



*"It is time scientists learn to make weather adapt itself to our clothes."*

temperature respectively in mm of mercury.

$r_a$  and  $rc_1$  = resistivity of ambient air and clothing respectively,  
 $W$  = proportional wetness of skin (varies from 0.05 to 1.0).

The introduction of clothing interferes with the rate of cooling by evaporation. It first reduces the wind effect and then lessens the evaporation loss. The cloth absorbs moisture from the skin and the moisture from the cloth evaporates and decreases the cloth temperature. No doubt, the cooling of the cloth will affect the body temperature but it is not as effective as direct evaporation from the skin.

Studies have been made to find out the insulating value of different fabrics. It has been found that fabrics such as wool, fur and some types of cotton give an insulating value of 4 clo units per 25 mm of thickness. It is observed that warmth of different degrees is felt with different fabrics of the same thickness. This difference is due to air movement through the fabrics. Cotton fabric is a good windbreaker in breezy conditions and provides better insulation than a woollen sweater. Woollen sweater would be a good insulator in still air. Effectiveness of a clothing insulation decreases for smaller parts of the body. For smaller parts, like fingers and feet, higher insulation is required to keep them as warm as the other parts.

It is of interest to a climatologist to find out the clothing requirements of a man in different seasons and in different climatic zones. Once the clothing requirements for different climatic zones are known, it is easy to study the palaeoclimate (climate of a region in the past) of a climatic zone, provided the clothing habit of that particular time is known.

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pressure gradient force, tidal currents generated by the gravitational force, etc. In addition to these groups, which may occur anywhere in a large area of water body, there are certain currents found only along the sea coasts in the break zone. These are the longshore currents and the rip currents generated by the ocean waves when they break near the coasts. Among these two, the rip currents require special mention because they carry a lot of beach material towards the sea and are very dangerous to the swimmers on the beach.

Rip currents are common along gently sloping sandy beaches. They are very strong and flow towards the sea away from the beach. Near the coast they are very narrow and widen as they flow away from the shore. It may be observed that near the shore the width of the rip is about 15 to 30 metres and it attains a width of about 30 to 130 metres away from the coast. These figures, however, are not typical because normally the rips are much narrower. The length of the rip currents varies depending upon the incoming waves. For a given beach slope, the length tends to be shorter when the waves are small.

The rips might be as long as 1.5 km to 3 km when the sea is relatively rough. Regarding the speed of the rips there are few observations, but they can attain a speed of about 2 to 3 knots under certain conditions. The speed decreases in the direction of flow. More precisely, the maximum velocity of the rip current decreases inversely with the distance from the coast, and the half width increases linearly with the distance. The region, where there is an abrupt expansion of the width of the rip current and a rapid decrease of the

## Rip current—swimmer's enemy on beach

ANY flow of water may generally be called a current and, depending on the force that generates

them, we can group them as wind currents generated by the wind, geostrophic currents triggered by

