

There is also the problem that the breakwater will change the wave energy and so sort the grains of sand on the beach in a different way. The result may be a beach where the grains are too fine or too coarse.

With all these potential problems most breakwaters are unlikely to do what was intended of them. In some cases enterprising Resorts decide to remove them. In others they leave them to deteriorate. These options are better than making the breakwater more continuous (which creates stagnant water conditions) or landfilling behind the breakwater so that the breakwater becomes a seawall (which creates a totally artificial beach).

In summary it is better, before installing a detached breakwater, to:-

**FIRST  
CONSIDER  
BEACH  
NOURISHMENT**

**SEAWALLS**

Seawalls are bad for tourism (buttwise and buckwise). However there are certain cases where a seawall may be necessary. Seawalls are described and discussed in the October edition of the COT newsletter.

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**STOP PRESS**

**TROUBLE WITH TURTLES**

Reports that Staff on Kuredu Island Resort in Lhaviyani Atoll were using turtle eggs in their cooking prompted us to ask them to advise us whether they have 'a voluntary\* policy concerning the use of turtle eggs on (their) Resort'. They replied that they 'appreciate (our) suggestion and have advised the staff more specifically, especially as Kuredu is used often by the turtles in the area for the laying of their eggs'. Hopefully this means that turtles are safe on Kuredu!

There is little doubt that the Resorts will need to play a critical role in the survival of turtles in the Maldives by offering the opportunity for undisturbed nesting. There are few non-tourist islands, inhabited and uninhabited, where nesting turtles are not presently exploited. Levels of exploitation will increase with the increasing human population.

\* There is no regulation controlling the use of turtle eggs in the Maldives. There are a number of regulations concerning the capture and sale of turtles and turtle products. Turtles cannot be collected if they have a shell length less than 2 1/2 feet. Stuffed turtles cannot be sold or displayed in shops. Whole turtle shells cannot be exported though ornaments made from turtles can (*most countries, however, do not allow importation - Ed*).

**Please give a Copy to  
your Diving School!**

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DATE: SEP 1990

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**COT  
NEWS LETTER**



**MARINE RESEARCH SECTION**  
**MINISTRY OF FISHERIES AND AGRICULTURE**  
The Republic of Maldives

## EDITORIAL

### SELLING AN IMAGE

Tourism in the Maldives is based on an image. The image is one of palm fringed coral sand islands, and clear blue waters... an 'unspoilt' place to relax away from the stress and problems of the industrialised world.

Yellow, blue, and green are the colours of this image. Sun, sand, and sea, form the frame. Backing all this are the facilities that are needed to allow the tourist to relax in comfort. All these elements are needed to sell this image and a shortfall in any one of the elements reduces the appeal of the product and the size of the potential consumer market.

Looking for, and finding, ways of remedying possible shortfalls in some of these elements are two reasons for holding the 'Dive and Resort Operators Workshop' on the 18th of October 1990.

The theme for the workshop is "Health of the environment - Safety of the Diver: two sides of the same coin". Whilst the title is rather long it embodies the theme of this editorial.. namely that the Tourism Industry in the Maldives requires that environmental health be maintained and that services, including those associated with diver safety, be enhanced.

The workshop gives an opportunity for a wide section of the Tourism Industry to discuss, and comment on, these issues and to make recommendations for improvements. It is a chance for the Industry to collectively 'get-its-act-together' and come to some sort of a consensus about the important issues that need to be addressed in the coming year.

The workshop can provide an opportunity for self congratulation on the increasing number of tourists arriving in the Maldives.

However it should always be remembered that environmental health and safety in the Maldives are not everlasting features that magically manage themselves. The Industry cannot afford to believe its own advertising 'hype' and leave everything to 'nature'.

Effective environmental health and safety practices require hard work and good management. If the participants think otherwise then they would be better advised not to attend the workshop but to relax and enjoy one of their own holidays whilst the holiday is still worth taking.

### NEWS FROM LOCAL ISLANDS

A total of 54 islands were visited in atolls to the south of Male' between the 14th of August and the 4th September 1990 (table 1). The reasons for the trip were to see the condition of the reefs, check them for COT, and examine the islands for problems of beach erosion.

TABLE 1. SUMMARY, BY ATOLL, OF ISLANDS VISITED BETWEEN THE 14TH OF AUGUST AND THE 4TH OF SEPTEMBER 1990.

