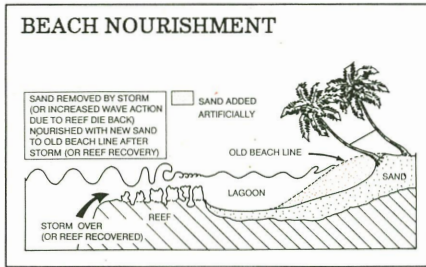


BEACH NOURISHMENT

Beach nourishment (also known as beach replenishment) is the process by which sand is added to a beach with the hope that it will not then go away (fig. 6). The process is more readily appreciated if the processes by which coral sand is formed and transported are better understood. We hope to give more details on beach nourishment next month.

Fig. 6



STOP PRESS

There was a period of strong northwesterly winds between the 11th and 17th of April 1990 (see table 2 below) that may well have gone some way towards counteracting any movement of sand caused by the period of strong east north easterly winds reported in December 1989 (See *the March Newsletter* - Ed)

TABLE 2

Daily and three hourly wind-speed in knots (average all directions) and dominant wind direction for April 11th-17th 1990 for Hulule supplied by the Maldives Meteorology Office.

DAY	DAILY AVERAGE	WIND DIRECTION AND SPEED DAILY AND 3 HOURLY AVERAGE (UTC) 3 HOURLY							
		000	0300	0600	0900	1200	1500	1800	2100
11th	NW 13	WNW 14	WNW 13	WNW 14	NW 12	NW 10	NW 13	NW 12	NW 14
12th	NW 17	WNW 16	NW 15	NW 18	NW 15	NW 18	NW 21	NW 14	WNW 15
13th	WNW 17	WNW 13	WNW 18	WNW 19	WNW 20	NW 20	NNW 15	NW 15	NW 13
14th	NW 19	NW 16	NW 18	WNW 20	NW 20	NW 22	NW 18	NW 20	WNW 18
15th	WNW 16	WNW 18	NW 12	WNW 18	NW 17	NW 17	WNW 14	WNW 18	WNW 17
16th	WNW 19	WNW 20	WNW 20	WNW 18	NW 18	NW 20	NW 18	WNW 18	WNW 19
17th	WNW 15	WNW 19	WNW 15	NW 14	NW 13	WNW 15	WNW 14	WNW 15	NW 13

Let us know if you saw any sign of beach sand movement during the April period.

REG. No: 354

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Please give a Copy to
your Diving School!

NO: 4
DATE: MAY 1990

COT NEWS LETTER



GREAT BARRIER REEF
MARINE PARK AUTHORITY

MARINE RESEARCH SECTION
- 2 AUG 1991
MINISTRY OF FISHERIES AND AGRICULTURE
The Republic of Maldives

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EDITORIAL

MAN AND NATURE

Hassan Ahmed Maniku has undertaken a comprehensive review of available literature entitled 'Changes to the topography of the Maldives...an historical overview'. He shows that natural disasters were quite common even before the Maldives started to be developed. 8 large storms are reported including one in 1821 which washed away 2 islands and one in 1819 in which 12 islands had to be abandoned. There are many undocumented historic reports of inundation of islands by seawater in the Maldives. Severe inundation was reported from several islands in 1964 and the inundation of Male' and several other islands in 1987 is fresh in everyone's memory.

How can conservation help when we face these natural disasters? Well, to be honest, it can't always help... at least directly. These disasters reflect extreme conditions and conservation is all about preventing the day to day deterioration of the environment. However, day to day environmental deterioration adds up. It adds up to reduce the capacity of the environment to cope with natural disasters and it becomes an increasingly rich spawning ground for disasters that are not natural. Environmental misuse kills the reef that protects the beach that makes the island that houses the people... and the greenhouse effect has been one hundred years, or more, in the making.

With the insights provided by his research Hassan Ahmed Maniku summarises these issues most eloquently and we are pleased that he has accepted our request to allow us to present the concluding paragraph of his report in our newsletter.

