

Micronesia, Part Two:

Giant Jellyfish, Wahoo Sharks, and Murphy's Law

Truk. There's hardly a diver alive who hasn't heard of this South Pacific hideaway, who hasn't fantasized about diving through the scores of sunken Japanese vessels, who hasn't pictured himself gliding through hatches and holds, probing storerooms and bunkrooms, and discovering for himself the eerie mysteries of Truk Lagoon. The wrecks are virtually untouched. They're a photographer's dream and Kodak's too, since I shot up 700 frames in 15 dives on 8 wrecks. The shallowest dive was in fact a snorkeling visit to an unnamed destroyer, while the deepest was in 135 feet of water. Each wreck is different and each has its own story. Some of the best information about diving the ships can be found in "Life Springs from Death in Truk Lagoon", by Sylvia Earle and Al Giddings, published in National Geographic in May, 1976.

There are at least three ways to dive Truk. One may take the Continental Airlines/Poseidon Ventures Micronesia tour, one may sign up in Guam with the Coral Reef Dive Shop, or one may show up at the Blue Lagoon, the local dive shop in Truk. As it turned out, the Coral Reef Dive Shop also leads the Continental tours. Because I had heard that the Blue Lagoon was undependable, I signed up with the Coral Reef in Guam. Then, when we arrived in Truk, we were joined by Blue Lagoon owner and expert guide, Kimiuo Aisek. So, forget the rumors. In effect, it's all one operation.

However, the Coral Reef charged \$60/day per person for the trip. That included a double room at the modern Continental and a two tank dive. For the two of us, that \$120 per day could have been reduced to \$74: \$24 for the hotel and \$50 for two tanks and miscellaneous equipment from Kimiuo's shop. To me it was marginally worth the extra money to be taken care of, but it is an unnecessary expenditure. It would be prudent, however to write ahead if your destination is Truk. Imagine making the journey and finding the shop closed!

There are hotel options. The Miramar is next to the dive shop and charges under \$20 for an air-conditioned double, and even less for open window air-conditioning. The setting and style is more rustic than the prefabbed Continental,

INSIDE UNDERCURRENT

Survival Suits: Another kind of dry suit just to save lives p. 5

The Efficiencies of Fins—A Lab Test: Two energy saving devices p. 5

Is A Dry Suit for You? Followup to the wet suit survey. p. 10

Women, Diving and Sexism: Some advances and one setback p. 11

Underwater Photography: At last, a manual of strobe techniques and troubleshooting p. 12

which is no more than a copy of their hotel on Palau. Less expensive accommodations can also be located.

The Coral Reef trip collects individuals of diverse backgrounds. On this trip, a Chinese pharmacist, two California veterinarians, two vacationing federal government employees (my companion and I), a free spirit physician, teachers from Okinawa (and the wives, husbands and lovers of all of the above) had one thing in common. They were the divin'est bunch of nuts I've ever seen. They often made three dives a day and burned up more film, bulbs and strobes than the White House camera staff. The mood set by these zanies made a great contribution to the excitement of each dive. I doubt that I would have been as adventurous in approaching some of these wrecks if I hadn't participated in skull sessions with the others. Many were back for a second time, and one was returning for his fourth.

We landed in Truk late in the afternoon, moved with dispatch through a superficial customs inspection, were met by a hotel bus, checked into the hotel and headed to the dive shop. Wayne Baumunk, the tour leader from the Coral Reef (he also leads many Continental tours), joined Kimiuo and consulted with many of our group who had been diving here before. A destination was quickly selected and not much over two hours after our landing, we were in the water at the Fujikawa Maru, a 436 foot aircraft transport.

At fifteen feet, coral colors ranged the full spectrum of the rainbow. Legions of tiny fish guarded their carefully carved out territory. Oysters festooned every habitable place. We dropped amidship landing on the deck at 70 feet. We inspected the center hold, which housed encrusted Japanese Zeros. The foredeck and bow possessed the most spectacular coral growth, oysters, soft red coral and anemones I had ever seen. Cowries and other shelled animals hid in covered spaces. Visibility averaged about 80 feet. The thrill of seeing the incredible marine growths and the myriad of blue damsels, batfish and Jacks swimming against a background of these silent, ghostly ship silhouettes, is a haunting, mindblowing experience.