ATOLL	INHABITED	UNINHABITED	RESORT STORE	OTHER	FUEL	TOTAL
Ari	3	1	1			5
Faaf	3	2				5
Dhaal	3	5			1	9
Vaav	1		1			2
Meem	4					4
Thaa	4	1				5
Laam	4	1		1		6
Gaaf Alif	3	6		1		10
Gaaf Dhaal	2	5		1		8
Total	27	21	2	3	1	54

### REEF CONDITION

Many of the reef tops, even around remote and uninhabited islands, showed some evidence of coral mining. Areas that were not mined were in very variable condition. There was no evidence to suggest that this variability was due to pollution. What is more likely is that the variability reflects different stages of recovery from natural stress such as storms, extreme low tides, and COT infestations. Reef areas that have just faced these stresses are mostly dead whilst others will continue to be covered in healthy coral until they, in turn, go through some natural stress that damages them.

If reefs in Maldives are subject to considerable natural stress it makes it doubly important to try to make sure that they are

subjected to the minimum of additional stress from human activities. Additional stress may slow, or prevent, the natural recovery cycle.

### COT

No COT plagues were identified on the trip (table 2). However, it is a cause for concern that all the reefs that were examined in Gaaf Dhaal had COT. 48 COT were seen in one hour on the house reef of Gaaf Dhaal Kandahalagala. This is well on the way to the numbers reported for some sites in North Male' Atoll (see the June Newsletter - Ed).

TABLE 2. INCIDENCE OF COT AT 37 SITES IN 8 ATOLLS VISITED DURING AUGUST AND SEPTEMBER 1990.

ATOLL	NUMBER OF SITES	SITES COT SEEN	NUMBER OF COT SEEN/HR
Ari	5	0	0
Faaf	4	1	9
Dhaal	7	0	0
Meem	1	0	0
Thaa	4	0	0
Laam	4	0	0
Gaaf Alif	6	4	1, 1, 1, 2
Gaaf Dhaal	6	6	1, 1, 2, 3, 3, 4, 8
Total	37	11	

The fact that Gaaf Dhaal is subject to relatively low levels of human impact, but has COT, may be further evidence that COT plagues are natural events.

### BEACH EROSION

Both inhabited and uninhabited islands showed beach erosion. Some of this erosion, particularly on inhabited islands, is caused because sand has been taken from the beach for construction. The solution to this problem is to suggest alternative sources of sand and, if necessary, replace the sand that has been removed from the beach from these sources.

It is also evident that many islands go through a natural cycle of beach erosion and build-up associated with the monsoons and occasional storm events. This provides justification for not over-reacting to beach

erosion by building groynes and seawalls but to accommodate this natural movement by building on piles near the shore (see the August newsletter - Ed).

Beach erosion only appears to be of significance to local islands where population densities are high (*Resorts are not allowed on islands with existing Maldivian communities - Ed*). The islanders response is to build a seawall and there are some local islands with virtually no remaining natural beach. Indeed these islands are planning to go still further and claim land from the lagoon to house their expanding populations.

### GENERAL ENVIRONMENTAL CONCERNS

Few of the local islanders we talked to reported any environmental problems. Various pests were a common source of irritation. Apart from these pests there were actual and potential environmental problems in plenty. The lack of local awareness and local concern about these problems should not be taken as an excuse for inaction. However, remedies must go hand-in-hand with education and encourage community involvement or they will be ineffective.

### FRIGATE BIRDS

We were extremely fortunate to visit one of the two main frigate bird roosting islands in the Maldives. The birds are reported to nest further south in the Indian Ocean British Trust Territory of Diego Garcia.

Unfortunately our arrival happened to coincide with an overnight camping expedition by boys from a local school. The boys and their teachers visit the island every couple of months and stay overnight. During this time they catch twenty or thirty roosting birds and make a feast of them.

We suggested to the headmaster that he ask his pupils to write an essay on whether killing these birds was the right thing to do. The birds might eventually stop coming, or worse

still, be wiped out altogether. The headmaster took our comments to heart. He said that he had thought there was nothing wrong with doing it since he took his example from the 'bigwigs' (senior people) who did the same thing when they came to the islands.

We look forward to seeing the essays!

## ADOPT A CORAL

Eight Resorts have now adopted corals. Details are listed in table 3. Twelve more Resorts have promised to send details of the corals that they have adopted.

TABLE 3. DETAILS OF ADOPTED CORALS.