"We have seen above (his review - Ed) some of the incidents that have gone to shape the island-topography of the Maldives. Most of these are forces of nature at work. Maldivians have, all along their long recorded history, taken these in 'a stride' and resigned to accept these as natural and over which they had no control. But we see in modern times the islands being joined with causeways, lagoons

being filled up in order to make more land available, more and more coral and sand being removed for building purposes, more trees which acted as wind-breaks being cut down. These would certainly contribute to make this pristine island environment different from what our forefathers had seen. We live right in the centre of an ocean which covers one-seventh of the earth's surface and on lands touching this great body of water live a quarter of the world's population. What happens here politically, ecologically and otherwise would certainly manifest vividly in the Maldives. Natural forces have shaped our little country on a fragile equilibrium. We go on and disturb this balance by our own handi-work, in the holy name of progress to an extent not necessarily dictated even by the highest measures of it. We, in fact, engage ourselves in destruction -- wanton destruction. This we assume is something that cannot be prevented. As the country marches from one halt to another on the so-called road to progress, the concrete jungles that replace the natural vegetation and which we proudly display as symbols of modernisation fill all space available. If the long dead great-grandfather of one of us comes to life now and tours our islands he would not recognise many of them to be the Maldives in which he lived. If he recognises an island and names it correctly, then we would hurriedly label that island as un-civilised and far down the ladder of progress, measured with our very own artificial criteria. This is a reality to be faced and accepted. But 'How much can we and our island environment tolerate?' and 'At what cost to us and our future generations?' These are just two of the many questions to be carefully studied and a decision taken with no delay. How and when we do this will show what the future Maldives will be for generations yet un-born".

Hassan Ahmed Maniku March 1990

NEWS ABOUT FILMING BY WIF

Good news! Our equipment is finally in working condition. The editing for the first episode has already begun and is continuing. Things look promising and we hope to keep this up.

Unfortunately there is also some bad news. One of the senior members of our staff, Mr Ahmed Naseer, who was actively helping with the "COT BUSTER" project, resigned from WIF on the 2nd of May. His loss is extremely unfortunate though we sincerely wish him all the best in his future endeavours.

NEWS FROM LOCAL ISLANDS

No news this month folks!

NEWS FROM RESORTS

19 Resorts have returned the COT questionnaire sent to them with the March newsletter. 41 (60%) had not replied by May 20th. We ask that they do so as soon as is convenient especially those that reported problems from COT in the past. The results of the questionnaire, as of May 20th 1990, are given in table 1.

COT UPDATE

Table 1. Results from the COT questionnaire for March 1990.

ATOLL	RESORT	HOUSE REEF COT SEEN/DAY	HOUSE REEF CONDITION	COT SEEN NEARBY?
Lhaviyani Baa North Male'	Kureddhdu			
	Kunfunadhoo			
	Asdhu			
	Baara	1-9	Healthy	NONE
	Boduhithi Club. Med.			
	Eriyadhoo	0	Healthy	NONE
	Furana			
	Gaafinolhu			
	Giravaru			
	Hetiengeli	0	Healthy	NONE
	Hembadhu	1-9	Recovering	SOME
	Hudhuveli			
	Huru			
	Kaafinolhu	1-9	Healthy	FEW
	Kudadhithi			
	Kurumba	0	Healthy	NONE
Lankanfinolhu				
Lhohifushi	0	Healthy	NONE	
Little Huru				
Makunadhoo				
Meerufenfushi				
Nakatchafushi	100-999	Recovering		
Reethi Rah	1-9	Recovering	FEW	
Vaabinfaru				
Ziyaaraifushi				
South Male'	Biyaadhoo	0	Healthy	NONE
	Bodufinolhu			
	Bolifushi	0	Healthy	NONE
	Cocoa Island			
	Dhigufinolhu			
	Embudhu Finolhu			
	Embudhu Village			
	Fihaalhothi	1-9	Healthy	
	Kaadooma			
	Leisure Island			
Olhuveli				
Rannaithi				
Rihiveli	0	Healthy	NONE	
Vaadhu				
Velissaru				
Veligandhu Huraa				
Villivaruu	0	Healthy	NONE	

Cont Table-1

ATOLL	RESORT	HOUSE REEF COT SEEN/DAY	HOUSE REEF CONDITION	COT SEEN NEARBY?
Ari	Angaga	10-99	Recovering	SOME
	Ari Beach			
	Bathala			
	Ellaidoo			
	Fesdu Fun Island	100-999	Deteriorating	
	Gangehi			
	Halaveli			
	Kuramathi	0	Healthy	NONE
	Masyanafushi	1-9	Healthy	NONE
	Madogali			
Mirihi				
Nika Hotel				
Velidhu				
Veligandhu	0	Healthy	NONE	
Alimatha				
Dhiggiri				
Vaavu				

10 of the 19 Resorts who answered reported not seeing any COT. 2 Resorts (Nakatchafushi and Fesdu) reported large numbers of COT from their respective house reefs (the fringing reef around the island-Ed). House reefs around 14 of the Resort islands were reported as healthy, 4 were recovering from COT (Hembadhu, Nakatchafushi, Reethi Rah, and Angaga) and one was deteriorating (Fesdu). Interestingly 2 Resorts reported storm damage to their reefs.

