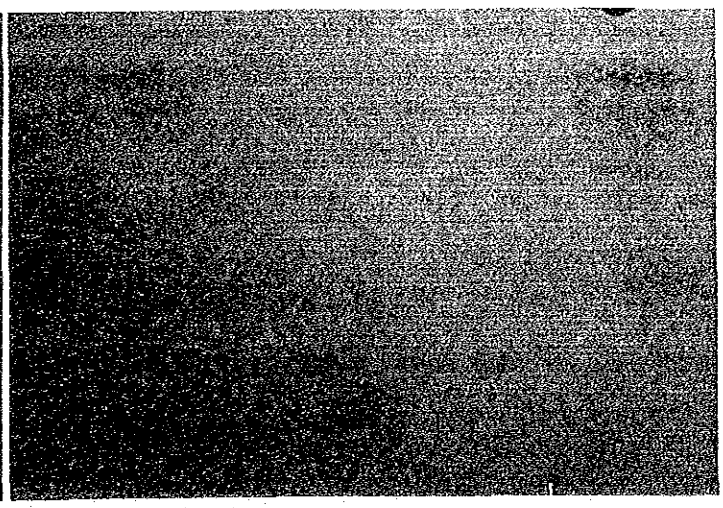
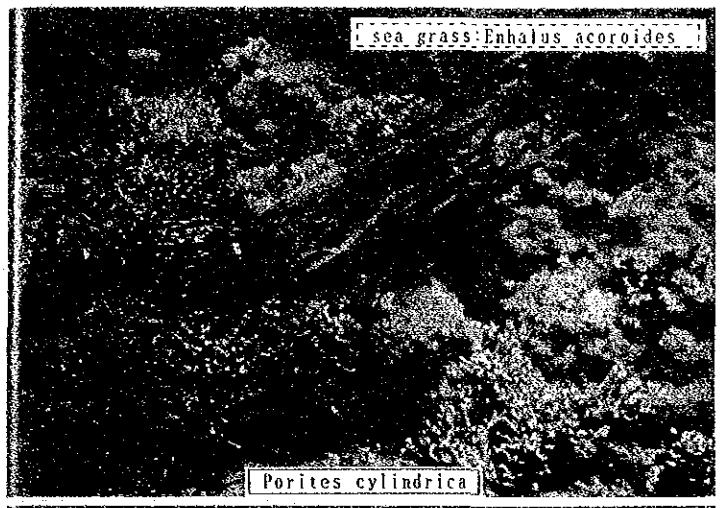


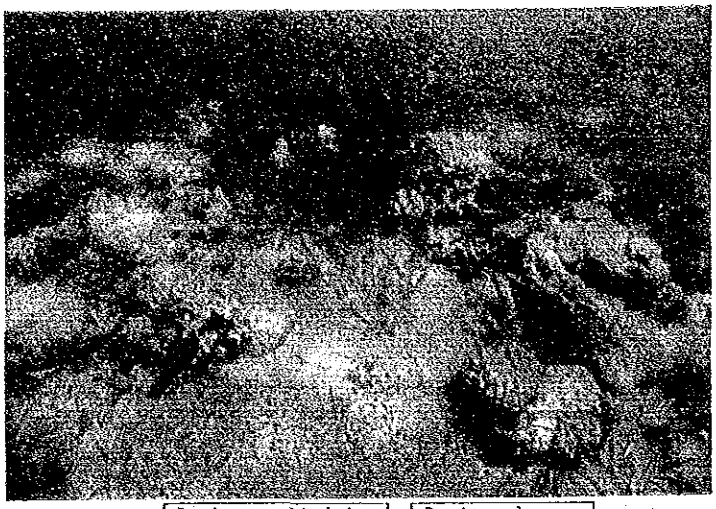
Fig.　(8)　The observation results of living corals [St.B]

