Integrating Coral Reef Ecosystem Integrity and Restoration Options with Watershed-based activities and MPA's in the Tropical Pacific Islands

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1. To characterize watershed discharges affecting coastal reefs chemically, temporally and spatially.

2. To determine the classes and concentrations of pollutants of greatest concern to coral reef sustainability and provide quantitative data for revising regional water quality standards.

3. To develop protocols that can identify sublethal stress in corals, before outright mortality occurs, and make these available to management agencies throughout the Pacific Islands.

4. To determine if coral reef recovery and restoration activities are practical following both anthropogenic and natural disturbances, and the sequence of watershed management practices that must precede or parallel reef restoration attempts.

5. To determine the efficacy of MPA's, in concert with watershed management practices, in conserving spawning stock biomass and supplying commercially and ecologically important species to impacted reefs.

6. To quantify the cultural and economic impacts of land-based developments that affect coastal resources, and incorporate this information into the decision making process.

7. To develop educational materials for a variety of users and stakeholders, from traditional Chiefs to school children, and to provide opportunities for capacity-building among island resource managers and institutions.

8. To develop a set of recommendations to prevent damage to coral reef ecosystems, and when such occurs, mitigation measures than may be undertaken.


China
Taiwan
Tropic of Cancer
Luzon Strait
Northern Mariana Islands
South China Sea
Philippines
Luzon
Philippine Sea
Mindoro
Samar
Palawan
Panay
Sulu Sea
Mindanao
Malaysia
Celebes Sea
Brunei
Borneo
Sulawesi
Ceram
Indonesia
Java Sea
Flores
Sumba
Timor
Timor Sea
Ashmore and Cartier Islands (Australia)
Darwin
Dolak
Arafura Sea
Torres Strait
New Guinea
Papua New Guinea
Solomon Sea
Gulf of Carpentaria
Cairns
Townsville
Coral Sea
Coral Islands (Australia)
Tropic of Capricorn
Australia
Brisbane
Perth
Great Australian Bight
Adelaide
Canberra
Sydney
Melbourne
Tasman Sea
Norfolk Island (Australia)
Lord Howe Island
New Zealand
Auckland
North Island
South Pacific Ocean
Kermadec Islands
Saipan
Agana
Guam
Mariana Islands
Yap
Caroline Islands
Koror
Palau Islands
Palau
Federated States of Micronesia
Equator
Kolonia
Senyavin Islands
Marshall Islands
Marshall Islands
Wake Island (U. S.)
North Pacific Ocean
Johnston (U. S.)
Hawaiian Islands
Oahu
Honolulu
Maui
Hawaii
Kingman Reef (U. S.)
Palmyra Atoll (U. S.)
Howland Island (U. S.)
Baker Island (U. S.)
Jarvis
Kiritimati (Christmas
Gilbert Islands
Nauru
Banaba
Kiribati
Phoenix Islands
Malden
Starbuck
Nikumaroro (Gardner)
Nanumea
Niutao
Tuvalu
Solomon Islands
Nukufetau
Tokelau (N. Z.)
Tokelau Islands
Guadalcanal
Santa Cruz Islands
Northern Cook Islands
Wallis and Futuna (France)
Samoa
Samoa Islands
Wallis
Pago Pago
American Samoa
Cook Islands (New Zealand)
Vanuatu
Tonga
Niue (N.Z.)
Viti Levu
Tonga Islands
Fiji
Southern Cook Islands
New Caledonia (France)
New Caledonia
Cava-i-Ra