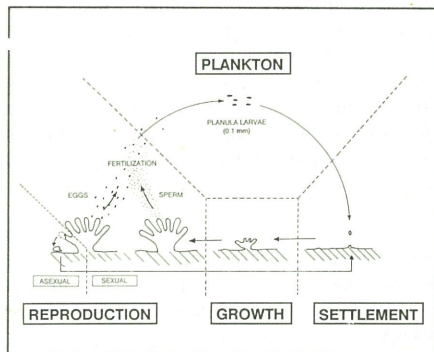
FESDU FUN ISLAND

We phoned up Fesdu on the 7th May when we received their COT 'update' questionnaire. Uli Rufeacht, the Dive Instructor, spoke to us. He reports that COT started appearing on a local dive site, Kadafushi Faru, a couple of weeks ago. Since then they have also started appearing on the house reef. Corals are being killed by the COT. (It was reported, in the April Newsletter that Fesdu was recovering from a COT infestation that took place several years ago - Ed).

CORALS AND POLLUTION

Corals react to pollution in a variety of ways. It is also important to realise that pollutants have different effects on different stages in the life cycle of a coral. In this respect it is best to visualise four main stages of the life-cycle of a coral when considering how it might be susceptible to pollution. The stages are illustrated in figure 1 below.

Fig. 1 Life-Cycle of a coral (generalised).



REPRODUCTION

New young are produced either sexually by the joining of eggs and sperm, or asexually, by a piece breaking off the adult.

TIME IN THE PLANKTON

After sexual reproduction the embryonic coral spends time in the open sea as a planula larva. It may live in the plankton for several weeks and be carried considerable distances by water currents. Little is known about this phase of the coral life cycle.

SETTLEMENT

Eventually something triggers the coral larva to settle on the solid bottom. The mechanism of settlement is extremely susceptible to pollution. Once the larva has settled it produces a glue that secures it to the bottom and starts to deposit a calcium carbonate (a hard form of chalk) skeleton.

GROWTH

Coral growth depends on both the coral and the algae that live in the coral tissue. The amount of energy that is available to a coral is very close to the energy needs of the coral. Any stress will, therefore, lead to a diversion of energy from other functions to fight that stress.

CORAL AND POLLUTION

Each type of pollution affects each stage differently and to a different extent. Corals can cope with a limited amount of pollution but the greater the amount of pollutant the more energy has to be expended in fighting it. This leaves less energy to fight other things or to carry-out normal functions like growth and reproduction. For example a coral may not be able to cope with a natural infection if it is also stressed by sewage pollution. Ultimately if the combined stress is too great the coral is overwhelmed. Stress can also lead to coral bleaching (the loss of algae from the coral tissue) and a further reduction in the energy available for normal functions since the algae provide coral with part of their energy needs.

SEWAGE AND CORALS

Sewage kills coral in three ways. (1) It uses up oxygen in the water as it decomposes. Healthy corals need very high levels of oxygen in the water and so suffocate at low oxygen levels. (2) Sewage covers corals in fine silt. The corals expend great quantities of energy in clearing themselves of silt. In some cases the amount of silt is too much and the coral is overwhelmed. (3) Finally sewage acts as a fertiliser that encourages growth of plants and animals that outcompete corals.

Figure 2 illustrates the effect of sewage on reefs. Settlement, growth, and reproduction are all seriously affected by sewage. The end result is a dead coral reef!

COT, CORAL AND SEWAGE

Figure 3 illustrates what will happen if a COT plague hits and there is some background sewage in the area. The result is a low coral cover reef that will only recover when, and if, the background environment becomes healthy again.

WHAT TO DO

Discharging sewage onto a reef is never a good idea either for corals or for human health. Unfortunately the alternatives are generally impractical or equally unhealthy.