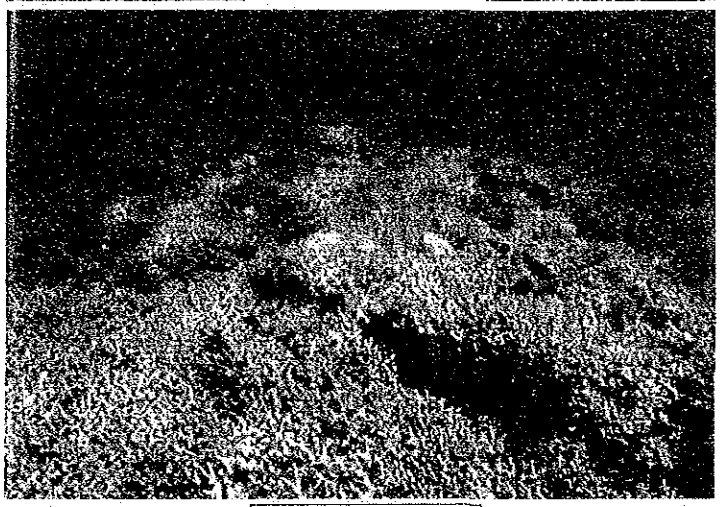
(cover degree and main dominant species of living corals at station B.)

St. R　　cover degree : 70%

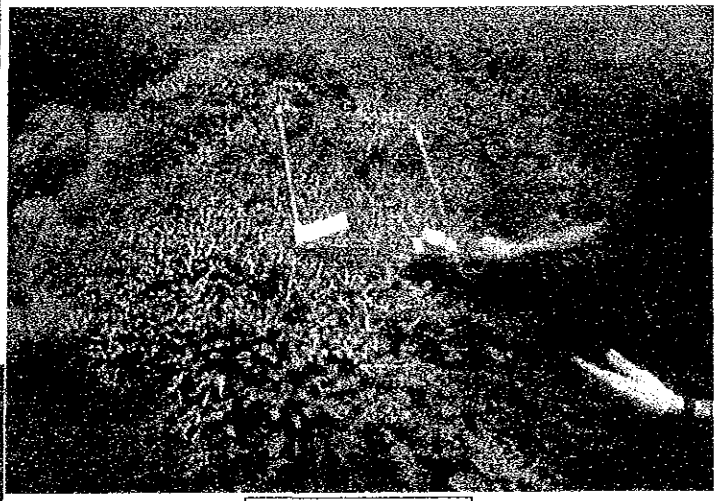
[<2m depth]




[2m depth]




[6m depth]


[10m depth]

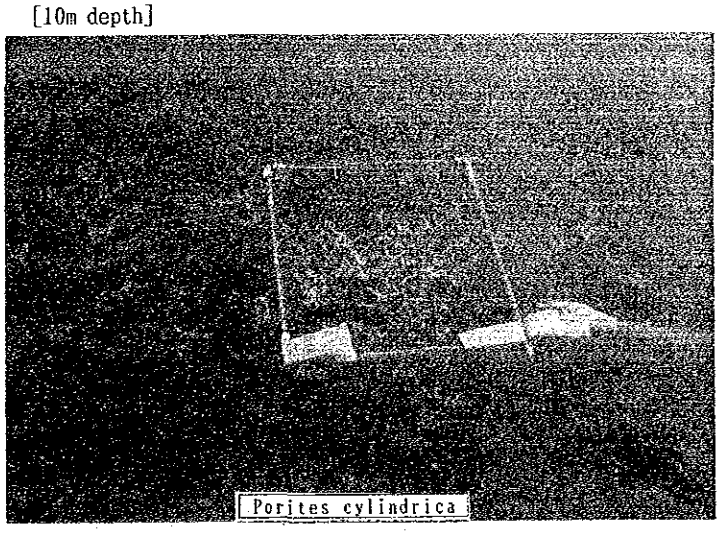



Fig.　(9)　The observation results of living corals [St.R]

(cover degree and main dominant species of living corals at station R.)

