

WAVES

A sign of things to come

BY COLEEN BONDY

Scuba divers tend to have a rocky relationship with waves. After all, they batter our beach entries, toss us against rocks, throw sand in front of our masks and even make us sick. Thanks to waves, an otherwise great dive trip can turn into alternating episodes of zero visibility below water and involuntary chumming from the boat above. But waves need not always be associated with unpleasant events.

Just as sound waves and light waves carry information to us from their source, ocean waves bring us messages about our dive spot as well as news from far out at sea. If read properly,

waves warn us of impending storms and tell us the nature of the bottom and of the currents in the area we are about to dive. Waves allow us to monitor the pulse of the oceans.

Most waves are generated by the wind, and they begin their journey toward land far out at sea. The size of a wave depends on the speed of the wind, the length of time a gust of wind blows, and the distance the wind traverses over the water. Thus, a strong blast of wind that lasts a long time and covers a great distance of open ocean will produce a large wave that crashes spectacularly on the land. Weak or short gusts of wind,

or wind that pushes water only briefly before striking land, will produce the short choppy waves we find in gulfs, bays, and estuaries. A chart, called the Beaufort Wind Scale (see sidebar), was created to show the relationship between wind velocity and wave height.

The strongest and largest waves are produced by offshore storms, hurricanes, and earthquakes. Storms at sea will swirl huge waves against nearby islands and continents, even though the storms themselves may never strike the coastline.

In the Northern Hemisphere, storms, and therefore large waves, are more

BEAUFORT WIND SCALE

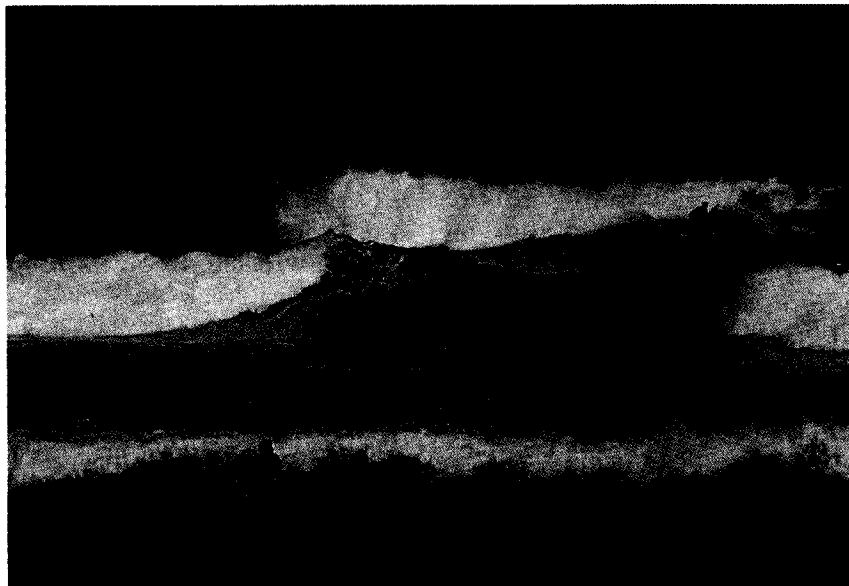
Beaufort international No.	As used at sea				As used on land			
	Wind	Nautical miles per hour (knots)	Wave height	Indications at sea	Wind	Stature mph reported at sea	Indications on land	Diving outlook
0	Calm	<1	<1'	Sea mirror-smooth	Calm	<1	Smoke rises vertically	Excellent
1	Light air	1-3	<1'	Small-scale wavelets, no foam crests	Light air	1-3	Direction shown by smoke, but not by wind vanes	Excellent
2	Light breeze	4-6	<1'	Waves short & more pronounced; crests begin to break; foam has glassy look	Light breeze	4-7	Wind felt on face; ordinary vanes move; leaves rustle	Very good
3	Gentle breeze	7-10	1'		Gentle breeze	8-12		
4	Mod. breeze	11-16	2-4'	Waves are longer, numerous white caps	Mod. breeze	13-18	Raises dust & paper; small branches move	Care needed
5	Fresh breeze	17-21	4-8'	Waves pronounced & long, white foam crests	Fresh breeze	19-24	Small trees begin to sway	Great care needed
6	Strong breeze	22-27	8-13'	Larger waves; white foam crests more extensive	Strong breeze	25-31	Large branches in motion; whistling heard in phone wires	Do not dive
7	Strong wind	28-33	13-20'	Sea heaps up; wind blows foam in streaks	Mod. gale	32-38	Whole trees in motion; difficult to walk against	Do not dive
8	Fresh gale	34-40	13-20'	Height of waves & crests decreases visibly; foam blown in denser streaks	Fresh gale	39-46	Breaks twigs off trees; greatly impedes progress	Do not dive
9	Strong gale	41-47	20'		Strong gale	47-54		
10	Whole gale	48-55	20-30'	High waves w/ long overhanging crests; great foam crests	Whole gale	55-63	Seldom inland; trees uprooted; considerable structural damage	Do not dive
11	Storm	56-65	30-40'	Waves that hide ships w/in the troughs; sea covered with streaky foam; spray fills air	Storm	64-75	Widespread damage	Do not dive
12	Hurricane	>65	>40'		Hurricane	>75		

