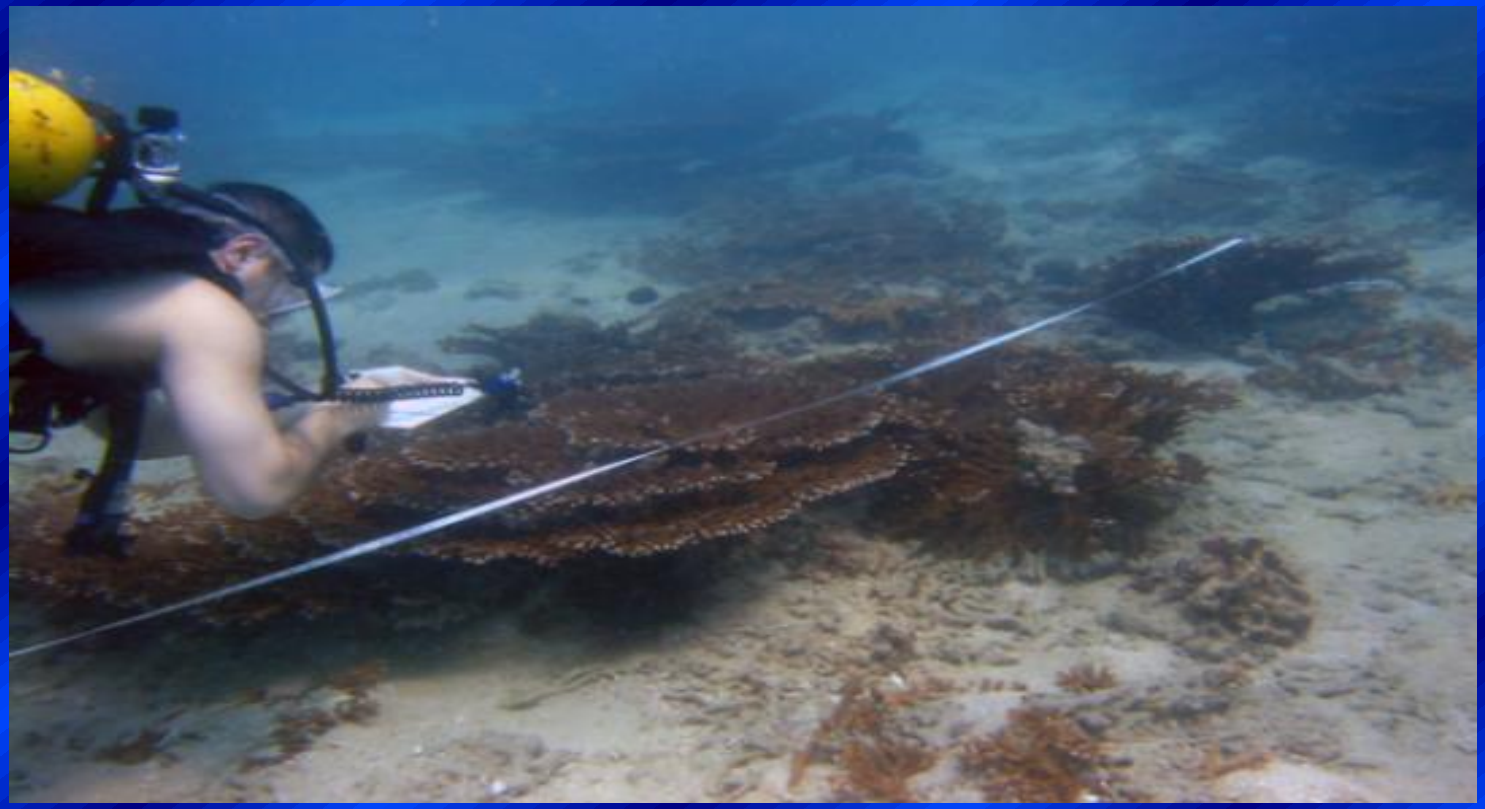
Some topics for coral reefs of the Persian Gulf



H. Rezai (PhD)


Persian Gulf
Strait of Hormuz

Some Characteristics of the Persian Gulf

- High salinity up to 41 psu in the north and 200 psu in the south
- High temperature range from 16 ^{o}C in winter to 36-37 ^{o}C in summer
- The narrow Strait of Hormuz prevents some larvae from entering the Gulf
- Shallow Gulf, mean depth of 35 m, recorded 108 m near Lesser Tunb
- Sedimentary basin, hi turbidity
- Circulation of water, Mediterranean type
- Pollution load
- Wars

The Persian Gulf is endowed with many islands. This is one of the rare places in earth where the corals can thrive at their extreme temperature with annual temperature fluctuations of > 25º C, so it can act as a laboratory for predicting Climate Change.

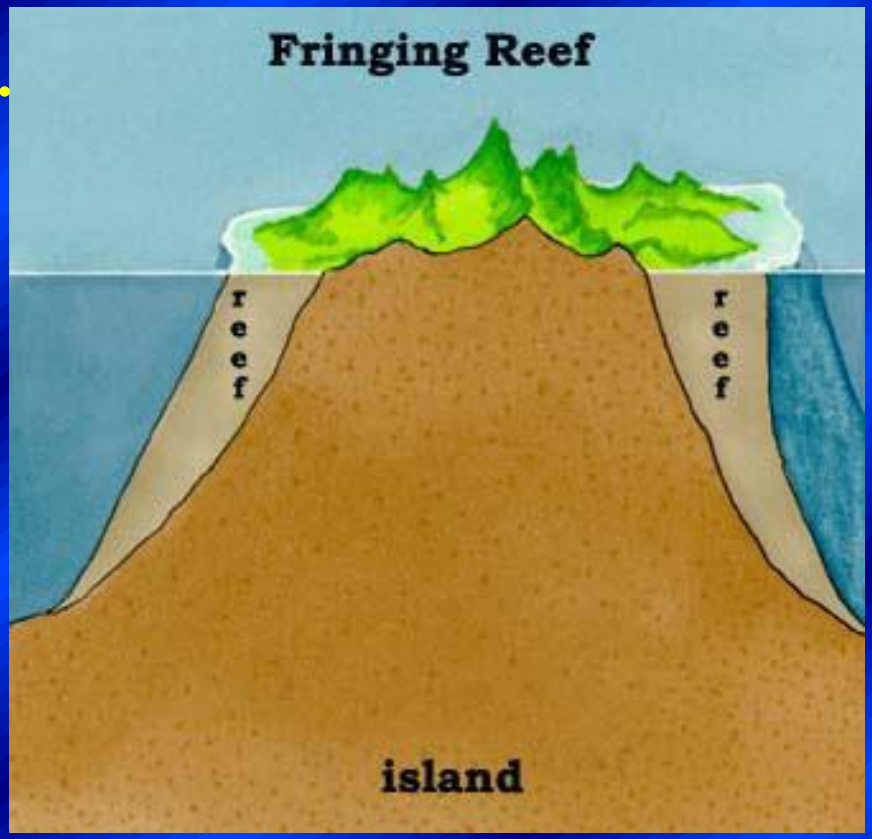
Low diversity in terms of corals, containing possibly 100 species, a quarter of the number in the Indian Ocean, but abundant in terms of individuals, this is due to extremes in water temperature and salinity that are close to the physiological tolerance limits of many coral species, including a few species endemic to this region (Sheppard and Sheppard, 1991).

Coral Reef Structure in the Persian Gulf

Dominant reefs are of fringing type.