St. L　　cover degree : 70%

[<2m depth]

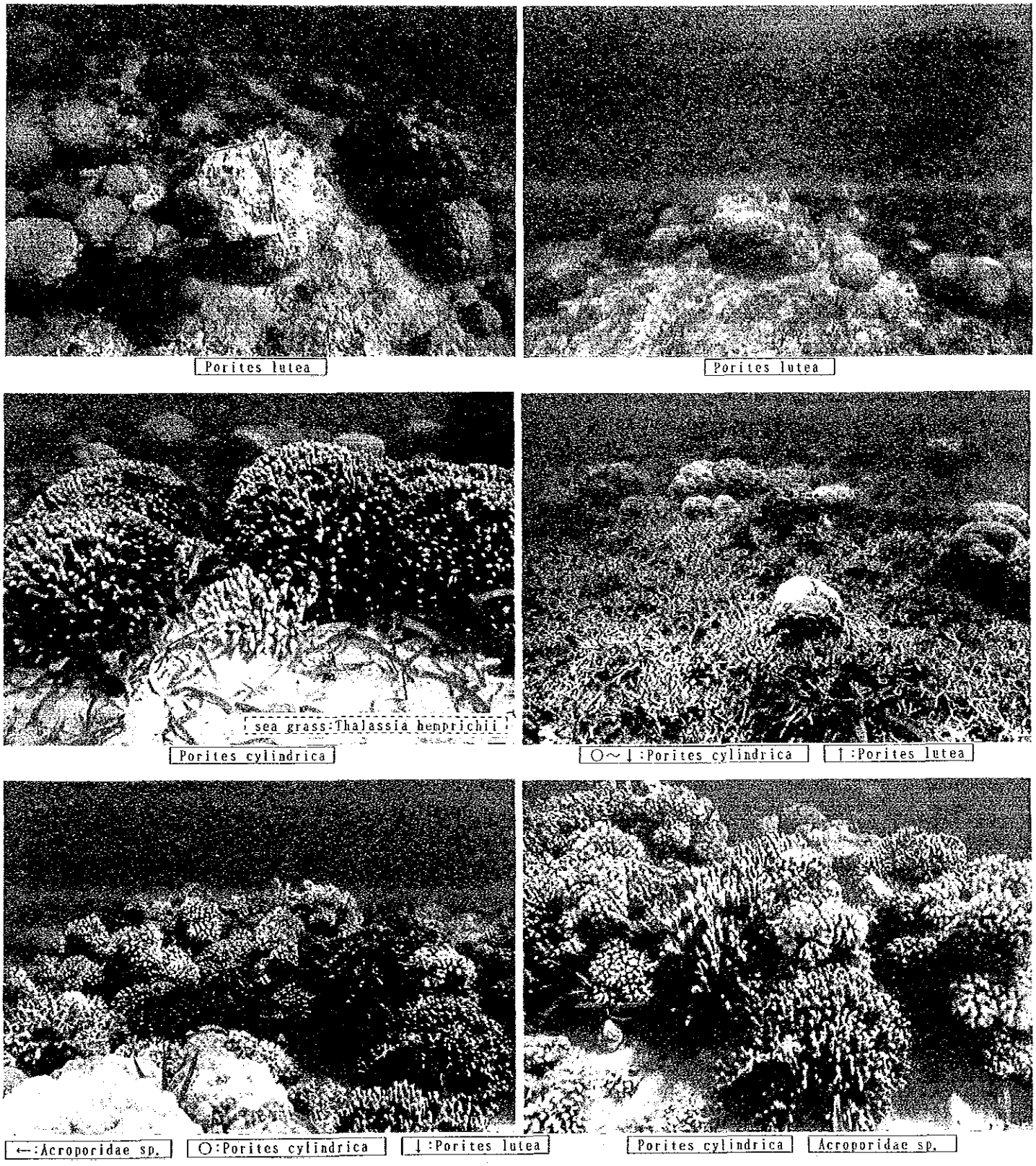



Fig.　(10)　The observation results of living corals [St.L]

(cover degree and main dominant species of living corals at station L.)

JICA