Oceanography -- Dr. Warren Norton

YAK ATTACK: A PERSONAL STUDY IN
WAVE DYNAMICS AND SURFING

by Will Boron

A wave is moving energy...the energy moves; the water
essentially remains in place. Surfing is the art of harnessing
that ocean energy, and in doing that the surfer momentarily
becomes a sea creature, moving in rapport with the waves.
(Wolkomir 36, 38)

This is the feeling I began to share and understand with my initiation as
a Mabilini; or new surfer (Patterson 21), in the residual-storm waves; signa-
tures of hurricane Bertha, which had passed through Cape Hatteras just a few
days prior to my visit. As I renewed an old love affair with the sea, I em-
barked also on a quest to know and comprehend the forces at work in the
pulse of its waves, and to master the art of wave riding. In my endeavor I
found that one must indeed have an intimate knowledge of the basics of sur-
ing and the forces of wave energy; equally important, however, are the
awareness of current-local conditions and the ability to predict the effects of
those forces on the coastal environment. To the resourceful individual this
information is readily available.

My vessel was a relatively new invention called a Yak Board (Yak),
which combines the riding position and maneuvering method of the sea
kayak with the agility and function of the surf board. The Yak Board is ap-
proximately 9 feet in length, as opposed to the sea kayak’s customary 14 to
19 feet. The loss of stability resultant of this shorter length is countered with
a considerably wider-flatter bottom (Sussman 67). The most noticeable differ-
ence between the two, however, is the fact that the kayak “in one sense...is
not even a boat, but rather something you wear that keeps you afloat”
(Theroux 42). The Yak is actually close kin to a vessel entertaining a small
following in the surfing world, the surf ski, with one minor deviation, straps;
as with the traditional sea kayak, you are bonded to your vehicle almost no
matter what happens. The Yak and the surf ski share the same basic struc-
tural design; essentially they are slightly wide-thick surf boards with
depressions for footholds and a small harness to support your lower back
(Holmes. On-line).

The novice Yakker gains some particular advantages over the board
Mabilini such as the fact that gaining standing position is not a factor, reduced
fatigue, and most noticeably, the far greater speeds achievable with the paddle, which means a great advantage in obtaining wave position. Patterson’s advice holds true for surfers of all varieties; “Mastery of the art of paddling is most essential before attempting to ride the waves. It is necessary to gain considerable speed before the wave and then to keep the path perpendicular to the wave front” (Patterson 27). The usable surface of the wave (to a surfer) is right at the edge of where the wave is spilling. The trick is to aim slightly away from the breaking area while maintaining a relative position to the crest.

Like most board surfers, Yakkers often disdain the use of life vests to reduce the chances of being injured by one’s own board when finding oneself in pilikia (trouble). The surfer’s body is able to slip beneath the surface of the water, where the board remains (personal communication; Surf Instructor/Advisor, August 3, 1996). In such a situation Patterson suggests:

Whenever you are spilled or thrown from your board, always attempt to keep hold of the board and get it back under control. If you have your hands on the board, you will know where it is and it will not be hitting you unexpectedly. Also, other surf-riders will not be subjected to the dangers of a “free” board through your carelessness. (30)

Bruce Fisher, a Floridian Yakker who provides a surfing FAQ on the Internet, offers some basic, but crucial, advice on surfing etiquette and courtesy:

When you join in the crowd, consider yourself at the back of the line. When a good wave comes, several people may start, but the one closest to the breaking part of the wave is considered to have the right of way (and indeed is in the best position to surf that wave). Don’t try to drop in on a wave. If someone is already on a wave, never try to ride it. Never. Be cognizant of the fact that folks with surf boards usually have to work a little harder to get on a wave, and will be starting out a few seconds earlier—if you see that, don’t try to “out race” them for the wave and create a conflict—be cool. Boat control around other surfers is critical. If you don’t have boat control, find an empty beach and get it. (4)