Approximately 30% of Reefs Have Been Negatively Impacted by Human Activities

Causes of Coral Reef Degradation

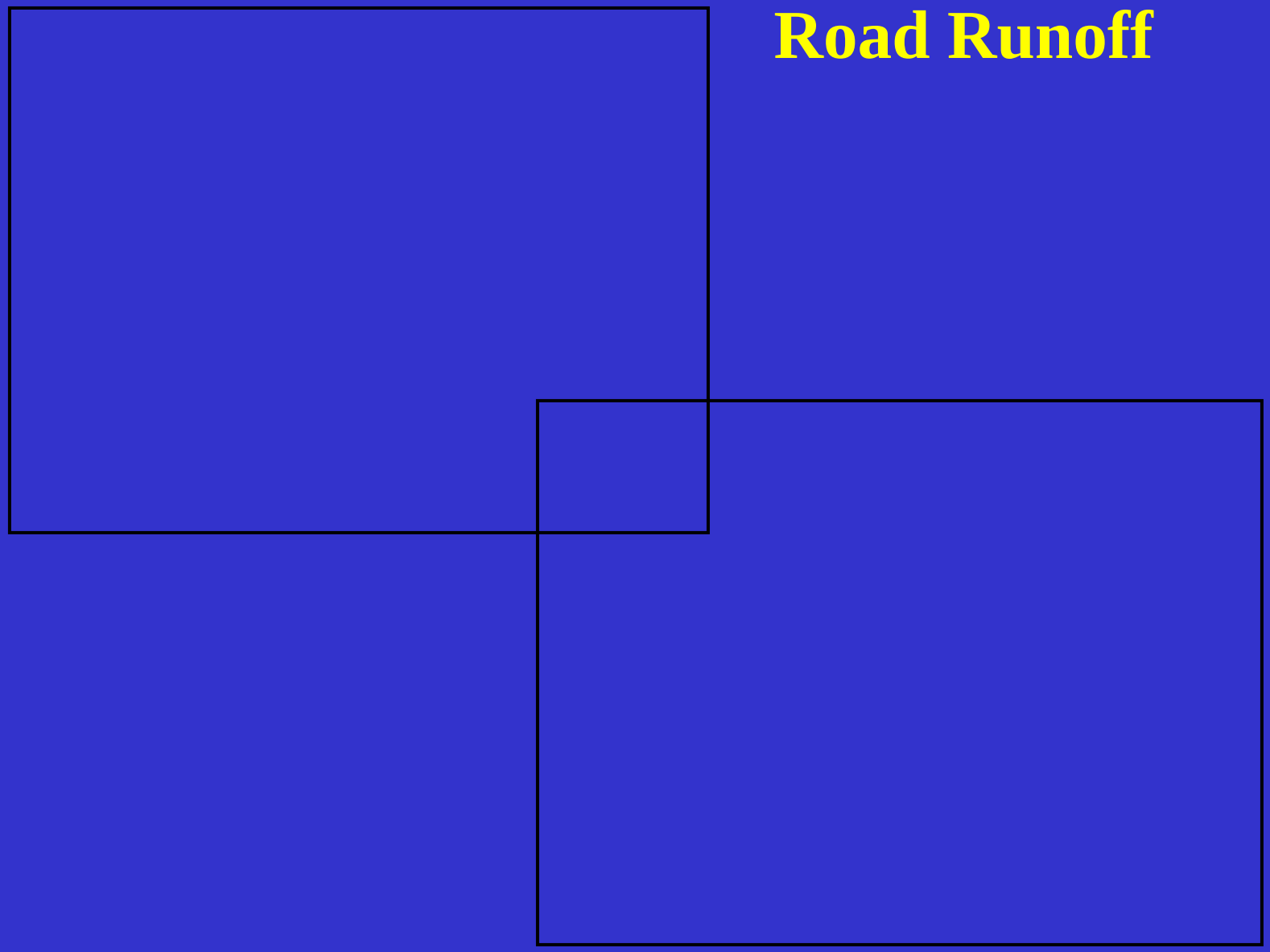
Erosion & Sedimentation

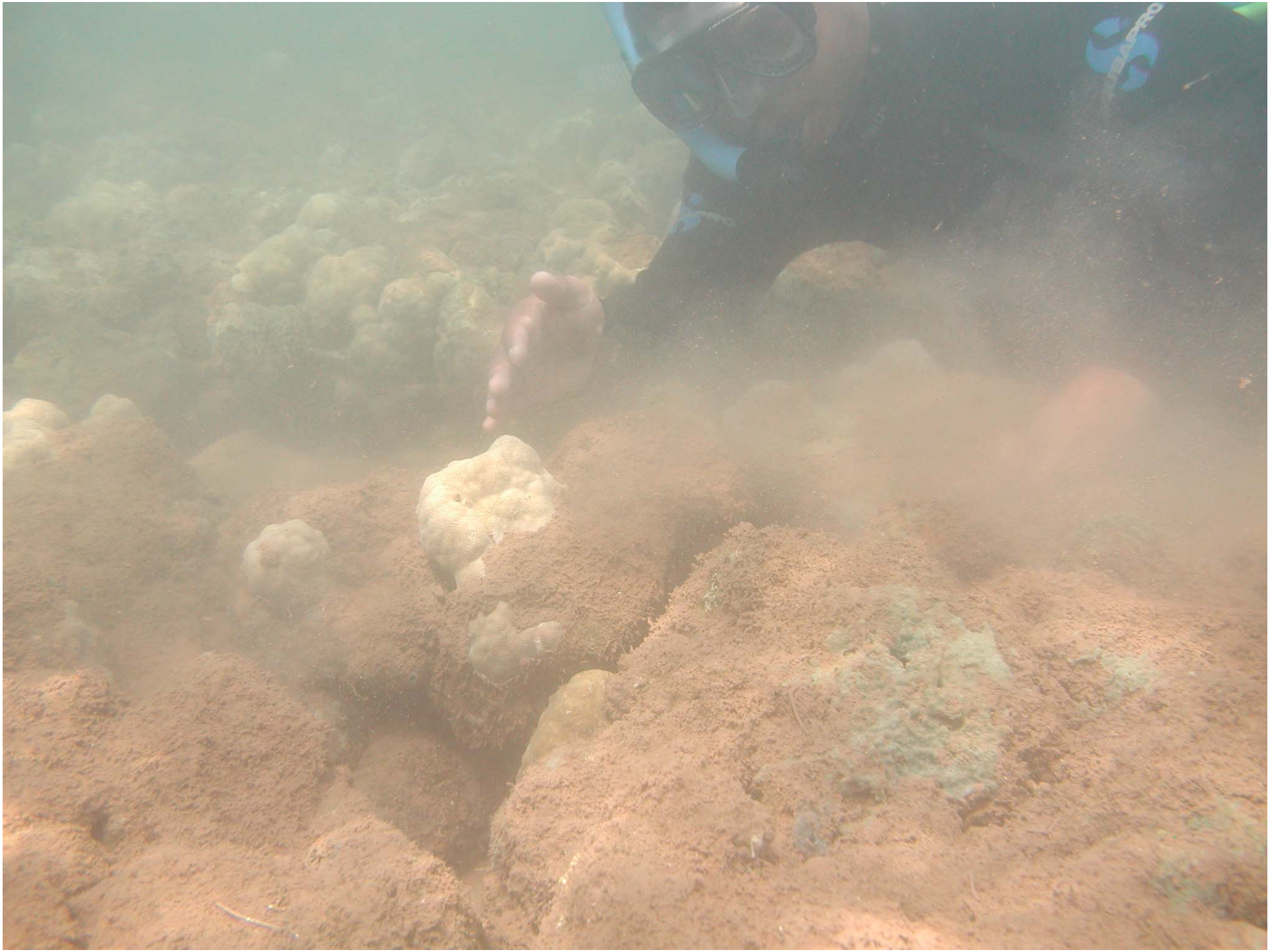
Overfishing

Coastal Pollution