Poorly developed patch reefs.

Cycle of mortality, breakdown and re-growth inhibit framework accumulation (Grandcourt, ?).



Coral reef development, limitation in Persian Gulf

-Undergo extremes of temperature and salinity fluctuations

-Undergo high levels of sedimentation and turbidity.

-Tolerate high pollution load caused by to oil spillage, shipping and wars

-Limited hard substrate for coral growth in the Persian Gulf.

- Diseases

- Human effects

Notion of reef

Oyster reef?

Polychaete reef?

So on

The synonym of coral reef in the Persian language is Wrong!

Coral reefs are not آبسنگهای مرجانی!!

سنگفرش مرجانی

Number of hard coral species in each country in the Persian Gulf.

Kuwait	Iran	Bahrain	Saudi Arabia	UAE	Qatar
35	P. Gulf >50?	28-31	50	34	< 20

Notion of True Reef vs. non true reef

"Corals growing on corals" was too simplistic, though special case in Arabia, in the order of meters of a few tens of meters.

- **The concept of framework**: It refers to matrix which traps sediments, allowing the later to consolidate into the bulk of the reef fabric. *Acropora* species provide framework in shallow water to about 3-5 m deep, together with substantial growth of *Porites compressa* in deeper water. The framework species of *Acropora* are most intolerant group.

- Limestone producing organisms are required for reef growth (corals, algae, etc.), and equally clearly carbonate sediments accumulating within spaces are important. However, without the consolidation processes, the result would remain merely coral skeletons with sediments, not a durable reef.

According to Sheppard *et al.* (1992) most of the reefs in the Persian Gulf are non-true reefs.

Methods in coral reef

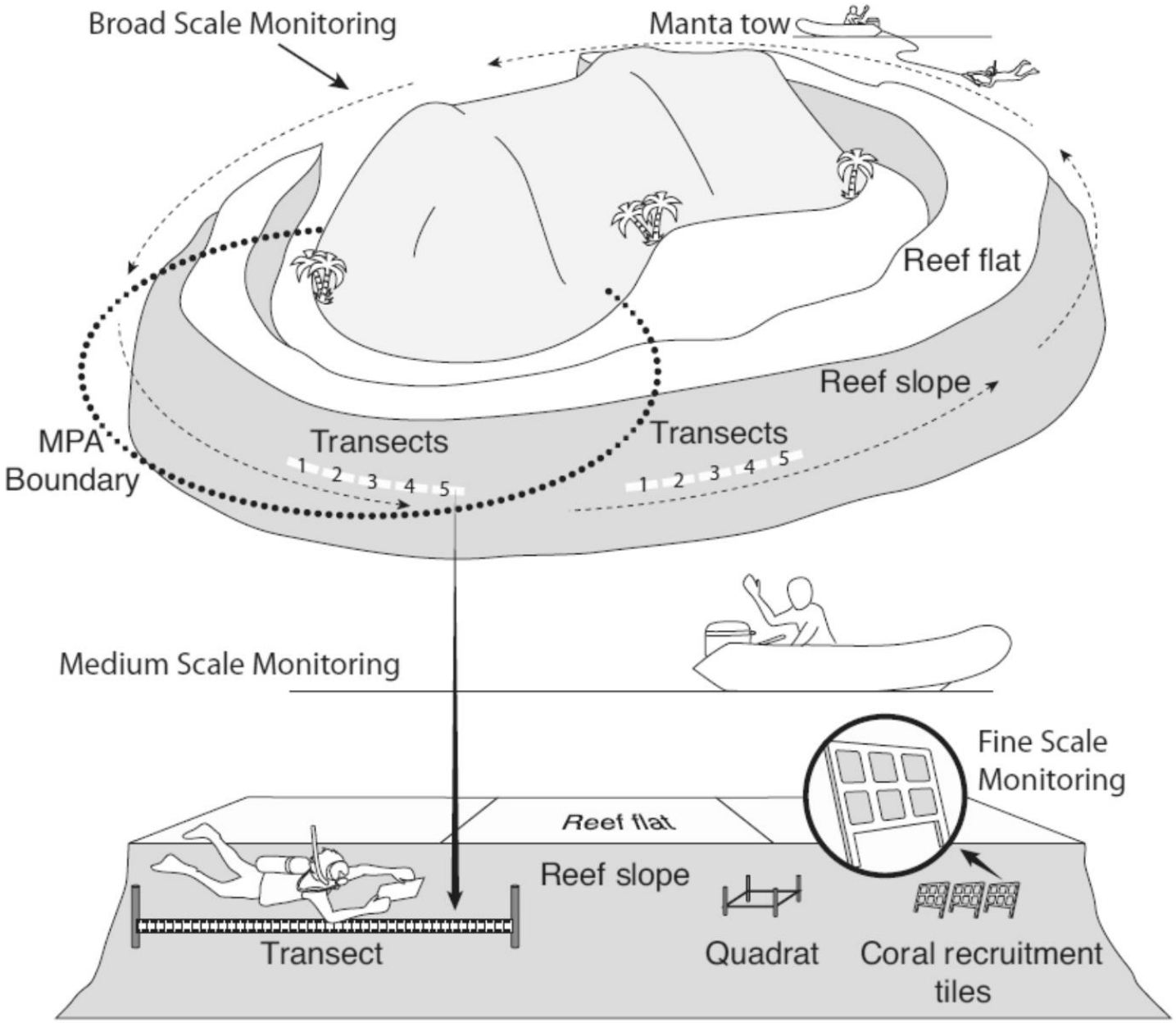


Figure 3. *An illustration of the three scales of monitoring: broad-scale covering large areas at lower resolution, e.g. with manta tow; medium-scale for higher resolution at medium scales e.g. line transects; and fine-scale for gathering high resolution data at small scales.*