The following day we dove the Rio de Janeiro Maru, 461 feet long and resting on its starboard side. I noticed that this ship had very limited growth and was more interesting for the exploration of the giant base gears, hanging bicycles (used when the troops went ashore), and the enormous ventilation "tuba", a good place to pose your buddy for the camera. The entire ship is covered with easily-stirred sediment, meaning that inexperienced divers who kick and flutter carelessly are terrible to follow. Also, lights are necessary for exploring this and all ships. Appropriate wreck diving techniques should be reviewed before making the journey.

In the afternoon we dove on the "Oil Slick" wreck, making entry through the cavernous hole on her side, the result of exploding boilers. The highlight of the dive was the "discovery" of a skull by our Trukese dive guide, a discovery I suspect he makes each time he dives this ship. We caught a large sea turtle which we passed around, photographed and released.

The following day we dove the Sankisan Maru, in 100 feet of water. The 30 foot ship is overgrown with soft coral and other lifes, and has a resident parrot fish weighing 40-50 lbs! One of the nice aspects of this dive was the good visibility (about 100 feet) allowed me to move back from the wreck and get a good perspective of the size. This was a fine dive.

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The Shinkoku Maru has growth similar to the Fujikawa, with just as interesting items in the hold--saki bottles, unbroken china and a telephone rust-fused to a typewriter, for example. One can enter the hold at any level and travel up or down through the torn decks. This ship also has a resident shark, but I only spotted him once. There are far fewer sharks here than in Palau, a relief for me since I don't relish swimming through wrecks and running into these fellows. Most sharks (hopefully all) flee when divers arrive, but an earlier tour of divers from the Coral Reef had to deal with a "territorial attack", presumably by the resident shark of the Shinkoku Maru.

After this dive, we lunched at the southern tip of Dublon Island, then snorkeled on the nearby unnamed sunken destroyer, one of the few war ships (most are tankers or transports) sunk in the lagoon. The depth ranges from 15 to 60 feet. When off in these distant areas of the world, Murphy's law prevails. Anything that can go wrong will. In Truk we dived from a large landing craft, exiting and entering through the dropable front landing door. Large amounts of water rush in during these periods and a bilge pump pours it right back out. Ours failed. Of course the craft was without tools or a spare pump. We spent several unsuccessful hours fiddling with it, then beat a retreat for the hotel. Be prepared for similar situations.

After several days of diving, I found that the wrecks without growth--e.g., the Heian Maru--became boring and I longed for the coral reefs or the wrecks with great marine life. Yet, the piece de resistance for me was my dive on the Shimohara, the I-169 submarine. The aura of this ship, which inadvertently sunk itself when it dived with an open hatch to escape the air raid, gives it a position of prominence. The Japanese had attempted to raise the ship to save the crew. Cables were found beneath her hull and an air hose was found attached to the hull. The crew died of chlorine gas poison when battery acid came in contact with sea water. The main control compartment was flooded, so the crew could not blow ballast. When the Japanese found that they could not raise her, they destroyed the bow and the conning tower with explosives. On my dive we landed on the badly damaged bow, from where the torpedo tubes are visible. The 90 foot visibility gave us good perspective of the 300 foot craft. The hatches had been welded shut because in 1975, a diver had become trapped because the raised sediment within the ship caused him to become disoriented. His buddy remained outside, helpless. The Shimohara was not content with the lives of 80 odd crewman she had taken 35 years ago. And that eerie, exciting feeling, accompanied me throughout this supernatural dive. I left exhausted--emotionally.

Truk, of course, is tiny, and nearly everyone who comes, comes to dive. Diving permits are required for diving and Kimiuo will help you to get yours. Apparently the permit fee depends upon how much you are willing to give. I understand that if you are niggardly, they will ask for more. Between \$5 and \$10 is the going rate. The Public Safety Boat will come to the dive boats to inspect permits, so bring yours with you. I'm not sure what the penalty for diving without a permit is, but it may range from sitting still in a straight-back chair with a giant jellyfish on your head, to jogging between the hotel and dive shop with fire coral in your shorts.