ATOLL	ISLAND	DATE ADOPTED	CORAL NAME	
			PORITES	TABLE
N. Male	Kanifinolhu	300890	Fatima	Ali
	Biyadhoo	080790		Raphael
S. Male	Fihalhohi	200890	Greenpeace	
	Fun Island	080890	Mama	Zulu
	Rihiveli	140790	Victoire	Bastille
	Rannalhi	060890	Bonzo	Graziella
	Villivaru	080790	Zenia	
Vaavu	Diggiri	260890	Peta	Dish

## CONFUSION

There seems to be some confusion about the reasons for 'Adopt a coral' and this may explain why several of the dive schools have shown so little interest in the scheme. There are several reasons for launching the 'Adopt a coral' scheme. Some of these reasons may seem unimportant at this time but will take on increased significance in the future. In the immediate term the idea is to use the adopted corals as 'house reef mascots' and so remind the Resort and Dive School Staff that the reef needs to be cared for.

The amount of work involved in 'Adopting a coral' can be minimal. The process is fairly straightforward.

- Go out and select two suitable healthy corals in snorkelling depth.
- Decide what you are going to call them. The names should, if possible, be Maldivian.
- Send Marine Research Section the date of adoption, the names of the adopted corals, a map showing

where the corals are on the house reef, and photographs of the corals.

- Let us know as soon as anything happens to the corals.
- If all is well send us a photograph of the corals on each anniversary of the adoption date.

As the years pass there will be real cause for celebrating the continued health of each coral mascot or concern if one happens to be unhealthy or dies.

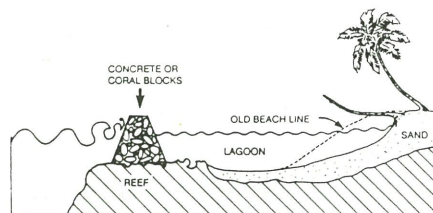
We also adopted 16 table corals and 16 Porites corals at 16 sites on our trip. We wish all the corals well!

## BEACH EROSION

The May edition of the COT newsletter outlined the various ways in which beaches can be protected from erosion. The best way is beach nourishment and this method is described in the June edition of the newsletter. Sources of sand for nourishment, and how they can be transported to the beach, are described in the August newsletter.

The other two ways of protecting beaches from erosion attempt to subjugate (overcome) the forces of nature and, if at all possible, should be avoided. The first is to use a detached breakwater (fig. 1).

Fig. 1 DETACHED BREAKWATER.



A detached breakwater operates rather like a healthy reef and reduces the energy of waves striking the shore. If larger waves strike the shore then the sand particles will be moved to a new position where the wave energy is less. This could be somewhere else along the beach line or further inshore. In the latter case the result is a steeper beach that is eroded back.

Fig. 2 EFFECT OF DETACHED BREAK WATERS ON BEACH LINES WHEN THE WAVES HIT THE BEACH HEAD-ON AND THERE IS MINIMAL LONGSHORE DRIFT.

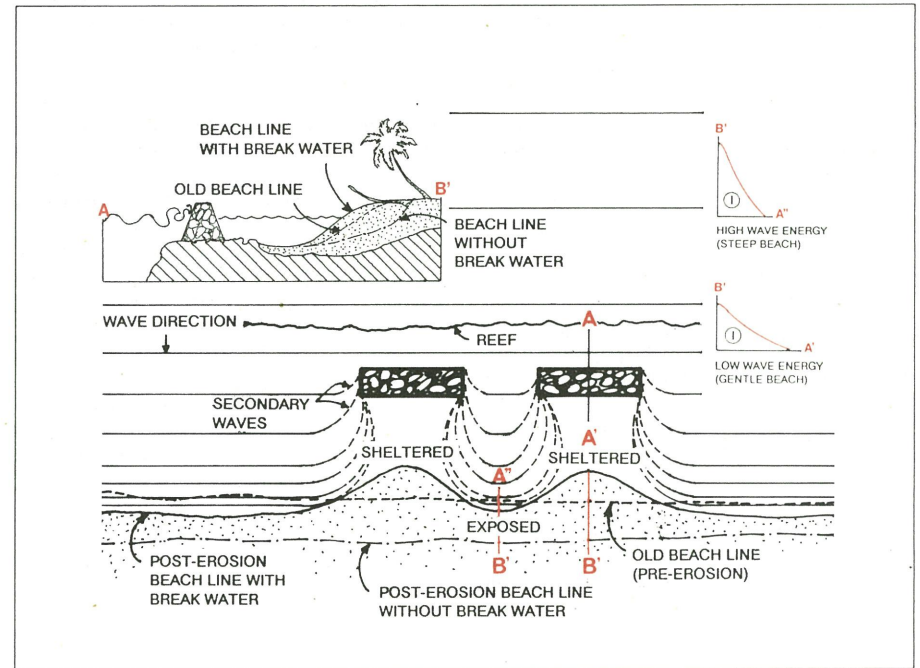


Fig. 2 illustrates the effect of a breakwater when the waves hit the beach head-on. Where the beach is sheltered by the break water the beach profile becomes less steep and the beach line advances (A'-B'). The reverse is the case where the beach is not protected by the break water (A''-B'').