Manta Tow

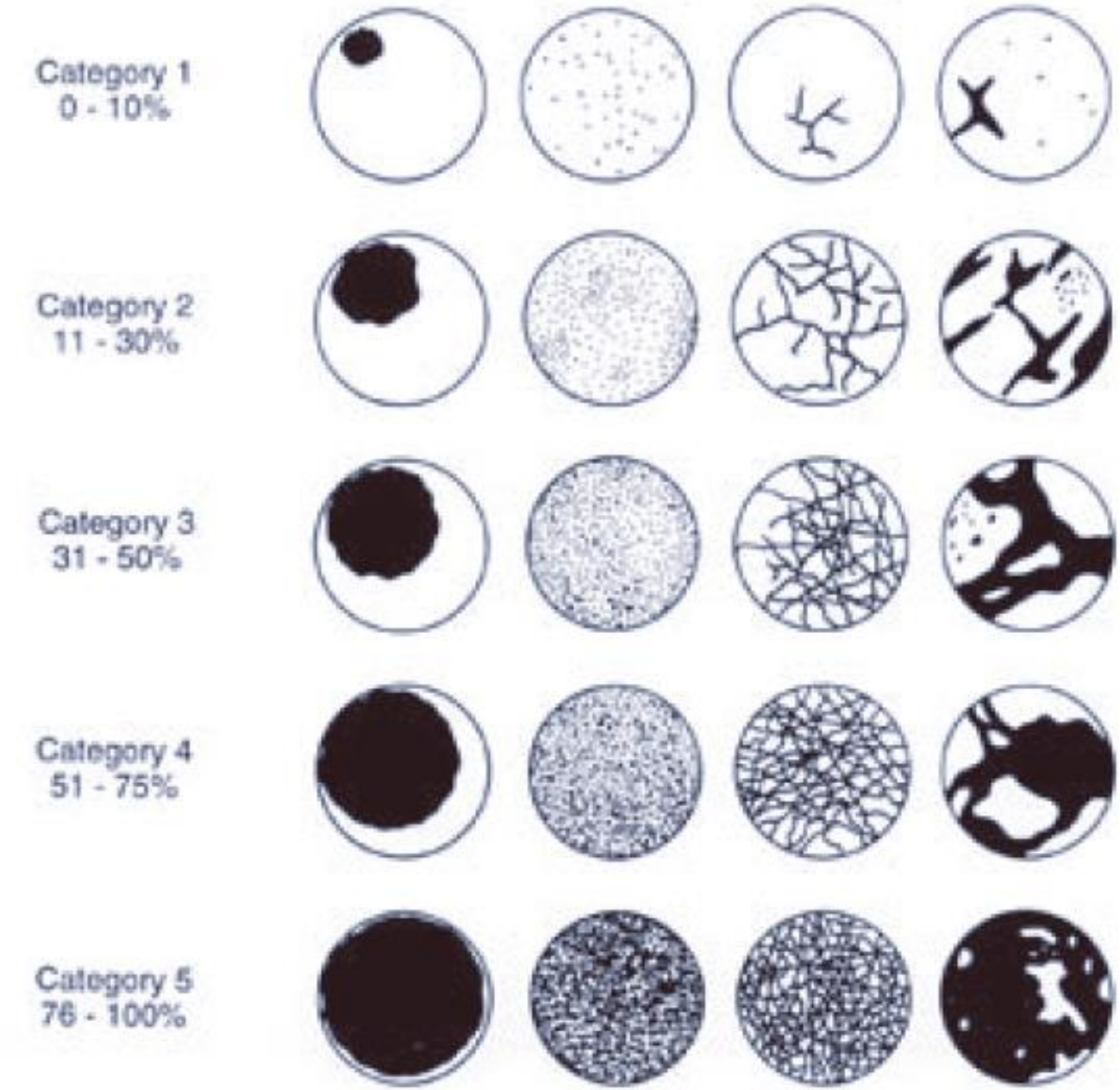
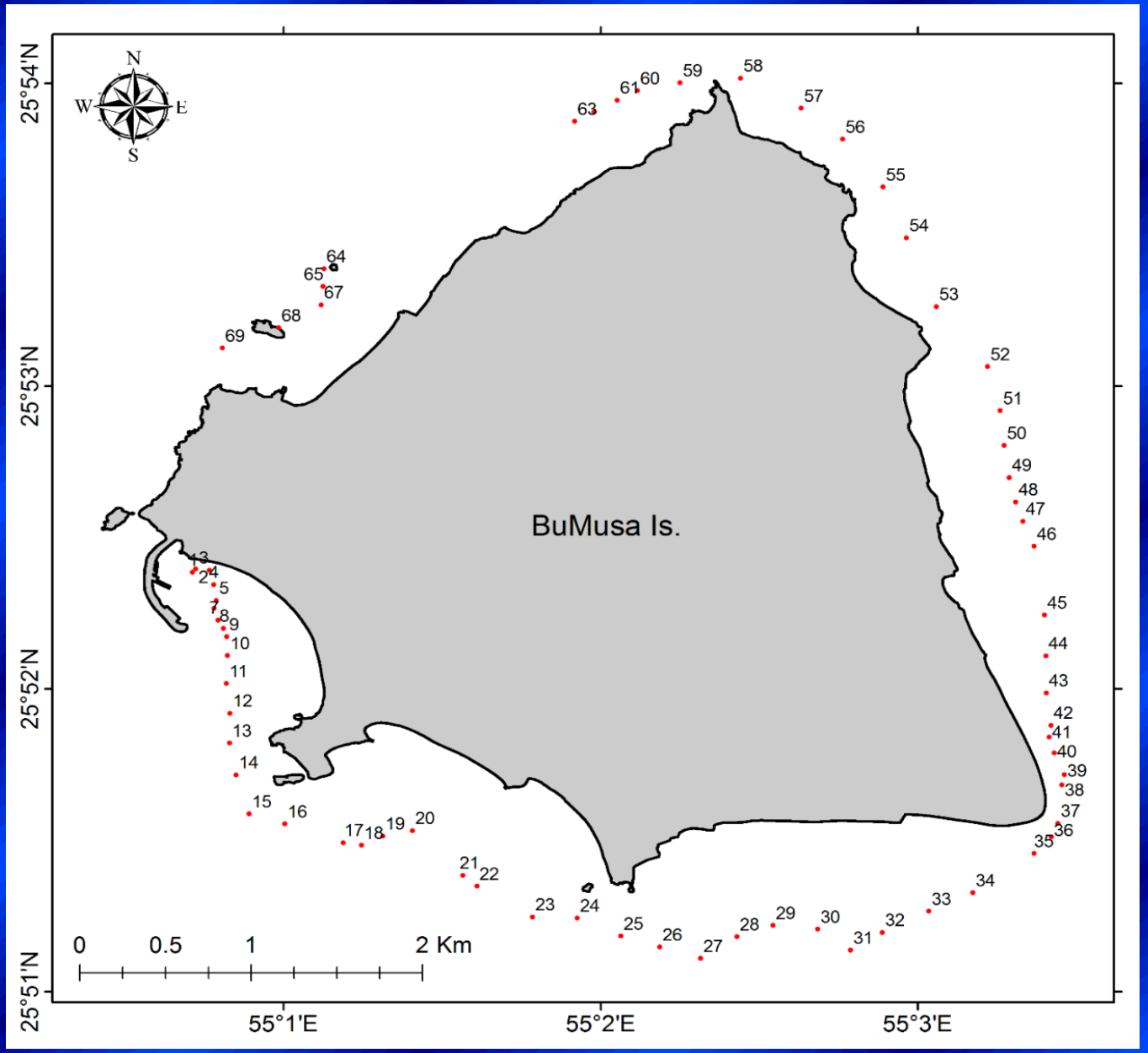
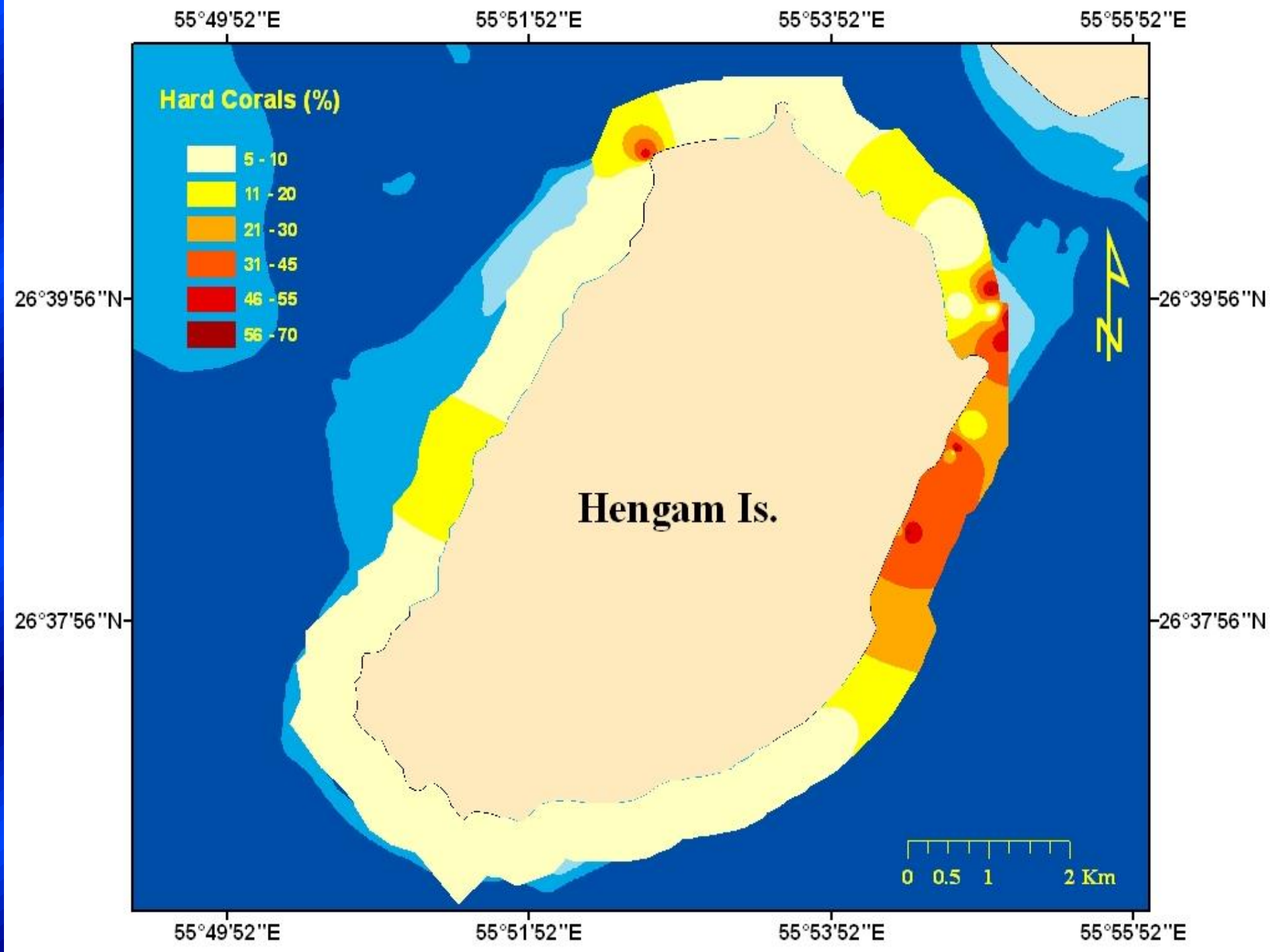