Fig. 2 SEWAGE AND CORALS

REPRODUCTION: Fertility of coral reduced since energy normally used in reproduction spent on fighting pollution- clearing away silt etc.

TIME IN PLANKTON: Effects of sewage not known, though low oxygen levels will be stressful.

SETTLEMENT: Settlement success is low because algae and silt provide an unsuitable (unstable) substrate.

GROWTH: Growth rate reduced. Energy normally used for growth spent on fighting pollution- clearing away silt etc.

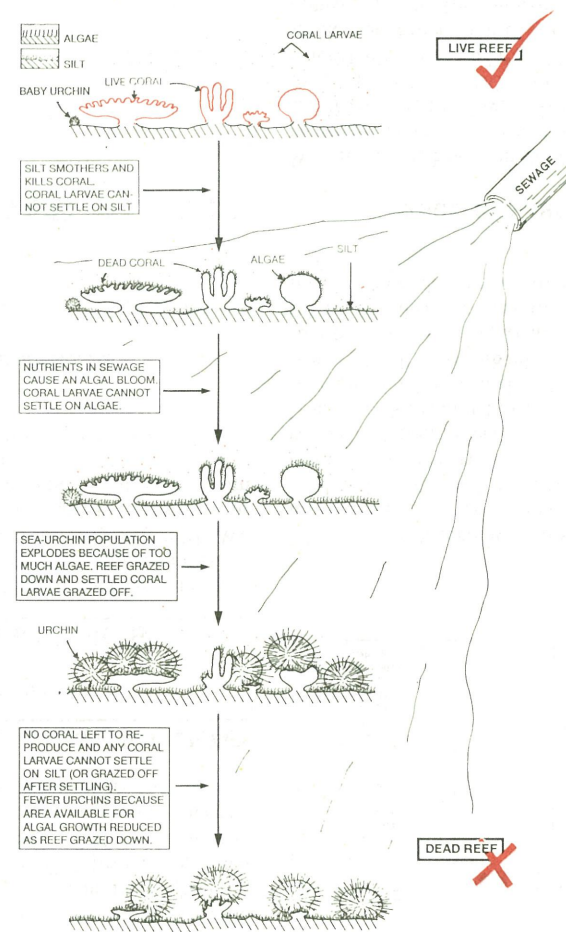
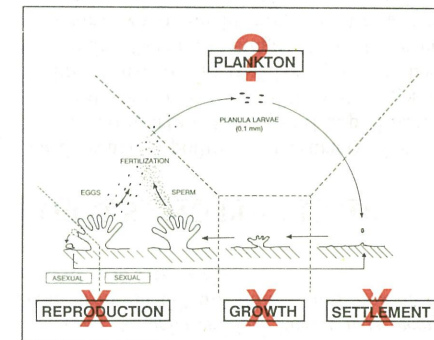


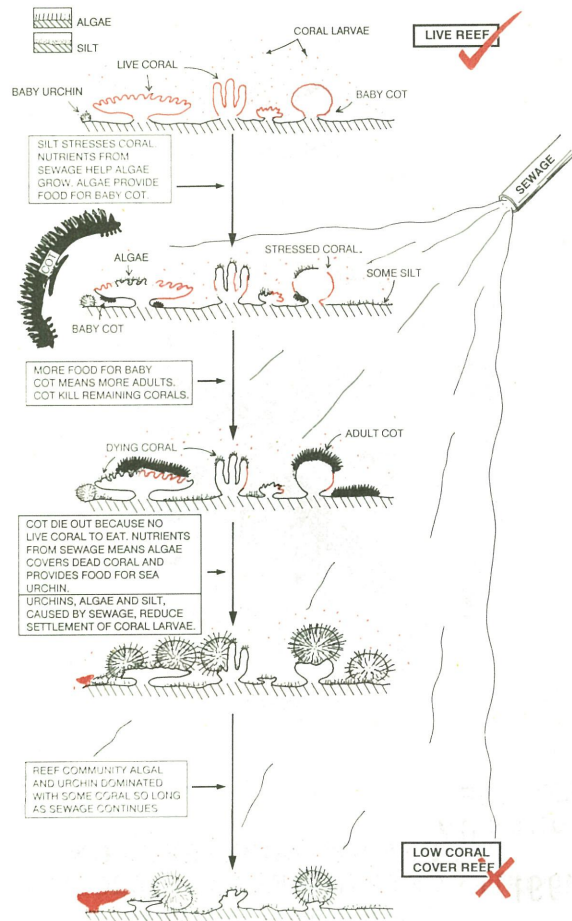
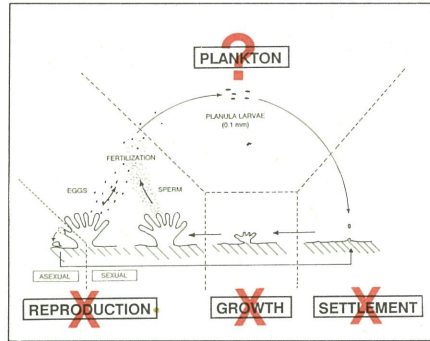
Fig. 3 COT, CORAL AND SEWAGE