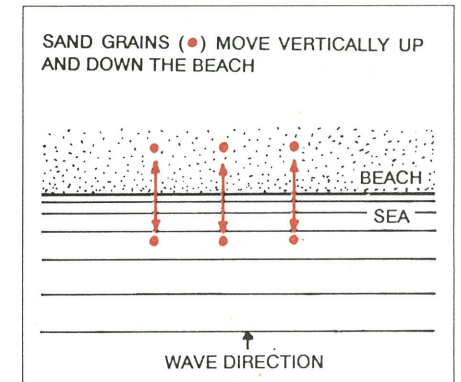
Use of a detached breakwater should only be considered for beach protection if the conditions that controlled the original beachlines have changed irreversibly and the degree of erosion is critical. Building a detached breakwater on a deteriorated reef is short sighted since the reef will eventually recover and do the job itself. It certainly won't recover if it is covered in a breakwater!

Even if the conditions controlling the original beachlines have changed irreversibly then putting in a detached breakwater may create more problems than it solves. To understand why requires an understanding of the process of longshore drift.

## LONGSHORE DRIFT

If waves hit the beach head-on sand is moved vertically up and down the beach (fig. 3).

Fig. 3 MOVEMENT OF SAND GRAINS ON A BEACH WHERE THE WAVES HIT HEAD-ON.



However, if the waves hit the beach at an angle the sand is also moved up the beach at an angle. There is a net movement of sand in one direction along the beach with the passage of successive waves. This process is known as longshore drift (fig. 4)

Fig. 4 MOVEMENT OF SAND GRAINS ON A BEACH WHERE THE WAVES HIT AT AN ANGLE.

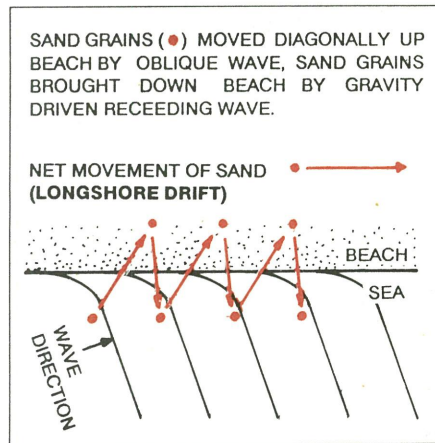
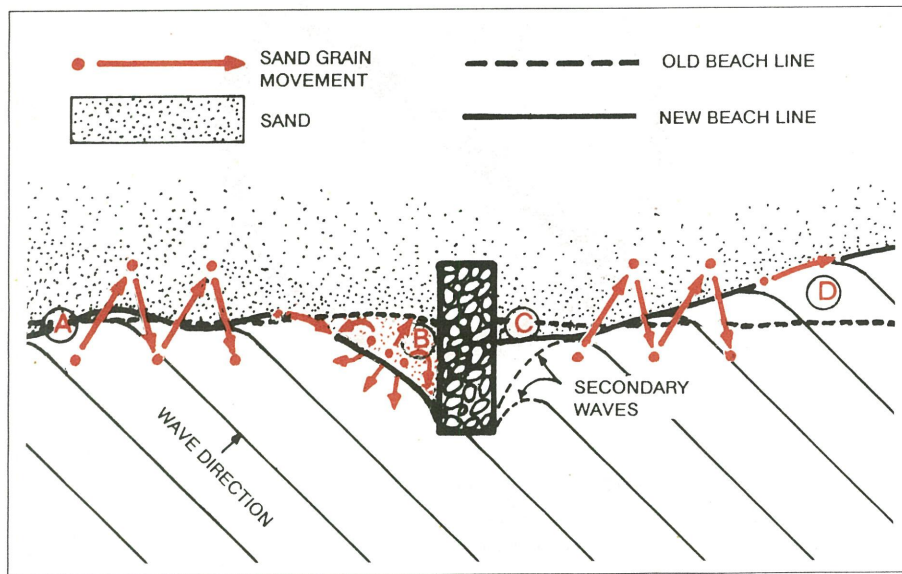


Fig. 5 EFFECT OF A GROUYNE ON THE BEACH LINE WHEN THERE IS LONGSHORE DRIFT.