Figure 4. *Visual estimation categories for percent coral cover from Dahl (1981) in English* et al. *(1997).*



Track of stations around Bu Moussa Island

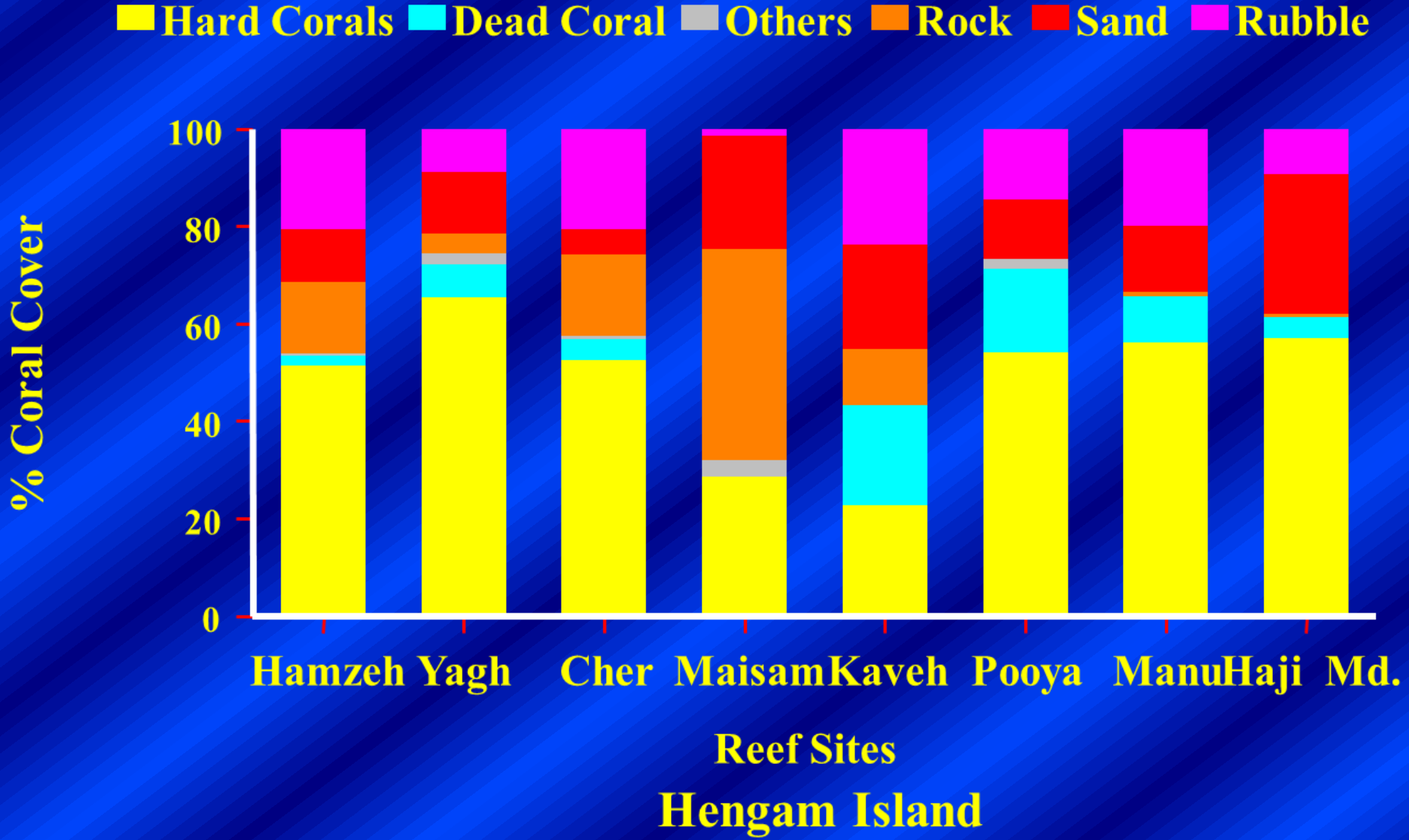

55°49'52"E
55°51'52"E
55°53'52"E
55°55'52"E
Hard Corals (%)
5 - 10
11 - 20
21 - 30
31 - 45
46 - 55
56 - 70
26°39'56"N
26°37'56"N
Hengam Is.
N
0 0.5 1 2 Km