Recreational Impacts

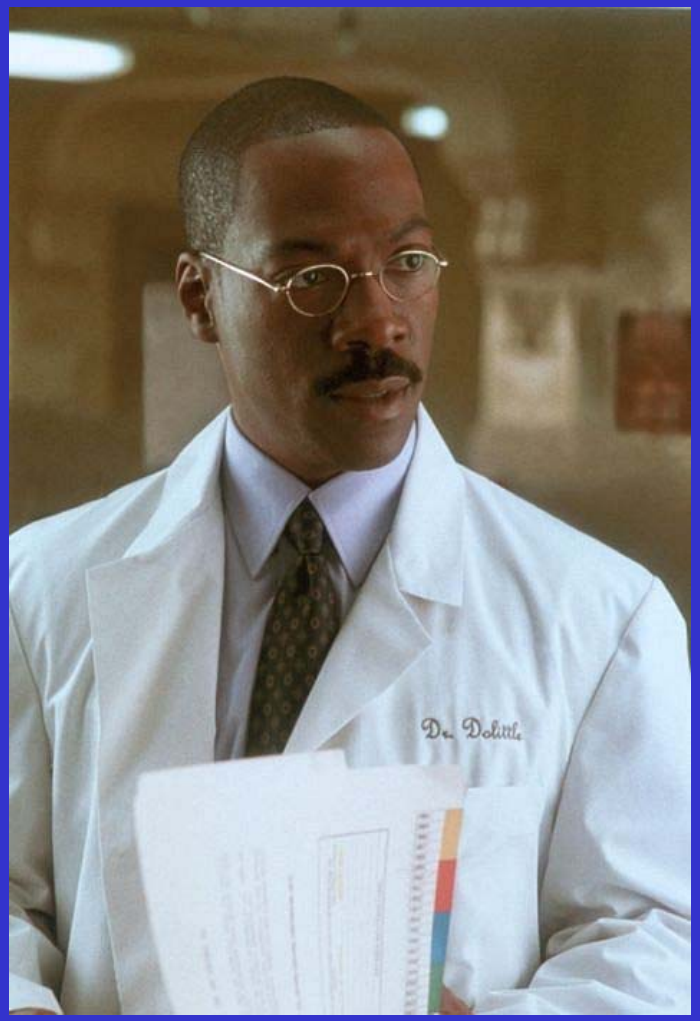
Road Runoff



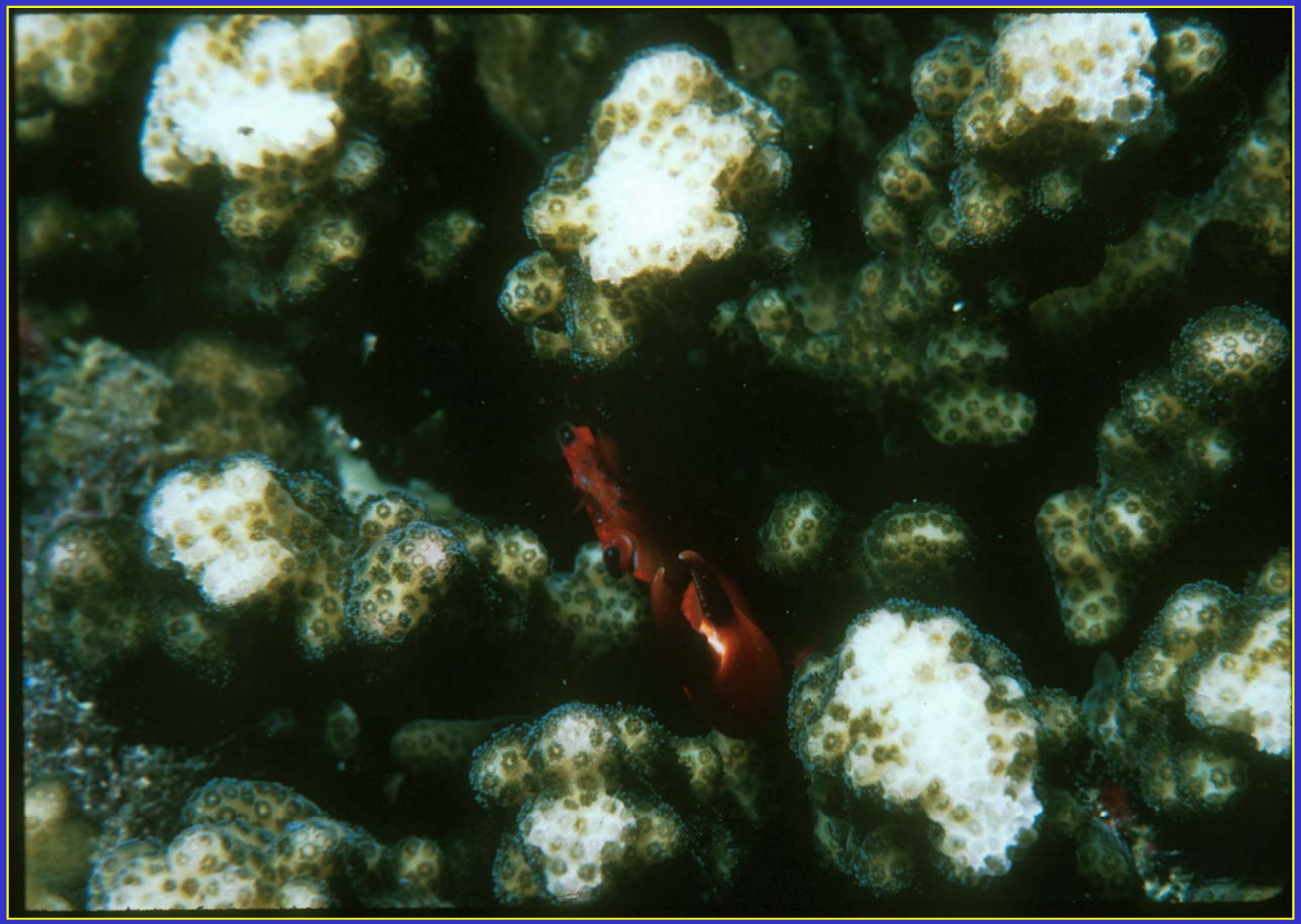


Reduced Coastal Quality: Water and Substratum

The Dr. Dolittle Approach: Talking to the animals, or more importantly, listening