REPRODUCTION: Fertility of coral reduced since energy normally used in reproduction spent on fighting pollution- clearing away silt etc.

TIME IN PLANKTON: Effects of sewage not known, though low oxygen levels will be stressful.

SETTLEMENT: Settlement success is low because algae and silt provide an unsuitable (unstable) substrate.

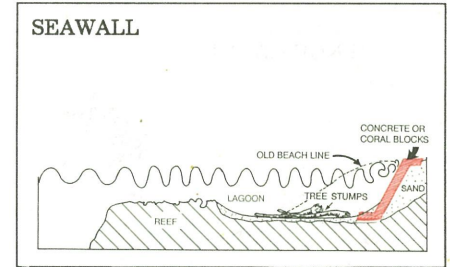
GROWTH: Growth rate reduced. Energy normally used for growth spent on fighting pollution.- clearing away silt etc.



SEAWALL

You can put a seawall on the beach (fig. 4) that makes the beach stronger than any of the forces that are eroding it. This is a waste of effort if the wall isn't strong enough and a great expense if it is. It will not be good for tourism (buttwise or buckwise). Seawalls should be tourism's last resort!

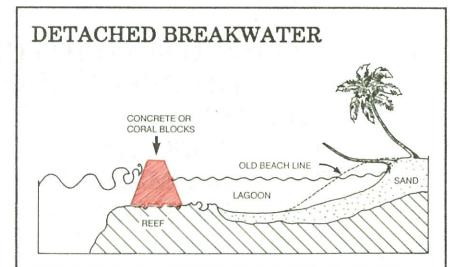
Fig. 4



DETACHED BREAKWATER

If the beach is eroding because it is being attacked by waves the answer could be to put up a detached breakwater (or wave damper) offshore from the beach and usually on the reef top (fig. 5). You can see them around several islands in the Maldives. Baros and Kurumba Resorts provide good examples. The idea is to reduce the size of the waves reaching the beach. Under normal conditions a healthy reef is like a detached breakwater (see fig. 3 in last month's newsletter). Indeed the best self-maintaining detached breakwater is a healthy reef!

Fig. 5



Sewage treatment is difficult on small islands and produces solid and liquid waste which is unhealthy and which still has to be disposed of (if any reader knows of a small scale sewage treatment facility that might work on small islands then let us know - Ed!). Soakaway into the groundwater is merely delaying the release of sewage into the sea and it is probably less healthy for humans than discharge into the sea if the groundwater is used for washing.

If sewage has to be discharged untreated into the sea the best compromise is to discharge-

- 1 As far from bathing areas as possible
- 2 Into fast moving water
- 3 At night

A number of resorts discharge sewage into holding tank(s) which automatically empty into the sea when full. Ideally the tank(s) should be large enough to store a days discharge and the discharge pump should operate when a sensor at the open-sea end of the pipe tells it the water current is running.

THE BEST SOLUTION

The best, though be no means the cheapest, solution would be to pump the sewage into holding tanks until a regular visit by a sewage collector vessel. The sewage could then be pumped into the vessel which would then take it a few kilometres outside the atoll and dump it into the open ocean.

BEACH PROTECTION

The last COT newsletter discussed the problems of beach erosion caused when larger waves reach the shore because the reef has been damaged by COT. It was also mentioned that this month's newsletter would describe various ways of protecting the beach from erosion. There are three main methods of achieving this. The first two methods attempt to subjugate the forces of nature and, if at all possible, should be avoided. A healthy environment is the best way to insure that the beach survives! The third, and best, method is beach nourishment.