These wrecks demand a great degree of respect from the diver. When descending to this structure that once acted as city and home to hundreds or thousands of people, a feeling of almost reverence emerges. There's something mystical about a dead ship on the bottom that it doesn't possess when it's clean and polished and floating. When swimming over their decks and through their holds, I feel the same sensation as when vicariously I explored with Carter the first opening of King Tutankhamen's tomb. Nowhere in the diving world is there any other place quite like Truk Lagoon.

SAIPAN: Another island on the diving tour of Micronesia, and it's indeed worth the stop. Ben Concepcion has the only game in town, but that's no problem whatsoever. Ben is an affable and energetic young man who'll pick you up at your hotel in his thoroughly rusted truck. For a five spot plus \$3.50 per tank, he'll whisk you along the scenic routes to The Grotto, certainly, as it turned out, a fascinating dive. There are other dives, including trips to Japanese ships, U.S. planes and landing crafts, some nearly intact, others little more than a pile of rubble. And, of course there are coral formations, but Saipan is not protected by a surrounding reef and the waves can get heavy. We debated diving at Banzai cliffs, where masses of Japanese war material was dumped, but the sea was too rough during our stay for the 90 minute boat ride. If you elect the trip, Ben charges \$10, plus the \$3.50 charge per tank.

The Grotto has many of the eerie qualities found in the Chandelier Caves at Palau, but it is not completely filled with water. Viewed from the sea, what houses the Grotto is a massive limestone cliff that has been undermined by the sea in three spots, hollowing out an enormous chamber within the cliff. Getting there is the trick. Access is from the landside where the sea has broken through on the downside slope of the cliff. With your equipment on your back, you must descend over 100 steps, but good ol' Ben hustles up and down helping those who don't quite have the stuff to carry two tanks and whatever else.

At the bottom is a large cave entrance half filled with water, leaving about 50-60 feet of headroom. The magnificently clear water surges through the three subsurface holes and breaks about the rock at landside entrance. The six of us diving donned our gear, then jumped the six feet required to get wet. As I submerged, I was impressed by the large dim lights glowing off in the distance--the light entering from three ports to the sea. In the center of the Grotto, at about 30 feet (the Grotto itself goes down to 80 feet), hovered a large fish which we approached cautiously. But the large fish, in the dim and eerie light, turned into scores of smaller fish in tight formation. Since I was told that there are a couple of resident sharks in the Grotto, I wondered what trick my mind's eye would play next.

The sharks never appeared. As we exited, I noticed the similarity with the Grand Drop at Palau, which I wrote about in the last issue. The fish were not as plentiful, but I stopped considering the abundance when, at 90 feet, the largest shark of the trip, a ten foot black tipped reef shark cruised a bit below us. As usual, he paid little attention and we moved on.

I enjoyed two different days here, and was particularly interested in one smaller cave which I guessed was similar to the Grotto in its beginning. I would hope to come back here in another life, some thousands, no, hundreds of thousands of years in the future to see if I was right. I found a yellow fan coral, relatively similar to black coral, and although I doubt that it was unique, it would be worth a second look. Many midwater fish were present in the distance, often scaring the bejabbers out of my brave but inexperienced companion. She figured that anything that big and moving in open water had to be sharks, so when we finally determined they were 4-5 foot wahoo, we jokingly named them Wahoo Sharks. Still, those lurking hulks in the distance have the unfettered ability to increase my heart beat by 20 per minute.

Saipan is interesting, both for divers and nondivers. Although, one hell-bent on getting the best diving in a 15 day tour might concentrate on Truk and Palau. Yet, a couple of days in Saipan can surely be enjoyed. The view from suicide Cliffs is thrilling, yet tragic. Here, upwards of 40,000 Japanese, mainly civilians, leaped to their deaths rather than be captured by the approaching American forces. The last Japanese Command Post is also maintained for viewing.