Larak Island

St.2	Larak Reef		Depth: 7m	Time: 13:14
Transition	Category	Taxon	meter	%
2.39	HC	ACR	2.39	5.975
3.18	S		0.79	1.975
3.4	RC		0.22	0.55
3.81	HC	ACR	0.41	1.025
3.86	DC		0.05	0.125
9.98	HC	ACR	6.12	15.3
10.2	HC	ACR	0.22	0.55
10.82	HC	ACR	0.62	1.55
11.32	RC		0.5	1.25
13.36	HC	ACR	2.04	5.1
14.08	RC		0.72	1.8
15.42	HC	ACR	1.34	3.35
15.85	DC		0.43	1.075
15.99	HC	ACR	0.14	0.35
16.29	DC		0.3	0.75
17.39	RB		1.1	2.75
18.07	HC	ACR	0.68	1.7
18.21	DC		0.14	0.35
19.71	HC	ACR	1.5	3.75
19.97	DC		0.26	0.65
21.3	HC	ACR	1.33	3.325
21.54	RC		0.24	0.6
22.88	HC	ACR	1.34	3.35
23.42	RC		0.54	1.35
25.34	HC	ACR	1.92	4.8
27.12	RC		1.78	4.45
27.32	HC	Platy sp.1	0.2	0.5
27.86	HC	RC	0.54	1.35
27.9	HC	Rb	0.04	0.1
28.3	HC	Platy sp.1	0.4	1
29.68	HC	ACR	1.38	3.45
30.82	DC		1.14	2.85
31.45	HC	ACR	0.63	1.575
31.9	RB		0.45	1.125
32.42	HC	ACR	0.52	1.3
32.68	RC		0.26	0.65
32.85	HC	Platy sp.2	0.17	0.425
33.43	RB		0.58	1.45
34.12	HC	ACR	0.69	1.725
37.86	HC	ACR	3.74	9.35
38.9	HC	Pavona	1.04	2.6
39.07	HC	Porites	0.17	0.425
40	HC	ACR	0.93	2.325
				100

Transect line

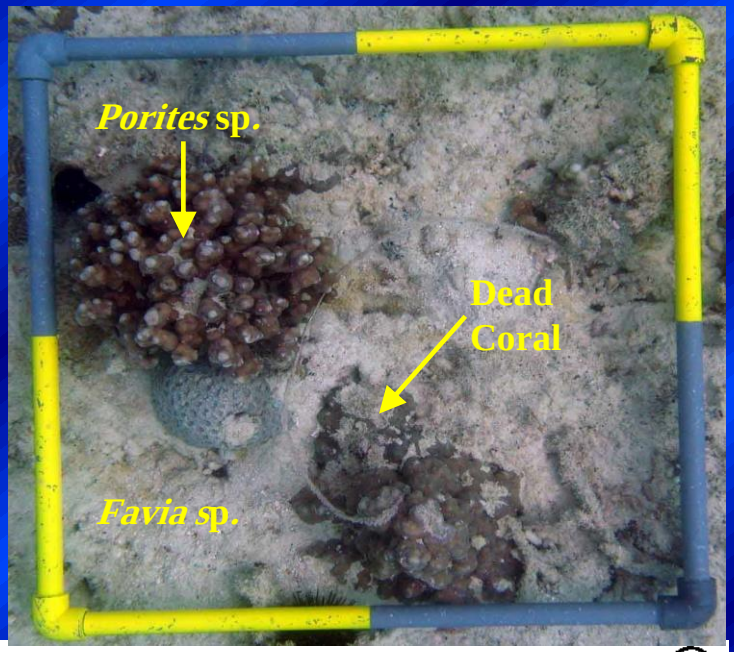
Transect line

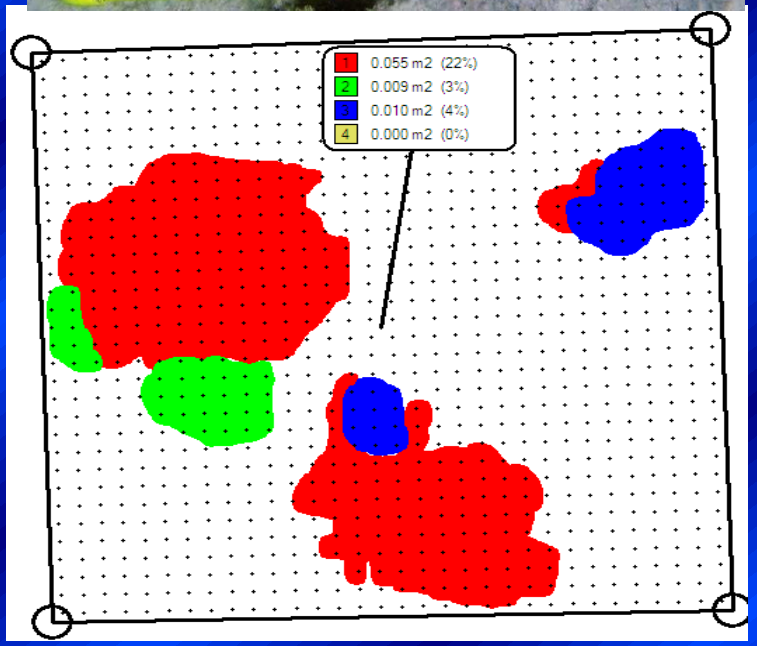

Hard Corals
Dead Coral
Others
Rock
Sand
Rubble
% Coral Cover
100
80
60
40
20
0
Hamzeh
Yagh
Cher
Maisam
Kaveh
Pooya
Manu
Haji Md.
Reef Sites
Hengam Island

Video transect

Quadrate sampling

Photoquadrate





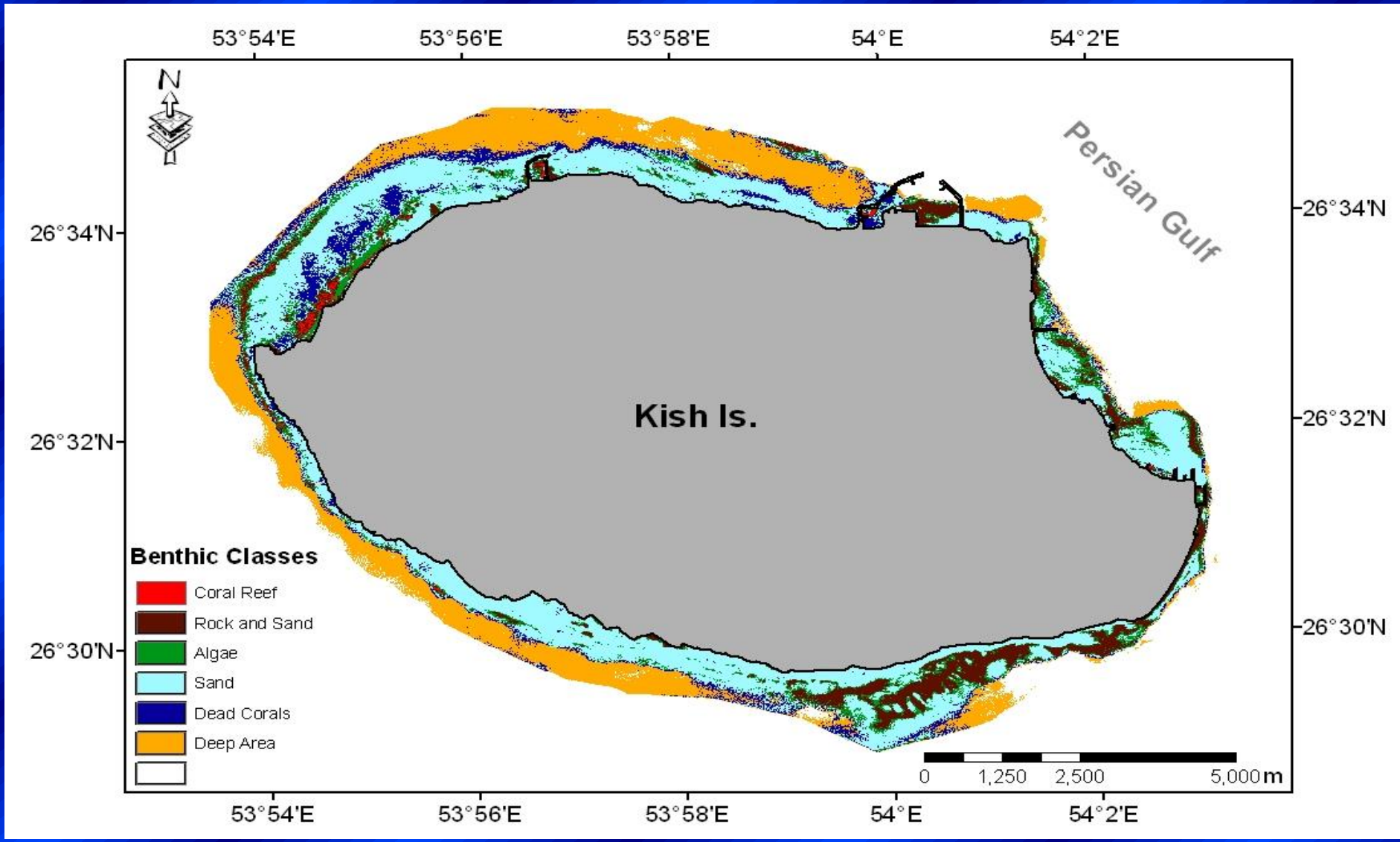
Reef check (Line point Transect) vs. Line Transect