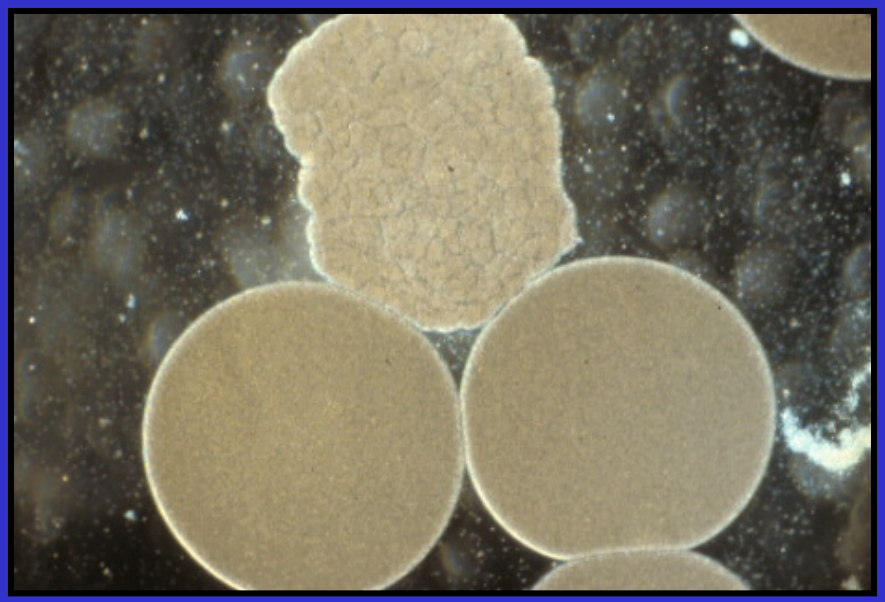


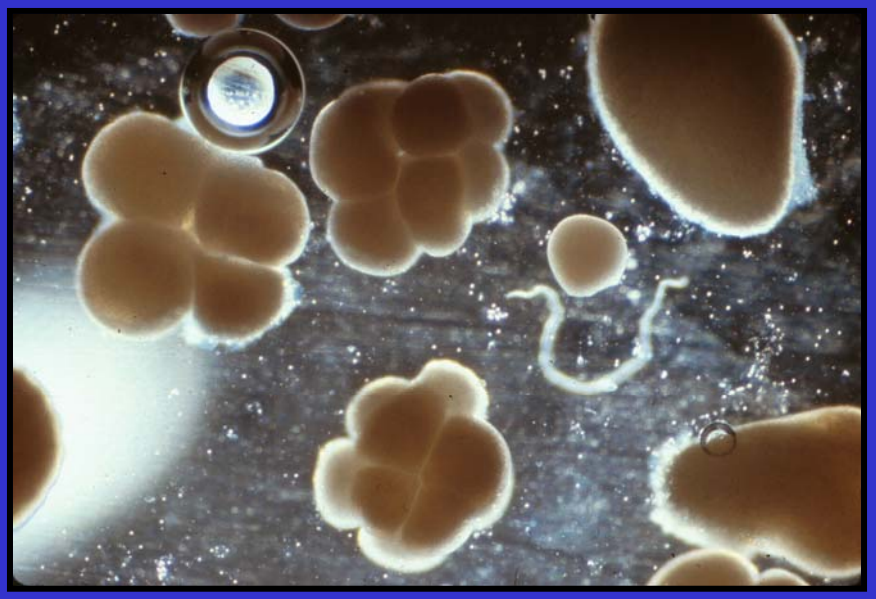
Symbiosis as a Means of Communication

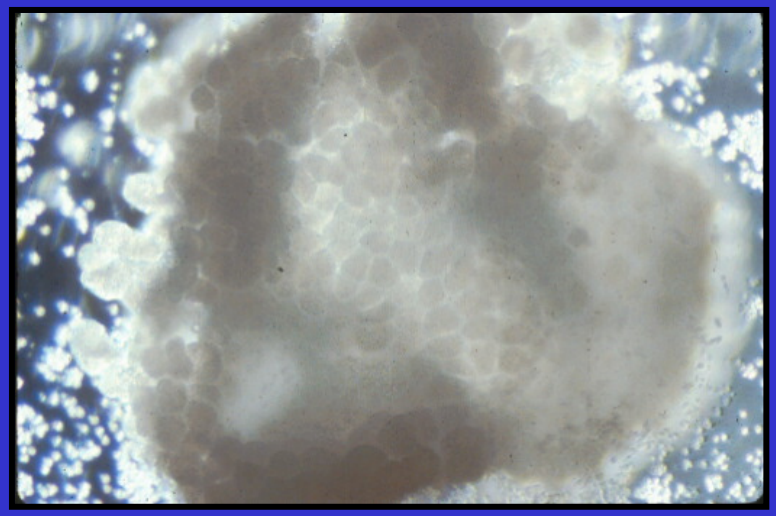


Egg – Sperm Interactions

REPRODUCTIVE FAILURE

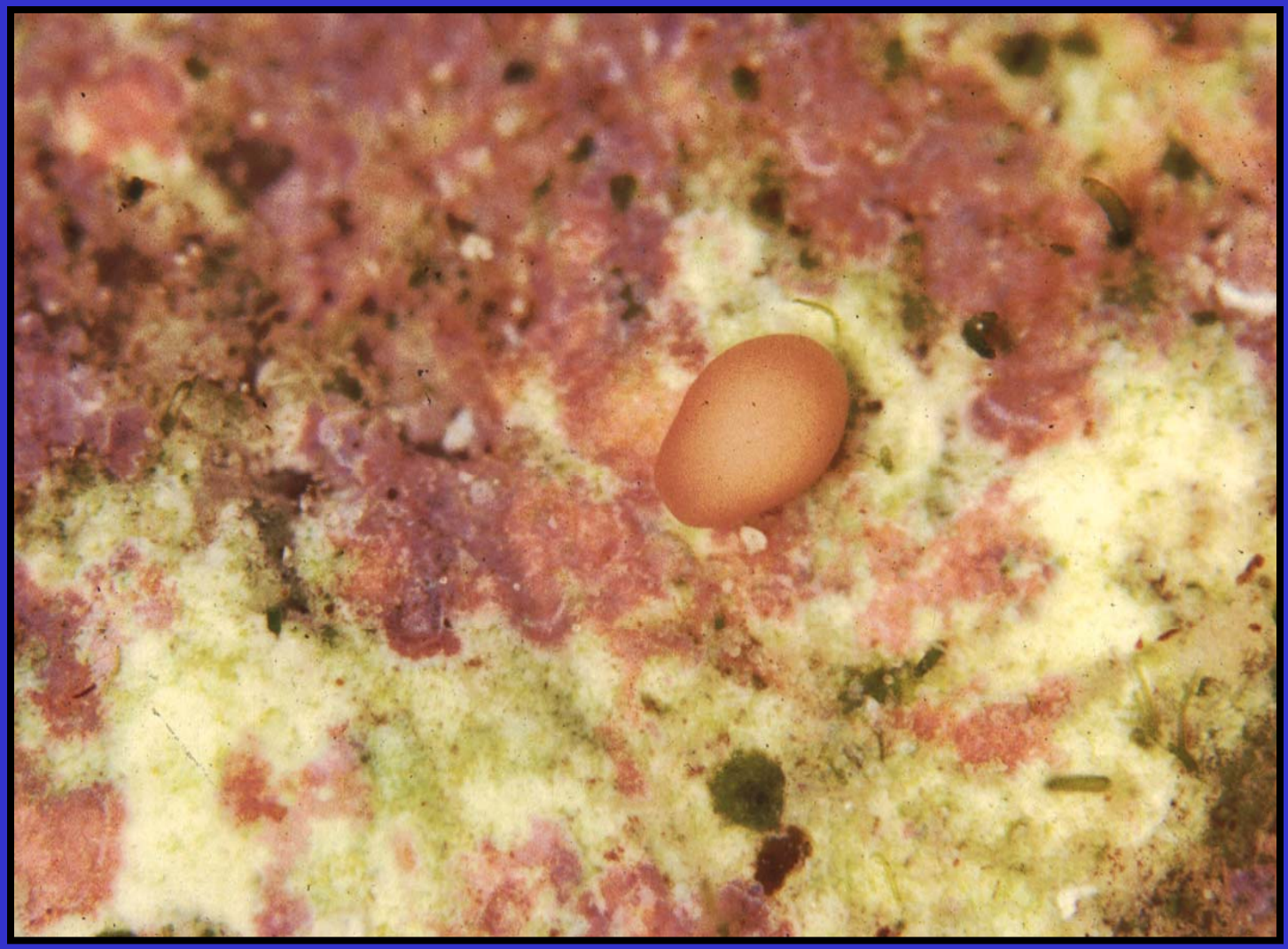






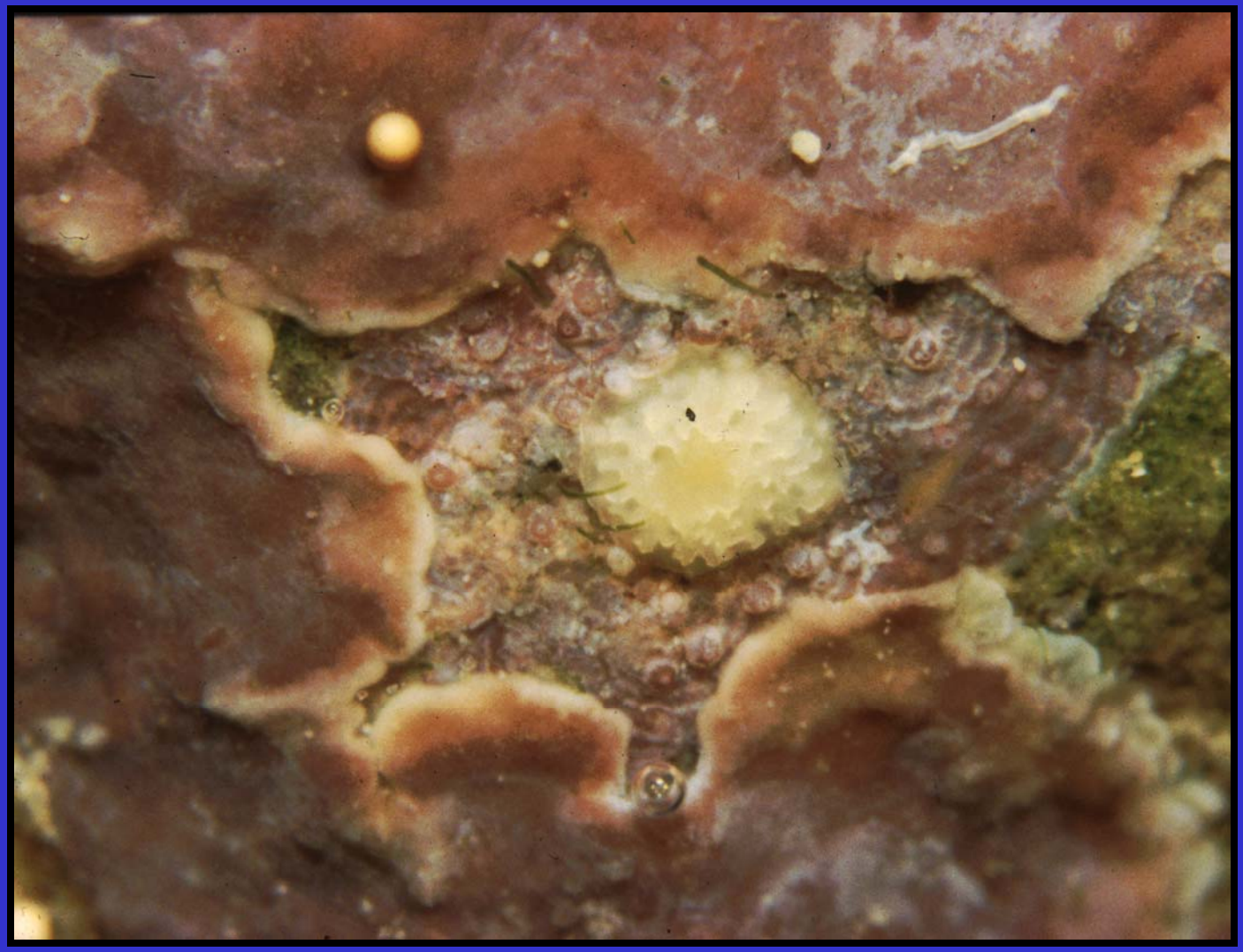
RECRUITMENT

1. Settlement

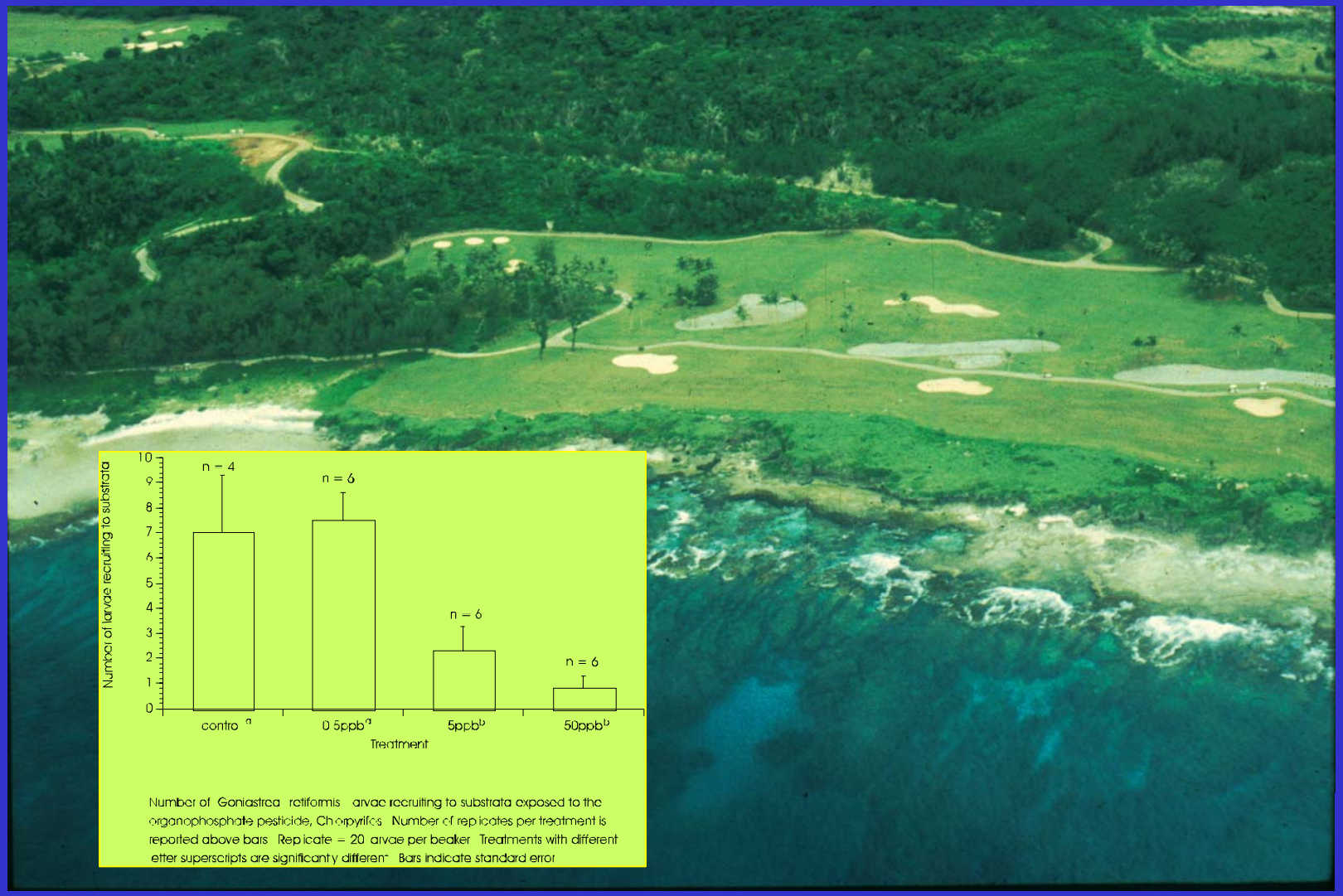


Recruitment

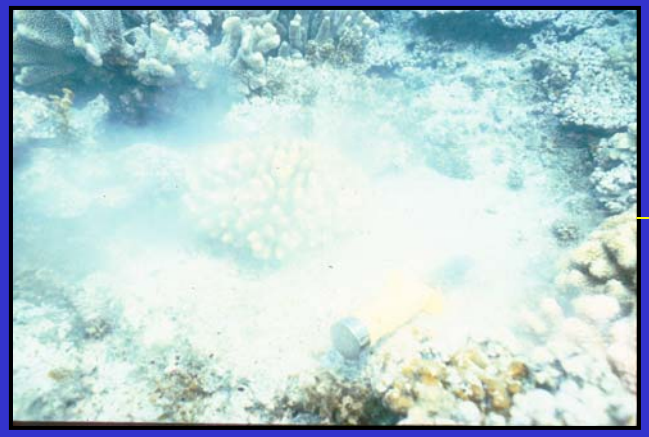