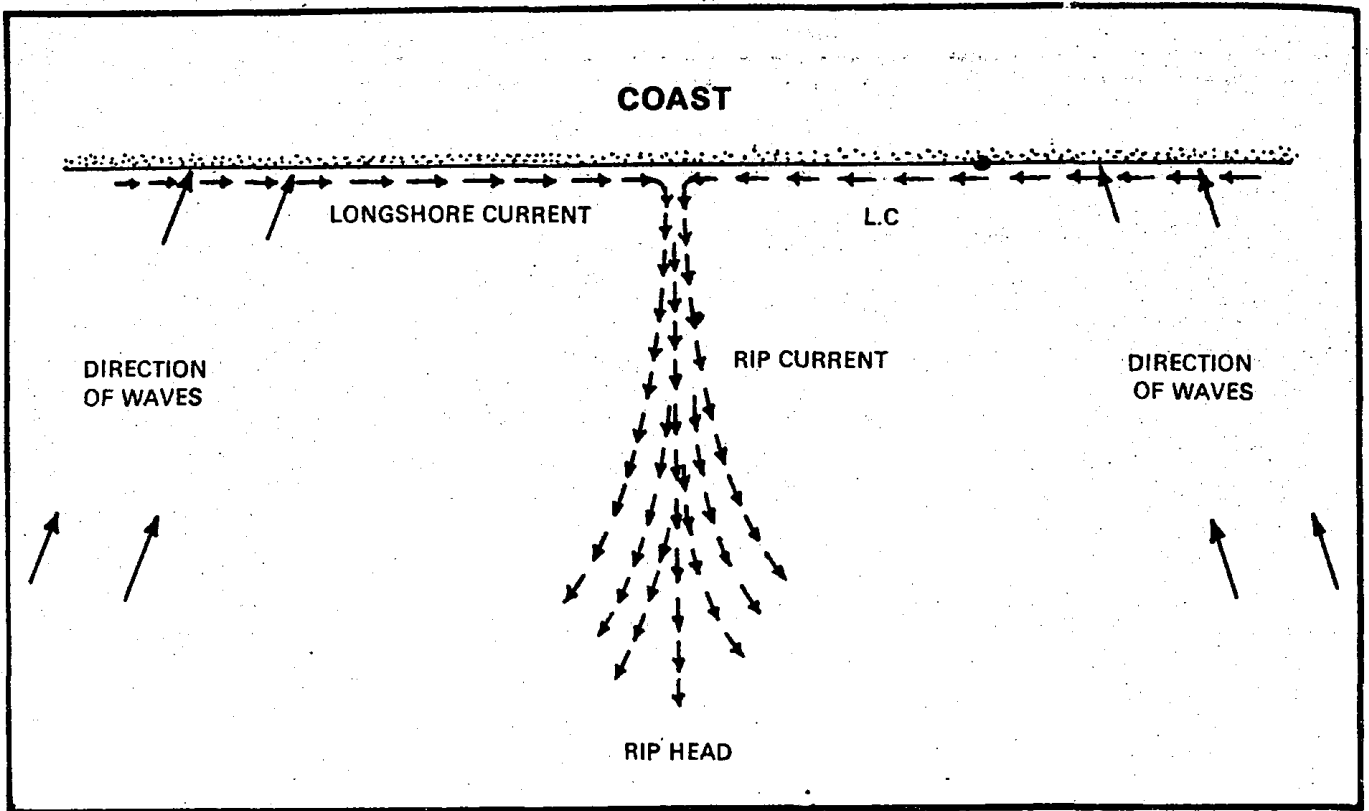


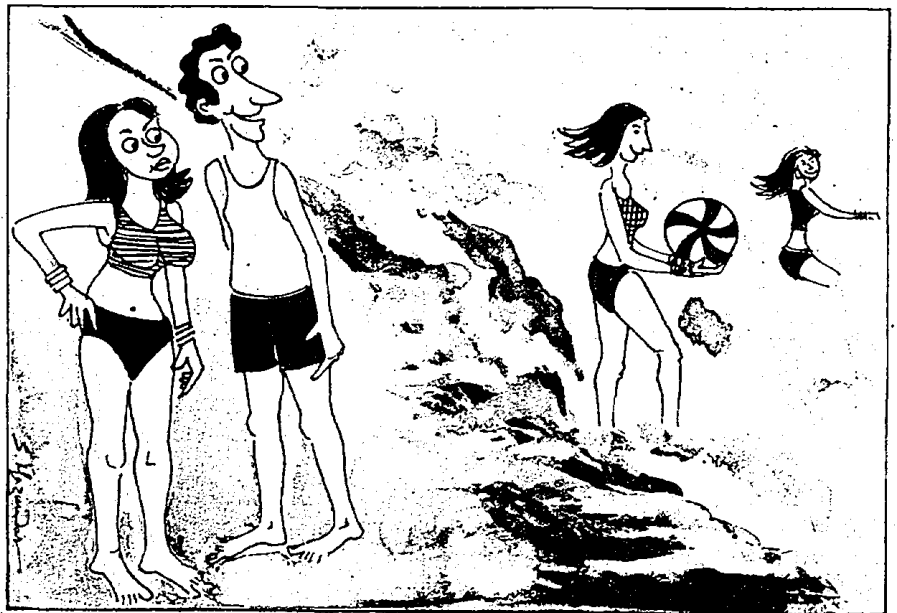
Fig. 1

speed, is called a rip head. Beyond the rip head, the current mixes with surroundings and loses its identity. The rip currents normally flow perpendicular to the shore line. But this need not always be the case. Many of them run obliquely across surf zone, and as the rips tend to turn away from the direction of approach of the waves, they may not always follow a straight course. There seems to be some sort of regularity in the spacing of the rips on the same stretch of a beach and they are generally noticed where the wave activity is less than in the neighbouring areas.

The mechanism by which the rips are generated is simple. When waves break, the wave energy is released on beach. Depending upon the angle the wave crests make with the shoreline, the forces generated by this energy can be resolved into two directions—one perpendicular to the shore and the other along the shore.