Just as important, the 7,000 population is the most friendly of the Micronesians

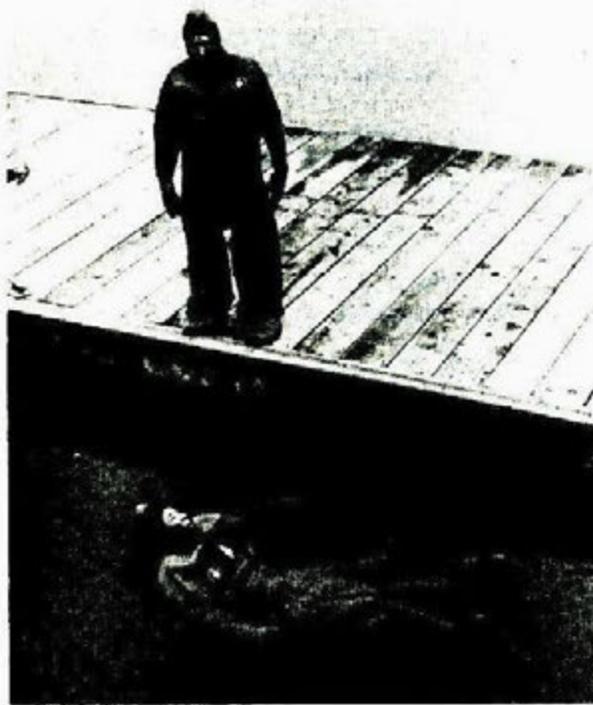
toward Americans. Last year, they voted themselves commonwealth status. Ben Concepcion can be written to at PO Box 31, CHRE, San Jose, Saipan, Mariana Islands, 96050

Getting There: The easiest way is to take the Continental Package of 14 nights. They begin with a dive or two in Guam (not bad as a warm up, but not good compared to what's ahead). Here a guide from the Coral Reef joins up for the remainder of the trip, which will always include Truk and, depending upon which package you select, Palau and/or Saipan. The price has been \$695/person (by the time you read this it has probably increased 5% or so) and includes two tank dives on at least eight days and a double room at the Continental Hotels. If that's not enough for your money, you can take additional dives on your free time (extra \$, of course) or take the trip on your own. There's some risk in organizing your own trip because you can't always be certain that the shops have it together, but we have no reports so far of disappointed divers. Don't forget to add airfare which is in the neighborhood of \$700 from the West Coast. Don't overlook doing some diving in Hawaii, since you'll have to stop there when traveling in either direction. Remember, nothing can be taken from the Truk Lagoon. (J.L. 8/76)

Survival Suits:

Another kind of dry suit just to save lives.

On November 10, 1975, 29 men were lost when the Edmond Fitzgerald went down in Lake Superior. The wreck of the Edmond Fitzgerald has been immortalized in song by Gordon Lightfoot, yet the crew members might be alive today had they been wearing sur-



vival suits.

What's a survival suit? It's an oversized, bulky dry suit made from neoprene which fits over your regular clothing—coats, mufflers, sweatshirts, boots and all. The Imperial Survival Suit, for example, has a waterproof zipper running down the front and features attached mittens, legs large and strong enough to slip over boots, and a hood permitting exposure of only the wearer's eyes and nose.

Survival suits are not for divers, but for crews and passengers of boats operating in cold water or, for that matter, in any water. They're to be slipped into when a vessel is sinking or passengers are likely to be knocked overboard. Just last winter, two fishermen spent nine hours in 35° water frenzied by 100 mile-an-hour wind. They survived the storm, but damn near didn't survive the bears once they made it to the beach. Regardless, they're alive today. And, Imperial has plenty of other stories to tell.

Navy tests show that wearers require roughly 40 seconds to don the Imperial suit and that it will give protection in 35° F. water for at least 13 hours. Nic Salmella, sales manager for Imperial, said that the suit comes in one size, and that it will fit and float a five-year-old boy or a 6' 10" man.

Piel, a French concern, Bayley and Aquatic also produce survival suits. Prices range from \$200 to \$250. For a brochure, write to Imperial, P.O. Box 4119, Airport Industrial Park, Bremerton, Washington 98310.

The Efficiencies of Fins—A Lab Test:

Two energy saving devices.

The sport of scuba diving has grown tremendously

since the late 1940s. There are over 2 million divers

currently certified in the United States. Diving equipment sales are increasing, with the design of the equipment becoming more and more sophisticated. A diver's choice of equipment is becoming more difficult, as each company claims to have the best in designs. It is also important for the diver to purchase the proper equipment initially. The cost is increasing, and in many cases the new diver is "stuck" with his purchase, like it or not. In addition, the information the diver gets before he decides to buy can be based on hearsay, instructor's bias, or design gimmicks which have not been scientifically tested.