2. Metamorphosis

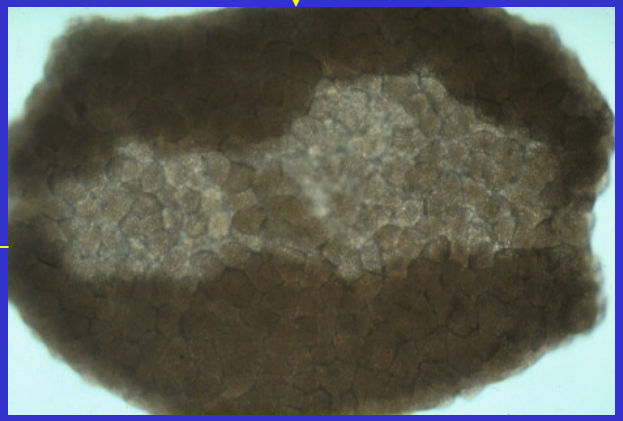


RECRUITMENT FAILURE

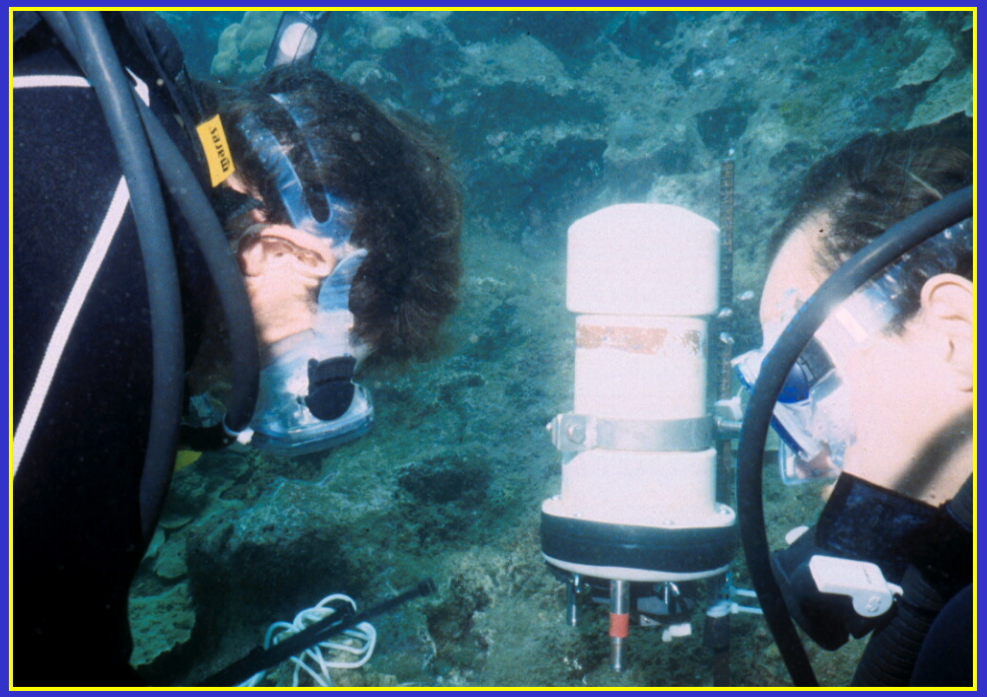


Number of Goniastrea retiformis larvae recruiting to substrata exposed to the organophosphate pesticide, Chlorpyrifos. Number of replicates per treatment is reported above bars. Replicate = 20 larvae per beaker. Treatments with different letter superscripts are significantly different. Bars indicate standard error.