One of the most important tools that any Mahilini can take with him into the water that first day is knowledge. Rick Grigg, PhD, Professor of Oceanography at the University of Hawaii in Honolulu, says that knowledge
can be “the difference between walking out of the water and being carried out.” He asserts that absolutely essential to surfing is the ability to swim (well) and a good physical condition (Pacelli 146). Wolkomir affirms that “a surfer who can size up a wave—understanding the forces it represents—is less likely to make mistakes that lose competitions, and lives” (39). These assertions are substantiated by Kenneth L. DeHart, MD, Director of Emergency Medicine at Grand Strand General Hospital in Myrtle Beach, SC, who states that surfing injury is relatively commonplace, the most prevalent of which include “anterior shoulder dislocations, cervical spine injuries, broken noses, and abrasions . . .” but that the extra strength and flexibility that accompany physical fitness can offer some protection (Pacelli 146, 149).

A wave is moving energy. Most ocean waves are created by wind, which transfers its energy to the surface-water molecules causing them to move slightly in the same direction, thereby bumping into one another and continuing the transfer of energy. This causes a “bunching” of the water molecules. The resultant vertical rise of water creates a “face” into which the wind imparts more energy, perpetuating this “bunching” effect (Wolkomir 39). G. D. Crapper elaborates; “The size of the waves, both in length and height, increases for the length of time for which the wind has been blowing and the length of water surface, or ‘fetch’, over which it has been blowing” (11). Varying conditions at sea create a multitude of waves of various heights, periods, and directions. Waves unimpeded (i.e., by other headwinds), dissipate very little energy and can travel for long distances (fetch) and durations. Waves which originated from storms far away are called swell waves, while the locally created waves (“around 100km”) are termed sea waves. The latter typically have much shorter wavelengths, which result in smaller waves (Shaw 72).

As I sought the “ultimate wave” from my Yak, I noticed that the waves appeared to come in sets of twos and threes, the last of which was frequently the largest. “Far out at sea, waves from different storms meeting crest to crest can augment each other. Meeting trough to crest they cancel. Such interference causes waves to organize into sets, or groups” (Wolkomir 39).

Grigg explains the breaking of waves in Wolkomir’s article:

Because water molecules in wave rise and fall in a circular motion, each wave rests atop a ‘cone of energy’ of moving water. The cone extends below the wave to a depth equal to half its length . . . When waves reach water shallower than half their length, the cone of energy drags along the bottom. Then the wave shoals and is ready to break . . .
the seabed rises gently, the crest slowly spills over. If it rises abruptly . . . the wave’s root slows suddenly, the crest shooting forward, and the wave seems to explode. (39)

An interesting point of note: Pacelli quotes Roger B. Lukas, PhD, associate professor of Oceanography at the University of Hawaii in Honolulu, in September of 1990 as stating the reason for the generally smaller waves of the East Coast of the U.S. as due to the “wide and relatively shallow continental shelf . . . which robs the waves of some energy as they travel toward shore,” while on the other hand, Hawaii, for instance, has very steep-abrupt parameters which do little to impede the wave’s progress before the break (148).

Meanwhile Grigg, of the same department and university, and also co-consultant for Pacelli’s article, is cited by Wolkomir in an article a mere two years prior, as refuting that very fact on the grounds that; “In most places, a continental shelf is 200 feet deep,” and, therefore, could not be a significant factor. He explains this variance in U.S. coastal norms instead by saying, “Hawaii has the best waves because of its proximity to Pacific storms . . . not necessarily the strongest, but the biggest. What makes big waves are the strongest storms with the longest fetches,” which are more frequently found in the wider Pacific Ocean (39).

This fall in Oceanography, with Professor Norton, I learned that when waves approach an irregular coastline, they have a tendency to mimic the bottom contours and conform to the coast. This action, known as wave refraction, concentrates wave energy along headlands and disperses it along embayments. “Waves that graze a point of land en route to shore ‘peel’ along their length, which makes them better for surfing, depending on winds and currents” (Wolkomir 39).