Advantages

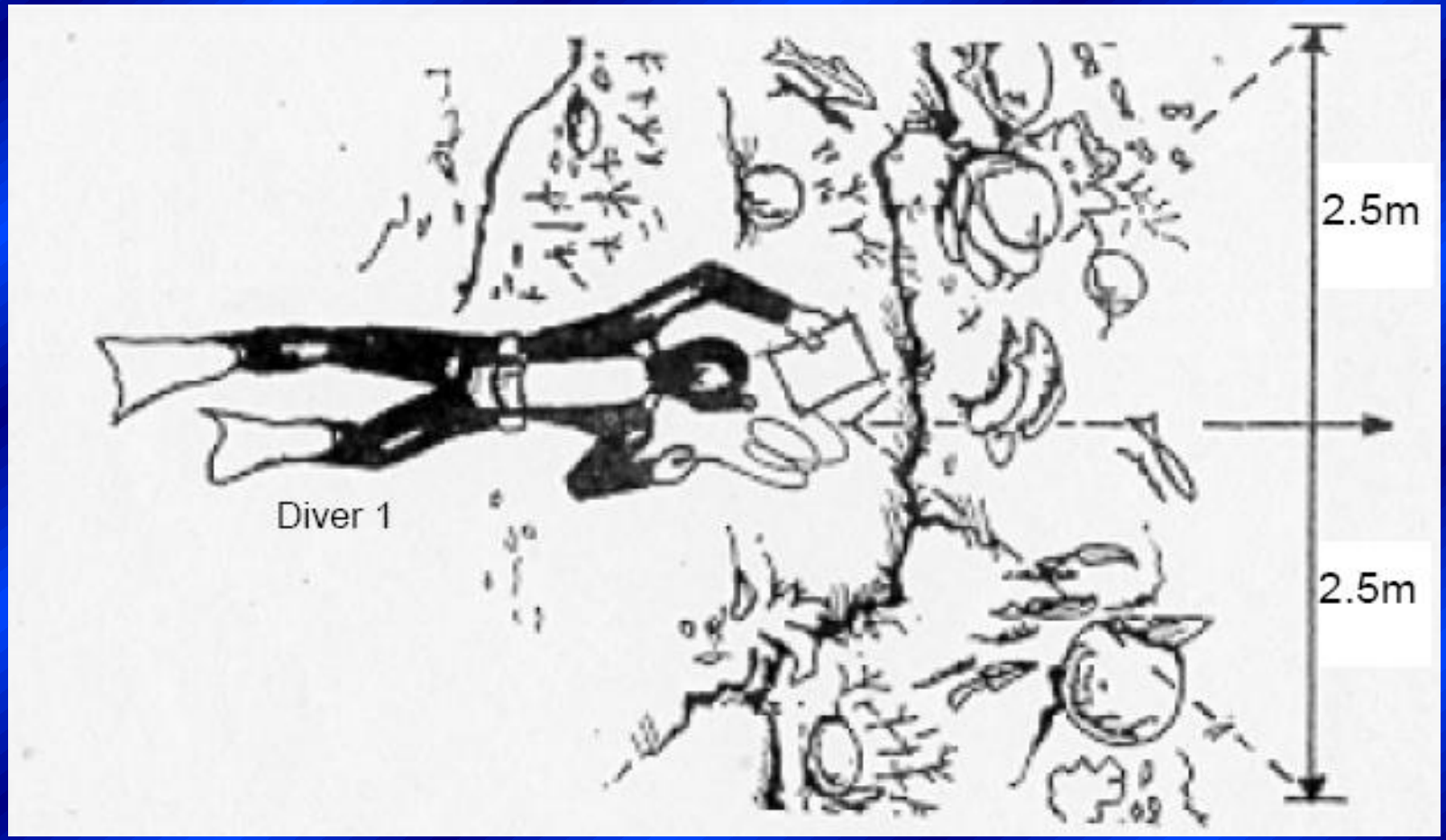
Disadvantages

What to do with acquired data?

- Stat
- GIS/RS for mapping
- For what?
- Management issues



Habitat Classes around Kish Island based on RS and field observations (overall accuracy ~70%)



Fish count using a 5m long, belt transect

Fish counting and size frequency

Fish survey should be done before coral reef survey.

Abundance categories used for counting fishes.

Log 4 Abundance Category	Number of fishes
1	1
2	2-4
3	5-16
4	17-64
5	65-256
6	257-1024
7	1025-4096
8	4097-16384