The perpendicular component of the force is responsible for stirring up the beach material, while the along-shore component generates a current in the direction known as the along-shore current. Since the distribu-

tion of wave heights along a long stretch of coast is not uniform and the waves strike the coast with different angles, there may be zones of convergence and divergence of wave energy at different parts of the coast



*"Not only are currents dangerous to swimmers, my dear, even the curves on the beach are so."*

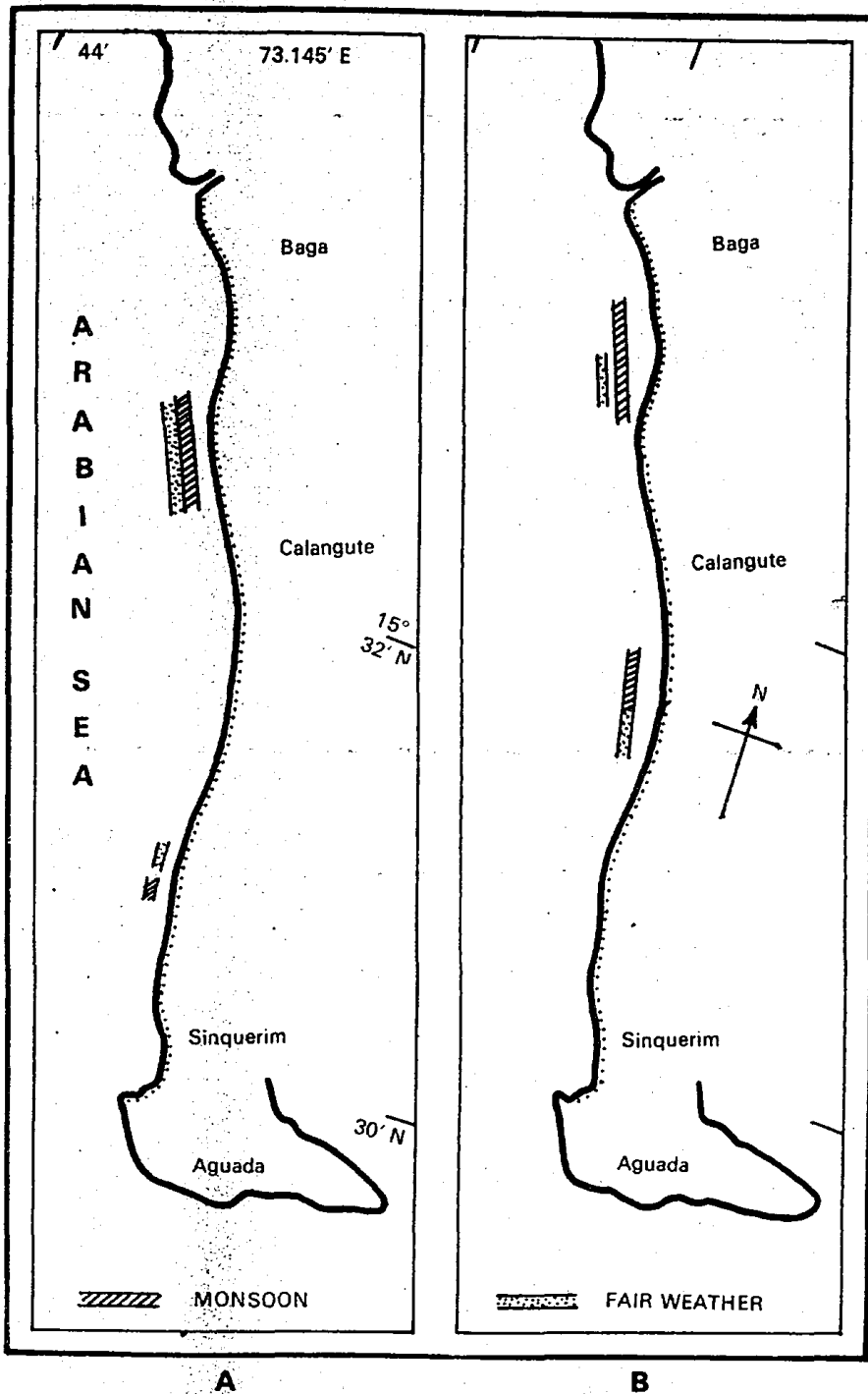


Fig. 2

and the longshore currents may flow in opposite directions. These oppositely flowing longshore currents meet at certain places and at these places the two currents merge together and flow away from the shore towards the sea as rip currents

(Fig.1). Though generally the rip currents are generated in this way, it is not always necessary that two longshore currents should meet to generate a rip current. In certain cases, when the angle of approach of the wave is sufficiently acute, a

strong longshore current will be generated and this current may turn obliquely towards the sea to form a rip current.