Since the late 1960s, scuba manufacturers and designers have flooded the market with "super fins." The super fins are larger in surface area than the conventional fins and usually incorporate such sophisticated designs as venturis, louvers or ridges to direct the flow of water. The value of these super-fin designs has never been tested. Therefore, the purpose of this investigation was to compare the super-fin designs with a conventional set of fins, noting any differences in oxygen consumption at a stipulated workload. The speed with which the subjects could kick a specified distance was also evaluated, thus giving an indication of the strength needed to use the fins.

Swim Fins

Four diving equipment manufacturers supplied their designs of super fins.

The Dacor Corporation provided the "Turbofin" (see illustration). The Turbofin is fairly stiff and has a surface area of 770 square centimeters. The fin is quite wide and is designed with large ridges on the sides. The design is believed to allow for maximal force to be used against the water. It tends to direct the flow of water in such a manner as to give maximum forward propulsion.

The Healthways Company donated the "Scubamaster Fins," a product representative of the vented-fin design. This design is based on the concept that the area of the fin directly in front of the foot pocket is the least efficient portion of the fin. The force generated from this area tends to lift the diver rather than deliver forward propulsion. Therefore, a vent in this area forces water through the vent and adds forward propulsion. The vent will also permit a decrease in the effort involved with the up-kick. The Scubamaster has a surface area of 885 square centimeters.

The Nemrod/Seanco Company supplied the "Venturi Fins." This brand is flexible and has a surface area of 562 square centimeters. It is designed with large ridges on the sides to channel the water out the end of fin. The design then adds a 7.5 by 1.3 cm. tube, or "venturi," that begins on the top side of the fin near the end of the foot pocket and extends to the end of the fin. This tube is there to redirect the water that would normally act as a lifting force, thus increasing forward propulsion.

The U.S. Divers Company supplied its venturi-fin design, "The Spoiler." The Spoiler is a stiff, curved fin

with large side ridges. It contains two openings on the top surface of the fin. These channel the water out the end of the fin. The fin has a surface area of 759 square centimeters.

The conventional fin was represented by the U.S. Divers "Otarie Fin." The Otarie is a slightly curved, flexible fin with a surface area of 529 square centimeters. It is designed with side ridges for "maximum power and maneuverability" for divers without a great deal of strength. It is a popular all-around fin for the neophyte diver.

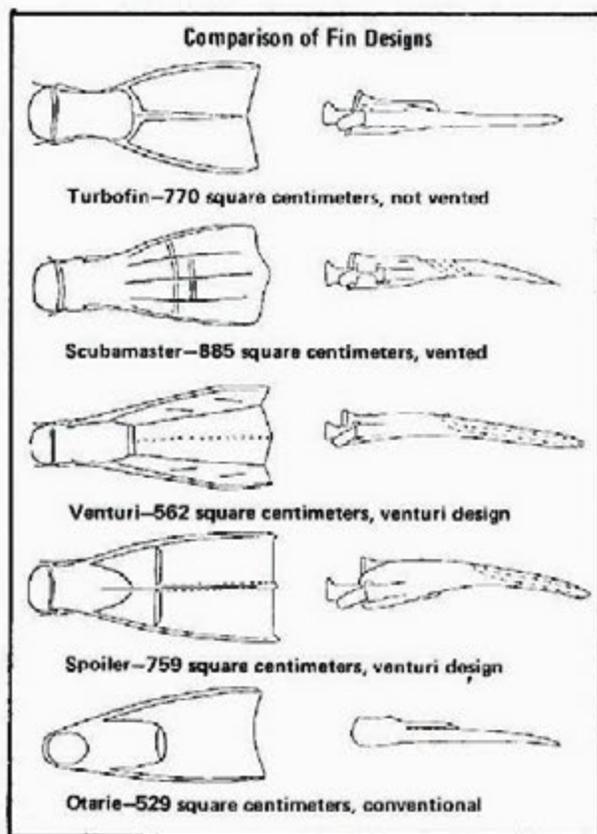
The fins chosen for this investigation are representative of the products on the market. Their selection should not be interpreted as an endorsement of any commercial product.