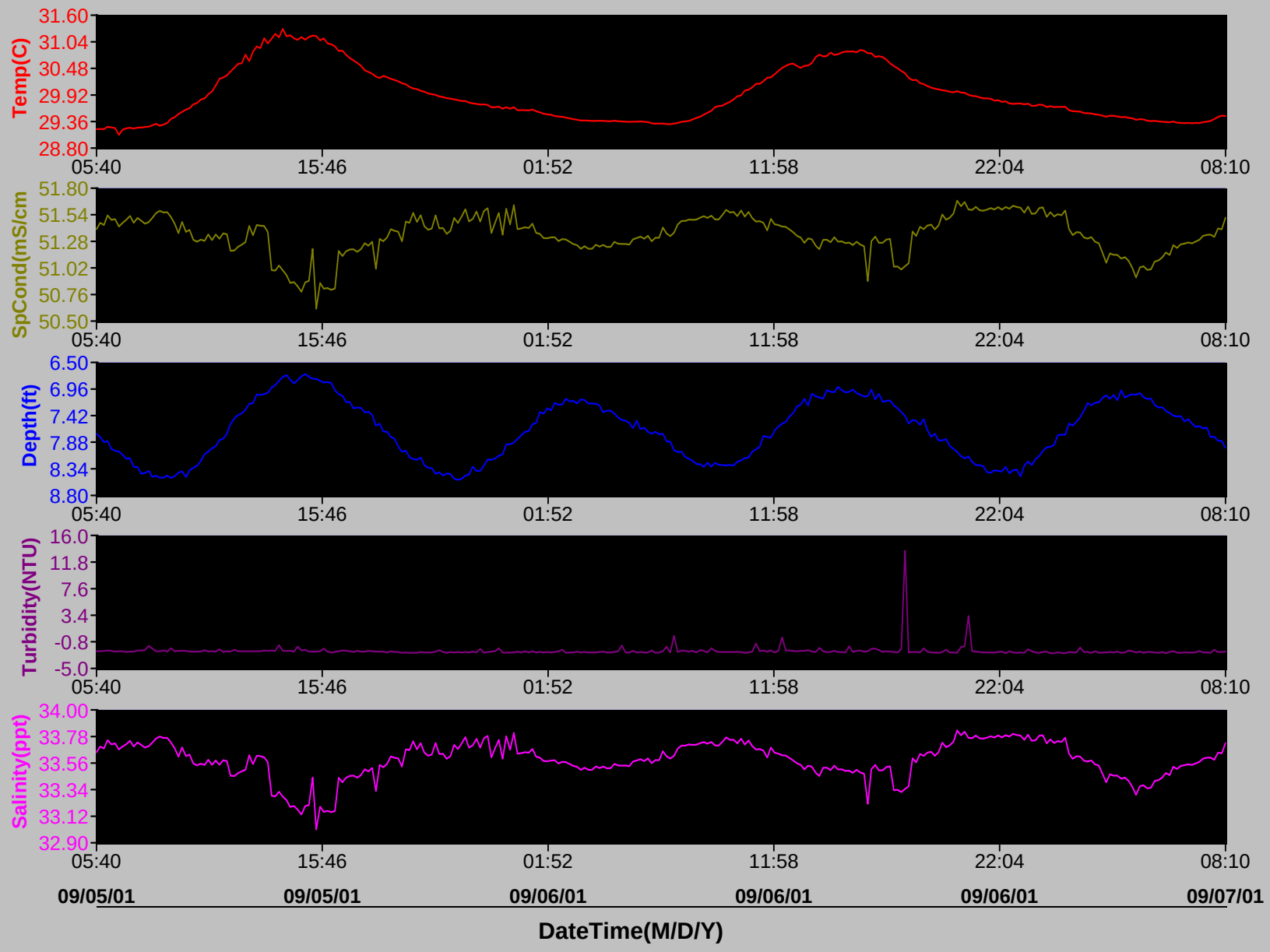




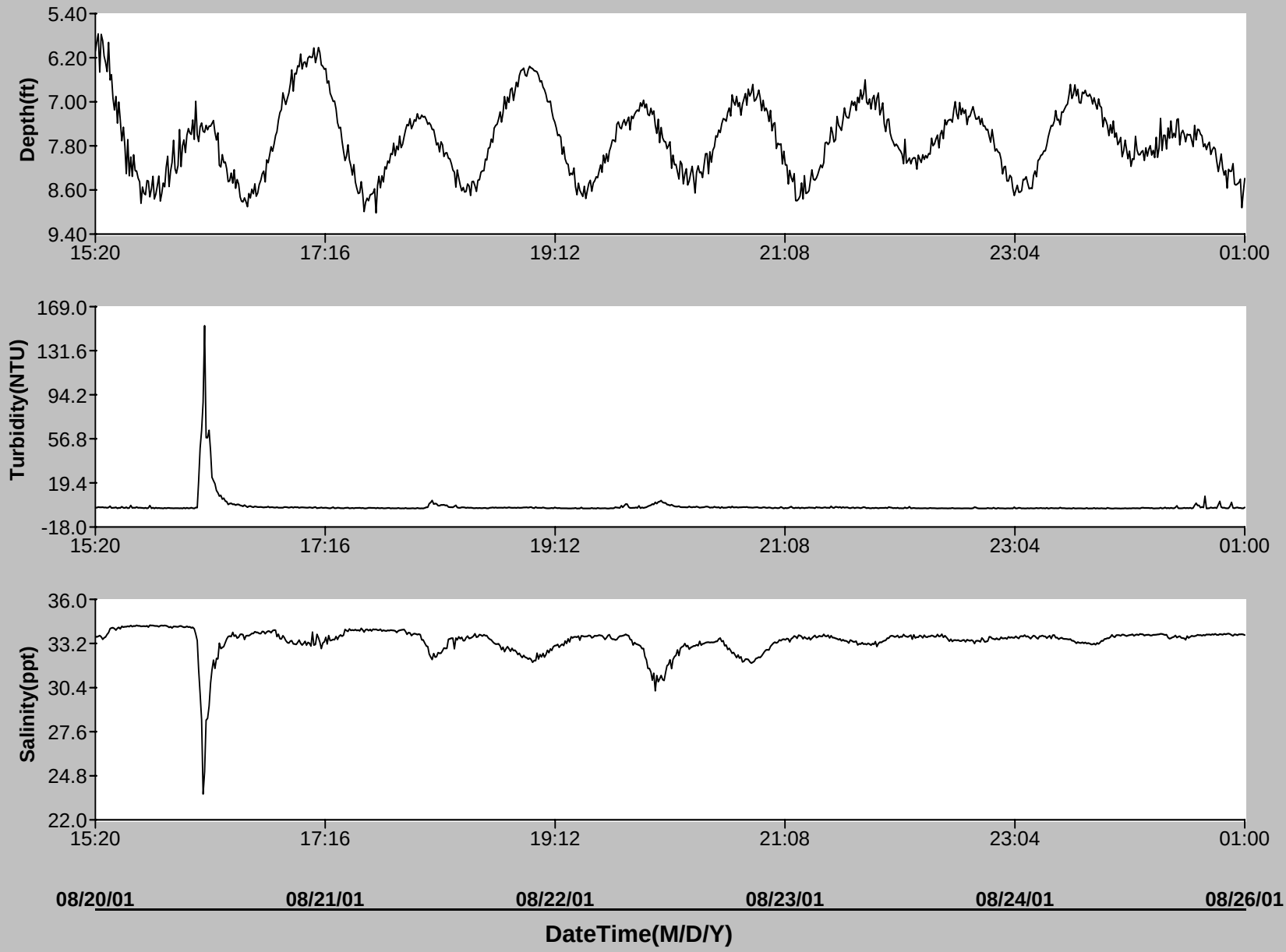
Watershed discharges: Spatial and Temporal