A Good Diver Is Always Training!

common in the fall and winter. Surfers have known this for many years — that's why the "hard core" prefer to ride waves in the wintertime, even though the water may be a little cooler.

length) decreases, causing the wave's energy to make its height increase. When a wave reaches an area where the water depth is about one and one-third times the height of the wave, it will col-

lapse forward upon itself. In other words, the wave breaks. This is the mathematical moment that surfers live for. The speed of the water rushing forward can push a surfboard and its rider at speeds in excess of 60 miles per hour (96 kph). Divers, however, aren't usually looking for the ultimate tube; if anything, they're trying to avoid it. But the method we use to determine lulls in wave patterns is exactly the same as our surfing friends.



LYNN LAYMON

Although waves appear to push water toward a beach, the water actually only moves up and down. The energy of the wave alone moves forward until the wave crashes, when some of that energy pulls the water forward with it. In many ways, ocean waves act like a rope tied to a tree. If you move the end of the rope up and down it makes waves, but the rope doesn't go anywhere. Waves are simply undulating forms of energy moving through a medium — like rope, air, or water.

There are two parts to a wave; the crest, or peak, and the trough. The larger the difference between the wave crest and trough, the larger the wave. The distance between wave crests is called the wavelength. Water-based waves, like radio waves, come in an enormous number of wavelengths and sizes.

The way a wave looks is not only determined by wind, but also by the composition and depth of the sea floor. As waves approach the shore through increasingly shallow water, friction with the bottom begins to drag on the wave. The distance between waves (wave-

length) decreases, causing the wave's energy to make its height increase. When a wave reaches an area where the water depth is about one and one-third times the height of the wave, it will col-

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SETS

The first thing divers, and surfers, for that matter, need to understand about waves is timing. Waves pulse onto a beach in a certain rhythm — called a set. Sets are caused when two or more "swells" (trains of waves created by wind) from two different sources meet up in the sea. Each of the swells is on a different wavelength and occasionally these wavelengths coincide. When this happens, larger waves are generated. This is called the set "peak."

However, swell wavelengths will only coincide for a few moments before their

frequencies start to conflict. Eventually one swell's crest will occur at the same time as the other's trough. This causes a canceling effect called a "lull." After the lull, the waves roll along until they converge at each other's crests, producing another set peak. The rhythm of peaks and lulls continues until the waves strike the beach. Usually there are five to nine waves in a set. Divers should remember that a beach site will have its unique set pulse. The best way to determine how many waves make up a set, and when the largest waves occur, is to watch and time sets before entering the water. Divers who learn to read sets will know when to enter the water as the weakest waves are crashing ashore, then swim beyond the surf zone before the large waves arrive. (See "Entries and Exits" in the August 1992 *Dive Training* for more information on these techniques.)

(Continued on next page)

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