Rip current is the biggest enemy of a swimmer in coastal waters. Most deaths by drowning in the sea occur as the victims are swept away by the rips. A swimmer caught up in a rip is most likely to be carried away. The human tendency in such situations is to try to swim against the current. As a result the swimmer gets exhausted and is drowned eventually. Once caught up in a rip, it is advisable to swim across the current and, as the current is very narrow, one can be out of it soon. The tendency to choose a comparatively calm region for swimming may also prove dangerous because, as mentioned earlier, the rips generally originate in calm regions.

Rip currents play an important role in the beach processes such as beach erosion, accretion, etc. When waves break, a part of the energy released keeps a part of the beach material in suspension and this suspended material is carried alongshore by the longshore currents. But it is the rip currents that carry such suspended material offshore resulting in a loss of material from the beach. It also forms a part of the circulation pattern in the breaker zone.

The rip currents along a particular beach can be demarcated either from field observations by throwing certain types of dyes or from theoretical studies like constructing wave refraction diagrams. For a given beach the constancy of the areas of rip currents depends on the direction of wave approach. As the direction of the predominant waves is not likely to vary much within a particular season, the areas of rip currents along a beach for different seasons can be demarcated with a certain amount of accuracy. It is, therefore, obvious that intensive studies on

the nature and genesis of rip currents will help considerably in determining the movement of beach sediments along a coast and would significantly reduce the number of deaths by drowning in the sea.

### Rip currents along Indian coasts

Information on rip currents along Indian coastline is meagre as only a few attempts have been made so far to study them. The only study perhaps may be the one carried out recently along the Goa coast where the rips were studied extensively (Fig. 2). This 7.5 km long straight strip of sandy beach includes the famous Calangute beach, one of the important tourist attractions in our country. Frequent deaths by drowning in the area and erosion during monsoon have created problems for the local authorities. Studies were, therefore, initiated by the National

Institute of Oceanography, Goa to understand the direction of movement of beach material and the areas of rip currents dangerous to swimmers during fair weather (October-May) and monsoon (June-September). The study has revealed a number of areas of rip currents along the beach. The areas of persistent rips are shown in Fig. (2 a).

In order to promote tourism, Government of India and the local authorities have recently framed a number of developmental programmes to improve facilities for tourists on our beaches. Nevertheless, information on rip currents is not available in respect of many of our beaches. It is high time to give serious thought to this problem.

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He and his team used sophisticated instruments such as motion picture cameras and electronic pupillometer to measure pupil's size.

### Hard, soft...eyes!

In an experiment Hess showed two photographs of a young attractive woman to a group of men and asked them to describe her. The pictures were identical except that in one the pupils were large and in the other small. The subjects, without noticing the difference in pupil size, described the photograph with large pupils as "soft", "more feminine" or "pretty". The picture with small pupils was described as "hard", "selfish" or "cold".

An eye wash preparation containing atropine—a pupil dilating chemical—was in use in the United States until it was curbed by the U.S. Food and Drug Administration. Evidently, the enlarged pupils make eyes more attractive. Why do we find children's eyes more loving, attractive or bright? It is because they have in addition to other physical characteristics larger pupils than adults.

## Eye-to-eye communication

WE often describe eyes of others as soft, hard, cold or warm. What do these adjectives mean in relation to eye? Is it correct, as is commonly believed, that eyes can express emotions? Ten years ago, Professor Eckhard H. Hess of the University of Chicago described that when viewing a pleasurable object, the viewer's pupils are dilated and the size of pupils is related to his emotions and mental activity. Recently, Hess has been interested in the role of pupil size in non-verbal communication, i.e., how emotions could be expressed by changes in pupil size. His findings (*Scientific American*, November, 1975) have revealed how some one's pupil size affects the attitude and responses of the person,

who observes them, at an unconscious level. We all encounter many instances in our day to day life: somebody who is confident while talking looks straight into your eyes and another, shy in nature, averts his eyes.

### Pupils: eyes windows

Pupil acts to regulate the entrance of light rays. In darkness pupils dilate to allow enough light to pass and focus on the photosensitive layer, the retina. The reverse happens in light: the pupils contract to prevent excessive light from entering into the eye. Pupilometrics—the measurement of changes in pupil size—as Hess has named it, is a useful tool in the study of changes in attitudes.

### Pupil size and sex

Large pupils in a woman are an indication of her sexual inclination. When viewing the larger pupils of a woman, a man's pupils too dilate meaning a change in his response to the female's attitude.

A psychologist, Thomas M. S. Simms, at the University of Toronto studied the pupil responses of normal married men and women. The subjects were shown two photographs each of a man and a woman, one with small pupils and the other with large pupils. The researcher found some interesting results:

- (i) the pupils of male subjects viewing woman's photographs with large pupils were dilated most.