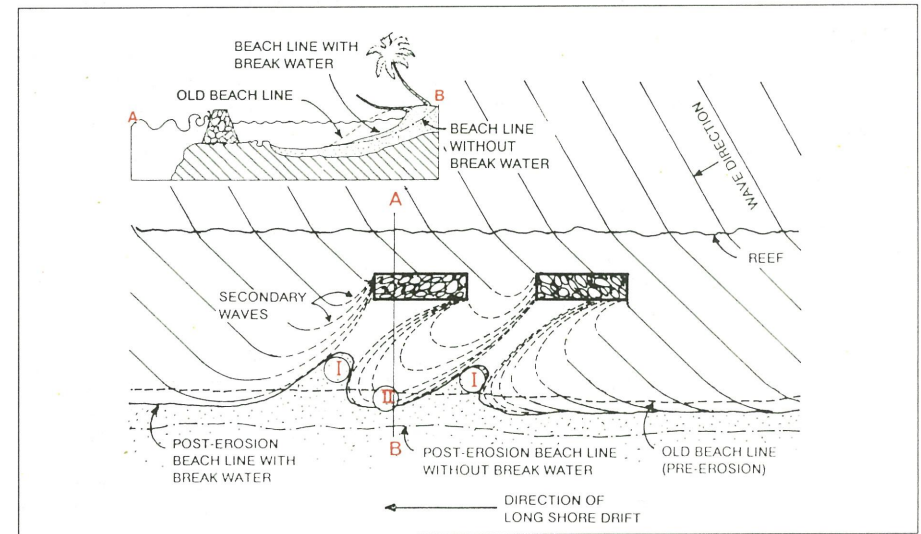
It is obvious that on a small circular coral sand island there must be some longshore drift under almost any wind direction so long as the wind produces sufficient wave energy to move the sand grains. There will always be waves hitting some part of the beach at an angle.

Longshore drift creates the problems that many resorts have tried to solve using groynes. The fact that a groyne often creates more problems than it solves is worth discussing in more detail.

### GROYNES AND LONGSHORE DRIFT

Fig. 5 shows how a groyne operates to block longshore drift. Indeed a groyne is the first place to check whether longshore drift is taking place. The sand builds-up on the up-drift side of the groyne (B) because the groyne physically blocks it from moving further. Sand is eroded from the down-drift side (D) of the groyne because the sand that is there is moved further along the beach by longshore drift but is not replaced (cont...opposite).

Fig. 6 EFFECT OF DETACHED BREAKWATERS ON BEACH LINES WHEN THE WAVES ARE HITTING THE BEACH AT AN ANGLE AND THERE IS SIGNIFICANT LONGSHORE DRIFT.



The beachline at (A) (see fig. 5 opposite) will not erode unless there is a blockage in the supply of up-drift sand (for example by a second groyne). Sand builds slightly at (C) because the beach is sheltered by the groyne. The situation on the diagram will reverse if the monsoon changes.

Eventually a groyne can cause as much erosion on the down-drift side as occurred before the groyne was put there in the first place. The Resort that then builds a seawall to prevent this additional erosion has crossed the starting line of the popular pursuit of chasing the sand beach around an island using a seawall.

In summary it is best before installing a groyne to:-

**FIRST  
CONSIDER  
BEACH  
NOURISHMENT**

### DETACHED BREAKWATERS AND LONGSHORE DRIFT

Fig. 6 illustrates the effect of installing detached breakwaters when waves are hitting the beach at an angle and are causing longshore drift. The sand moves along the beach until it reaches the wave-sheltered area created by a breakwater. There is insufficient wave energy to move it from this area so the sand collects and the beach builds (I). Unfortunately because the sand is collecting it is not moving on into those unsheltered areas where the sand is being moved out by the longshore drift (II).

On a relatively straight shoreline it is possible to decide where best to position detached breakwaters to landscape the beach to your designs. On a circular shoreline around a coral sand island, where the wind direction also changes with the monsoons, it is extremely risky. A gain of sand at one site will mean a loss of sand from another since the sand budget of an island is limited by various factors that are not, necessarily, controlled by breakwaters (see fig.2 in the June Newsletter -Ed).