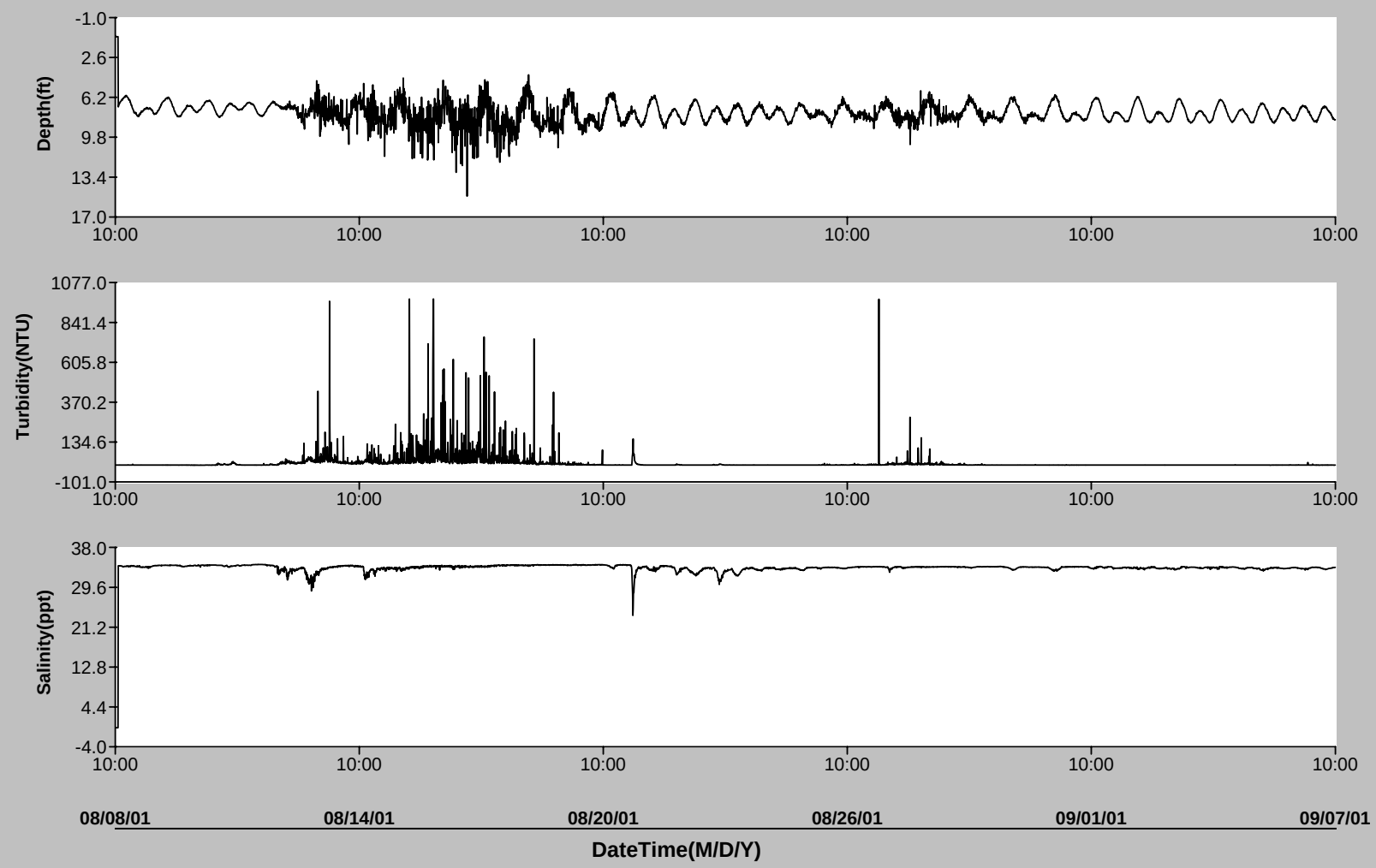
FOUHA5-2.DAT

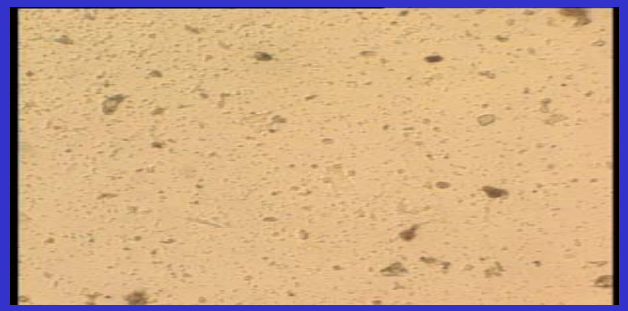

Temp(C)
31.60
31.04
30.48
29.92
29.36
28.80
SpCond(mS/cm
51.80
51.54
51.28
51.02
50.76
50.50
Depth(ft)
6.50
6.96
7.42
7.88
8.34
8.80
Turbidity(NTU)
16.0
11.8
7.6
3.4
-0.8
-5.0
Salinity(ppt)
34.00
33.78
33.56
33.34
33.12
32.90
05:40
15:46
01:52
11:58
22:04
08:10
09/05/01
09/05/01
09/06/01
09/06/01
09/06/01
09/07/01
DateTime(M/D/Y)

Fouha Bay

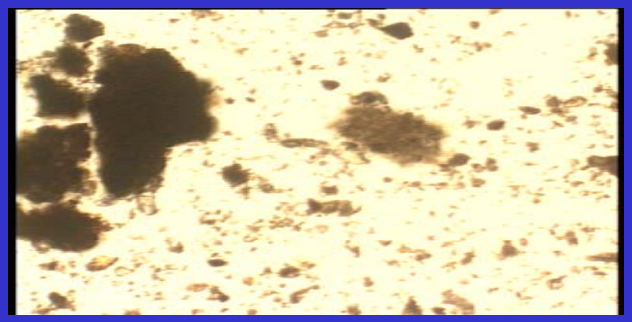

Depth(ft)
5.40
6.20
7.00
7.80
8.60
9.40
Turbidity(NTU)
169.0
131.6
94.2
56.8
19.4
-18.0
Salinity(ppt)
36.0
33.2
30.4
27.6
24.8
22.0
15:20
17:16
19:12
21:08
23:04
01:00
08/20/01
08/21/01
08/22/01
08/23/01
08/24/01
08/26/01
DateTime(M/D/Y)