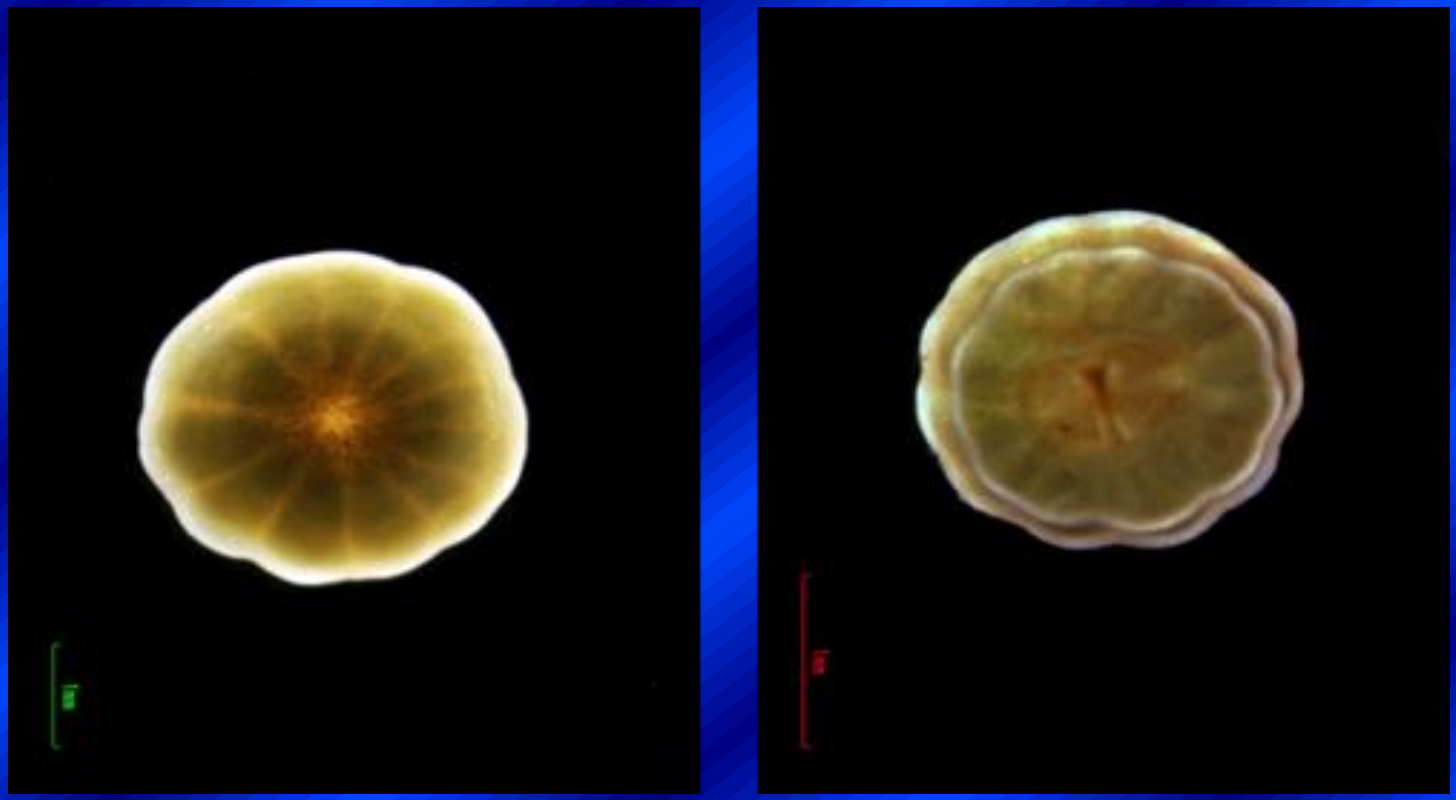
Climate change: A paper describing corals in tropics shifting to temperate waters due to temperature rising.

Climate change: low biodiversity

Soft corals, zooxanthellae and non-zooxanthellate

Zooxanthellae: resistant clades to high temperature: D and C

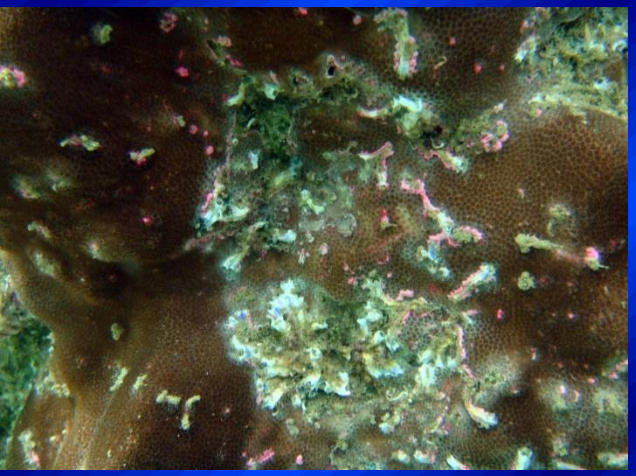
Reproduction: Mass spawning occurs in late April-early May near Larak Island during full moon. Synchronized mass spawning during full moon in the PG.



Coral eggs around Larak Island collected by plankton net

Coral Dating, Qeshm Island

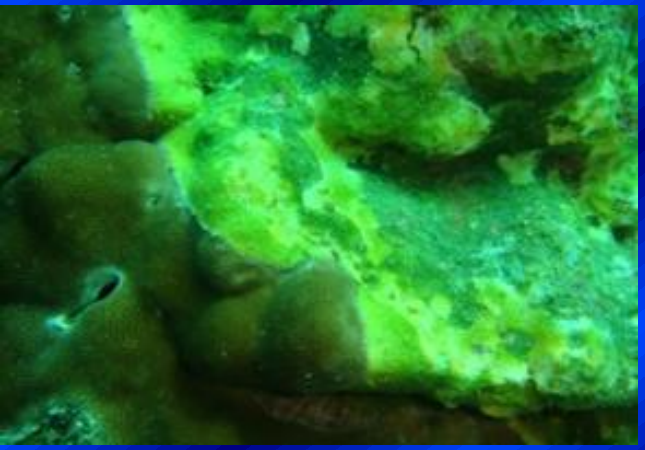
Diseases



Pink coloration

Black band disease

Pink coloration



Yellow band disease

Black band disease

White syndrome

Coral Bleaching

Bleaching and management

Table 2.4 Recording the severity of bleaching of coral colonies

Category	Description
0	No bleaching evident
1	Partially bleached (surface/tips); or pale but not white
2	White
3	Bleached and partly dead
4	Recently dead

Table 2.5 Recording the proportion of corals affected by bleaching

Category	Per cent	Description	Visual assessment
0	<1	No bleaching	No bleaching observed, or only very occasional, scattered bleached colonies (one or two per dive).
1	1–10	Low or mild bleaching	Conspicuous bleached colonies seen occasionally, but vast majority of colonies not bleached.
2	10–50	Moderate bleaching	Bleached colonies frequent but constitute less than half of all colonies.
3	50–90	High bleaching	Bleaching very frequent and conspicuous, most corals bleached.
4	>90	Extreme bleaching	Bleaching dominates the landscape, unbleached colonies not common. The whole reef looks white.

Methods for Bleaching Assessment

- Establish and maintain a network of reef users to provide casual and regular reports of bleaching status at reef sites

- Develop and distribute an appropriate assessment protocols and datasheets for participating reef users to report reef conditions and coral bleaching, using RS, and aerial surveys for shallow reefs (up to 5-7 m)

- Encouraging regular reporting of bleaching and non-bleaching observations.

- Providing regular and useful feedback to volunteers about their data

- **How can I determine whether long-term changes on my reefs are due to mass Coral Bleaching or other causes?**

- **Ongoing monitoring is required to document long-term ecological impacts on corals**

- **Climate change: A paper describing corals in tropics shifting to temperate water due to sea temperature rising.**