It was my good fortune while Yakkling the Outer Banks to discover an offshore bar that was producing the above-mentioned phenomena with great regularity and frequency. This allowed me a good deal of practice in the breakers, which I may otherwise have been deprived of due to my inexperience. It was like having my own-miniature Pipeline reef to break the waves for me, but it had disappeared the next morning as the sediment was probably dispersed in a late-night storm.

Another interesting find was merely by happenstance. I was fighting my way through the waves on my return to the breaking point when I found myself in an area of water slightly darker in color, where the paddling was suddenly much easier and more productive. Though ignorant to the reason for this, its implications were not lost on me, and I began to seek this “dark water” out for my returns. Wolkomir explains; “Water from spent breakers,
draining back, forms a longshore current. Finding a channel, it shoots to sea as a rip current. When they can, surfers ride the current out to the line of breakers” (40). Where longshore currents meet, there is a merging of forces which causes a rift in the current line through which the excess water shoreward of the breakers is cycled back out to sea in a rip current (Pinet 257).

Says Grigg:

They [surfers] have to have adequate knowledge of that part of the ocean where they are planning to surf. They should know how deep the water is, what the bottom is like, whether there are rip currents, what the waves are like, how often they break, and where. That is the kind of information that a lifeguard should be able to provide. (Pacelli 146) Admittedly in many areas there is no life guard, or maybe you would rather do the thinking for yourself. Grigg collects weather, wind, and wave information from weather satellites and instrument buoys, sometimes thousands of miles away, to calculate swell sizes that wind will create (Wolkomir 39). You can seek this information from the television or radio. For those with access to an Internet connection a visit can be made to the National Data Buoy Center (NDBC) Home Page or the web site for the Coastal Marine Automated Network (C-MAN). These sites, operated by the National Oceanic and Atmospheric Administration (NOAA), provide ocean-meteorological data (such as wind and wave readings, air and sea temperatures, precipitation, et al) to forecasters, researchers, and others. These readings are obtained from automated data stations and buoys occupying large portions of U.S. coasts and waters (fig 1), although they are rapidly gaining a global perspective (NDBC. On-line).

Fig.1. Great Lakes NDBC & C-MAN Station Locations.
Other sites are a bit more comprehensible to the layman, such as Michigan State University's Current Weather Maps/Movies Page, which provides video clips and photos from satellites and weather radars such as GMS-5 and GOES-8 and even Surface Maps and Radar Composites displaying U.S. surface temperatures and cloud cover. From this site I downloaded a current (as of 27 Oct. 1996) image of a montage (fig.2) depicting worldwide land and sea surface temperatures and cloud cover (Henrich. On-line).

Fig.2. World Wide Montage.

Source: Michigan State University, Oct. 1996.

For the meteorologically impaired there are even sights like Surf Info that provide up-to-date visual sightings of the surf at major beaches around the world, as reported to the site via E-mail by surfers themselves (Surf Info. On-line).

By far the most dedicated and informative site I discovered is a U.S. Army Corps of Engineer research facility located on the Outer Banks which provides detailed reports from sensors at various offshore locations on a plethora of subjects like sedimentation, wave and wind data, and tide and temperature readings, to those pursuing scientific studies and analyses. They also keep progress reports and descriptions of their latest projects. You can even download photographs of daily-coastal conditions taken from cameras at the research facility; they offer north and south (Cover Photo) beach views (Field Research Facility. On-line).
It is essential in any sporting endeavor to educate oneself in the basic safety and operational guidelines of the sport, and those of others which share the same space, to avoid conflict and injury, and to receive the optimal physical and recreational satisfaction attainable. To the disciples of sports which require one’s attunement to the mighty forces of Nature, the cruciality of knowledge and understanding of “the basics” aquires a whole new level. One less bends Nature’s forces to one’s will, than manipulates one’s goals to coincide with those of Her’s. The art of surfing is more than just the mastery of a vessel or a wave, it is a complex balance of research and experience that may be incredibly rewarding to the dedicated individual, or remarkably deadly to the rash Mabilini.

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Works Cited