Turbidity/salinity/wave profile – Fouha Bay, Guam

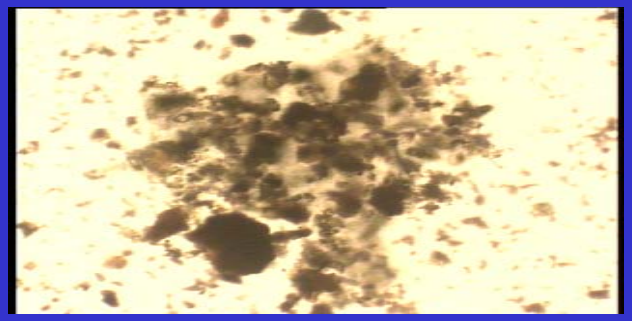




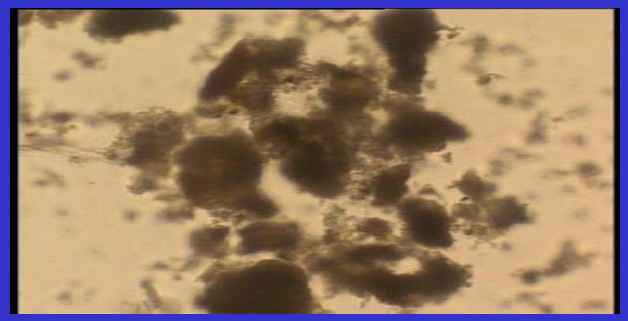
Freshwater



5 min



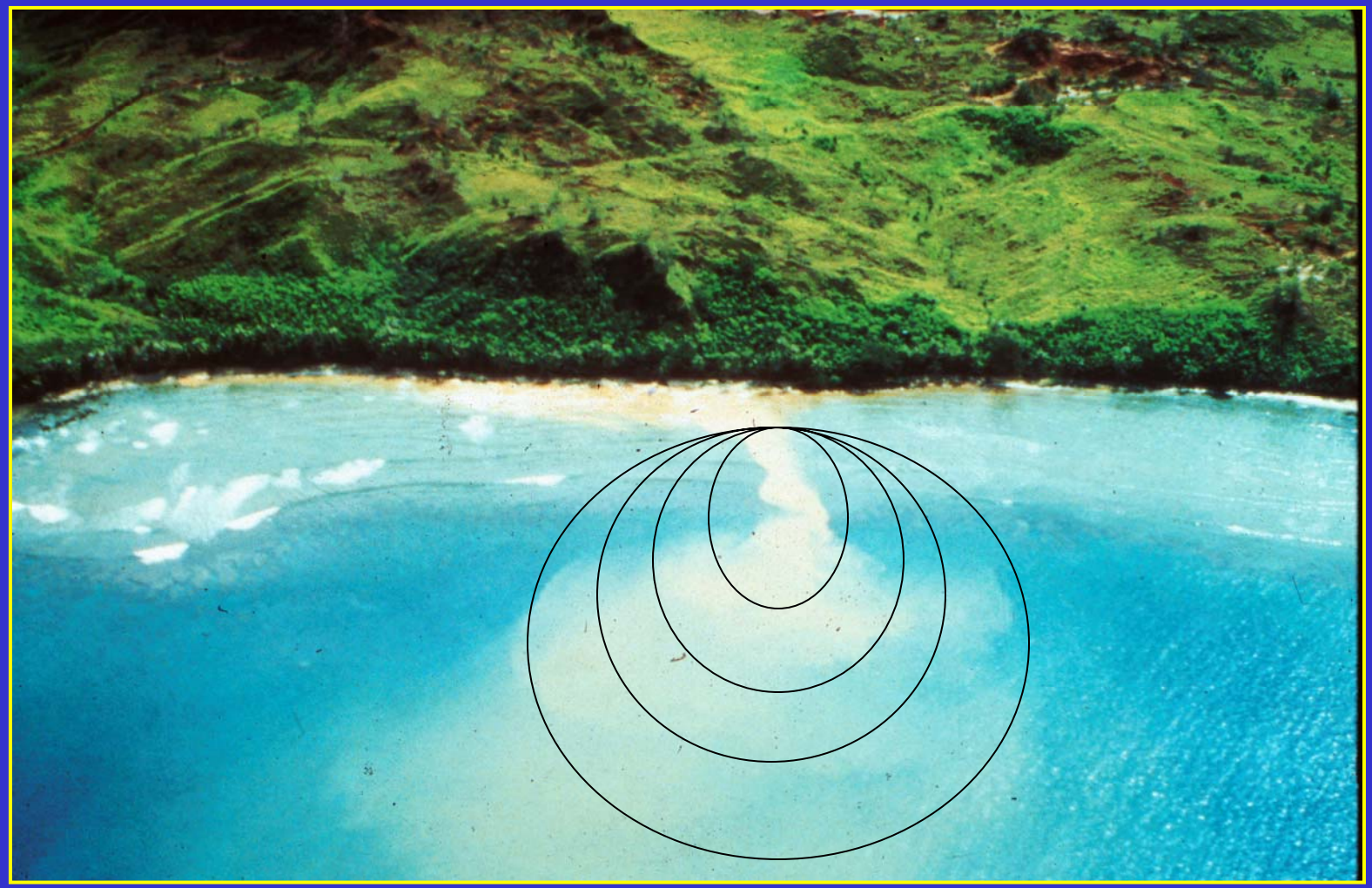
10 min



30 min

Width=1000 um

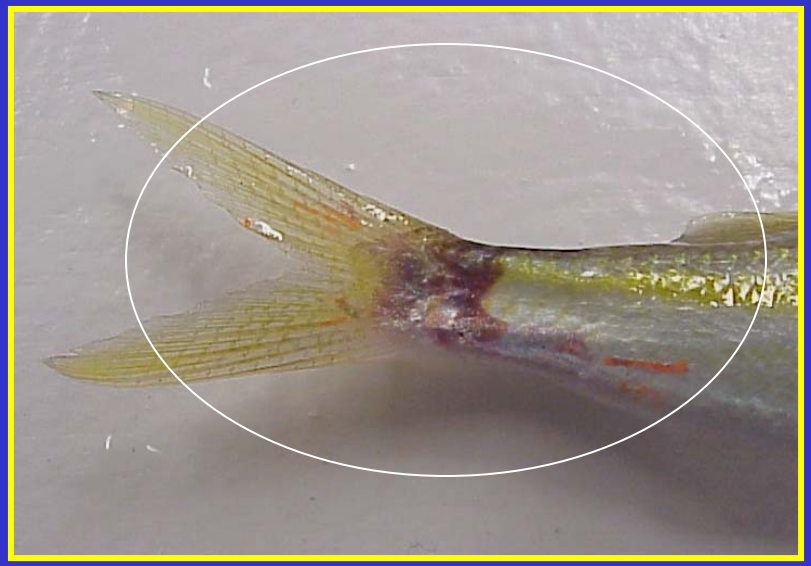
INTEGRATED WATERSHED MNGT



Does spillover from MPAs enhance fishery yields in adjacent exploited areas?

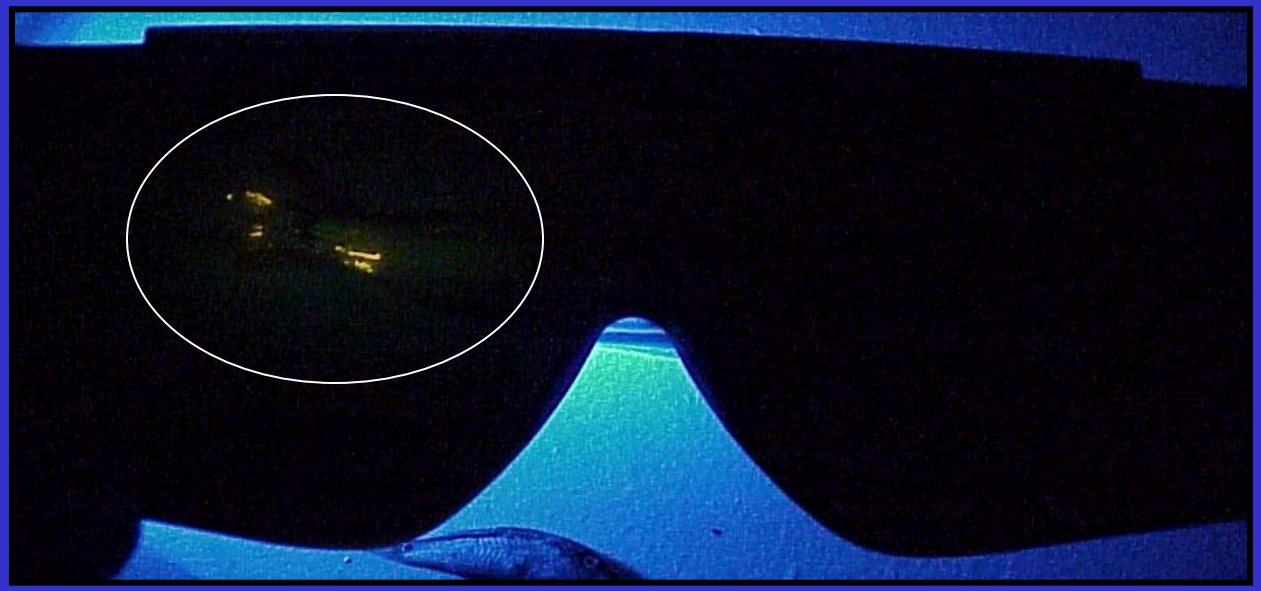
Collecting goatfish from Piti Bombholes Marine Preserve for tagging studies

Elastomer implant tagging



Fluorescent orange implant is visible to the naked eye…

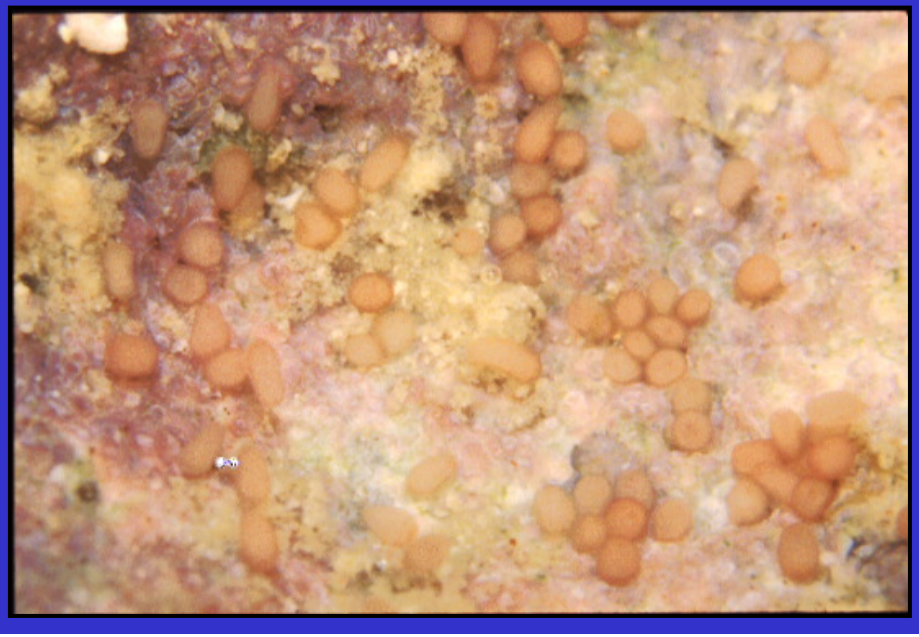
…but is more easily viewed under submersible UV light, using an amber filter



Eutrophication and Algal Overgrowth

Coral Cultivation

CORAL RESEEDING & RESTORATION



Stakeholder Involvement

Ngerikill Watershed - Palau

Multiple Technologies and their Application

Global Climate Change

- Alternate Stable States
- Massive Regional Bleaching Events