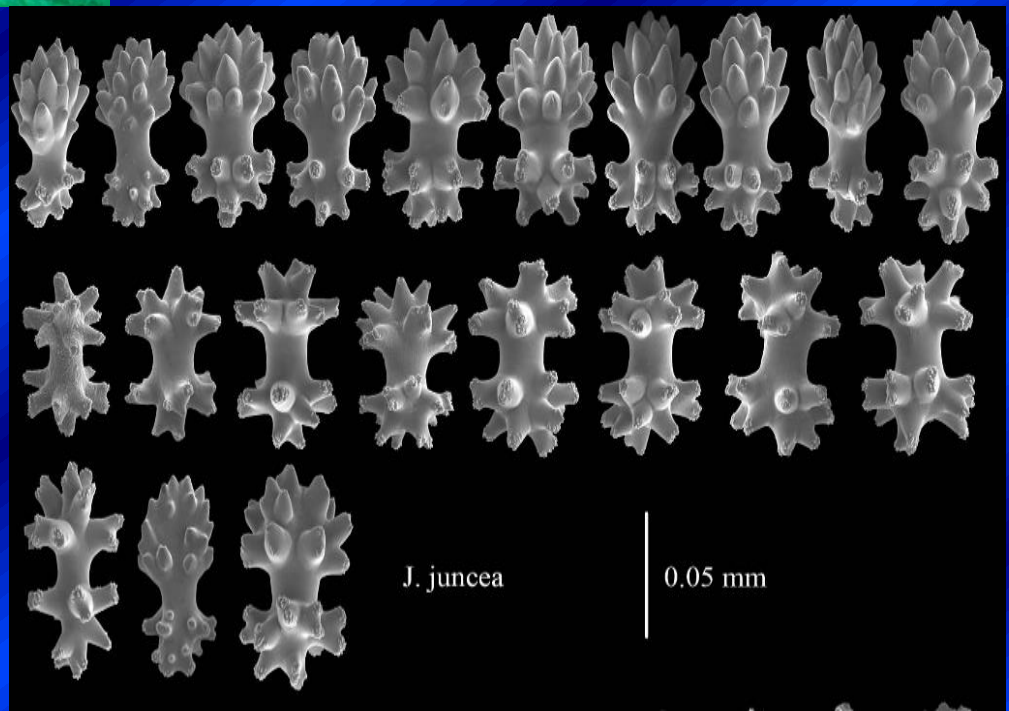
- **The data from targeted surveys will help managers determine the relative influence of coral bleaching on the long-term dynamics of coral reef ecosystems.**

- **Transboundary issues: larval transport from Iranian reefs to the southern parts, especially fish larva**

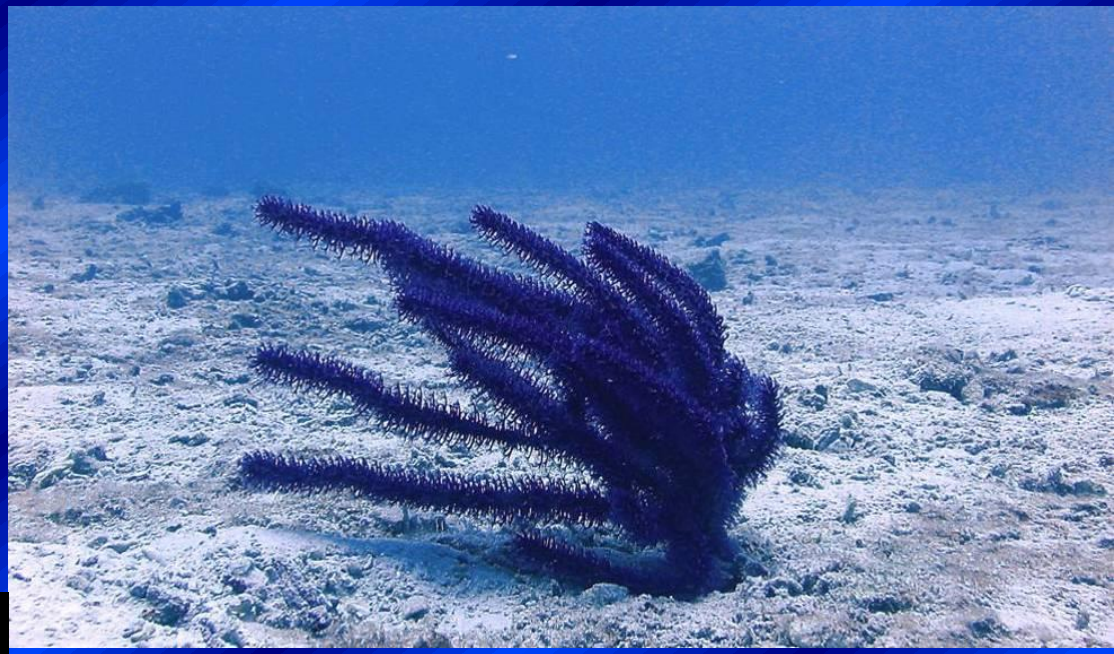
Soft Corals

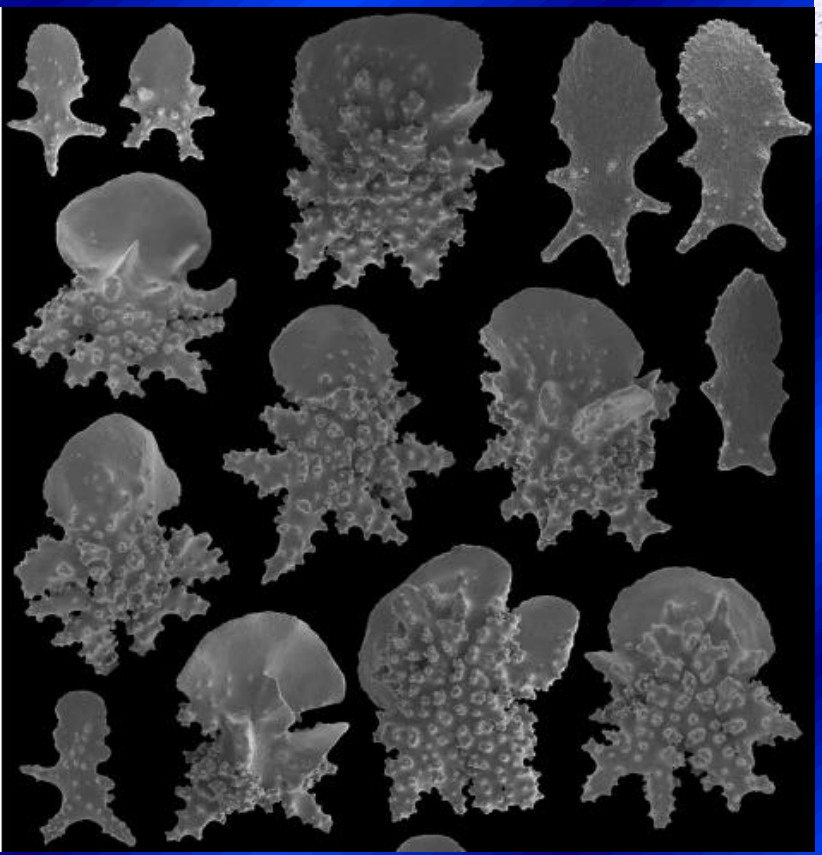
- ~ 3000 species of Octocorallia worldwide
- Sessile, mostly colonial Anthozoa with polyps containing 8 pinnate tentacles
- Skeleton made of calcium carbonate, sclerites
- They grow in relatively deeper waters, some as deep as > 40 m, ex. Qeshm Island
- Need hard substrate to grow
- Eat zooplankton
- *Sinularia, Sarcophyton* and *Briareum* are zooxanthellate genera, light dependent, limited to 10-12 m, more in Abu Moussa Is.
- Azoozanthellate species in deeper waters on hard substrates.
- Identification based on morphological structures of sclerites
- Reproduction: sexual and asexual
- Zonation and densities depend on different physical parameters such as light, sedimentation, wave exposure and water motion depending on species.
- They host sponges, polychaetes, echinoderms, molluscs and fish.
- Important sources of natural products in pharmacology
- Bio-indicators of environmental changes

Junceela juncea



Menella sp.





Soft corals in Qeshm Island (> 40 m) (Photo: Abdi Poor)

Soft Corals


East of Hormuz Island
Red Color Sediment (Iron Oxide)

Zaonthids in the SE of Hormuz Island.

Soft Corals

Sarcophyton sp.

Larak & Small Tonbe Islands