Subjects and Pretest

Six men and one woman participated in the testing process. Six of the seven had been actively engaged in scuba diving for at least two months before the tests. The seventh person, inexperienced at diving, represented the neophyte diver.

A pretest was used to determine a workload of about 60 per cent of the subjects' maximal oxygen consumption while kicking without fins. This 60 per cent workload used during the fin trials was chosen because it closely resembles the rate normally required in scuba activity. The workload was determined by using an apparatus consisting of a pulley mechanism, with one pulley attached to the side of the pool and a second pulley attached to a stand. A cable was attached to the diver with a belt. From the diver, the cable extended

(Continued on Page nine)



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The Efficiencies of Fins—A Lab Test

(Continued from Page six)

back through the first pulley on the side of the pool to the second pulley from which weights were suspended. The pretest was also used to allow the subjects to become familiar with kicking in place and the use of the breathing apparatus.

Each subject was familiarized with the procedure to follow. When ready, the subject initiated kicking, using the flutter kick without fins, with a workload of 500 gms. The work bout lasted for one and a half minutes. After two minutes of rest in the water, the subject again initiated kicking, using an increased workload of 1400 gms. The work continued for one and a half minutes, followed by two minutes of rest. Work bouts continued using this procedure with increasing workload until each subject could no longer keep the weight suspended. Expired gases and heart rates were monitored for each work bout.

Trials

The subjects entered the pool area and put on wet suit boots. These boots were used to improve the individual comfort and fit of the fins. After fitting the fins, the subjects entered the water and kicked about 68 meters (75 yards) both as a warmup and to check the fit of the fins. Each subject was then given three minutes to rest. After that, the subject kicked for 10 minutes and 15 seconds. Expired gases were collected and, at the end of the trial, the subjects moved to the side of the pool where heart rates were monitored. After resting, each subject was then timed for 22.86 meters (25 yards) of kicking with the fins. No push-off was allowed.

Similar procedures were used for each trial with the fin brands selected at random. Each subject was tested at the same time of day. He had been asked not to eat within three hours of the test. The trials were completed on consecutive days.

The flexibility of each set of fins was measured by placing weights 15 centimeters from the end of the foot pocket. The weight was increased in 50-gram increments until the fin could no longer hold up the weight. The fins were then ranked in order of flexibility.

Results

Tables I, II and III show how fins compare based on three tests—volume of oxygen consumed, heart rate produced using the fins and speed over a 22.86-meter distance. The Scubamaster led in both lower oxygen consumption and in lower heartbeat, while the Otarie led in speed.

For statistical buffs, our analysis found that:

- Use of either the Scubamaster or Turbofin resulted in significantly *lower* oxygen use than for the Otarie or the Spoiler.
- The Spoiler produced a significantly *higher* heartbeat among the subjects than did the use of the other four fins.
- The speed attained by the subjects using Otarie

or Venturi fins was significantly *faster* than the speed attained by the Spoiler fins.

- There was a significant correlation between surface area and oxygen consumption; i.e., the greater the surface area the *greater* the oxygen consumption; but we did not find a significant correlation between surface area and speed.

We did find significant correlation between speed and flexibility, indicating that the more flexible the fins the greater the speed attainable.

We found no significant correlation between oxygen consumption and flexibility of the fin, nor did we find a significant correlation between surface area and flexibility.

Discussion

Design differences may contribute to our finding that the use of either the Scubamaster or Turbofins resulted in significantly lower oxygen consumptions than trials using either the Otarie or Spoiler fins. The Scubamaster and Turbo fins have approximately 20 per cent greater surface area than do the Otaries. The greater surface area of the "super fins" would allow more force to be directly applied to the water. The Scubamaster and Turbofins are less flexible than the Otarie. *Decreased* flexibility allows for *less loss* of force against the water. A more flexible fin would tend to bend, thus allowing a greater amount of water to be "released" and therefore reducing propulsion.

On the other hand, the Spoiler fins, although similar in surface area to the Scubamaster or Turbofins, were significantly stiffer than either of the two sets of fins. The increased stiffness may have caused discomfort and increased oxygen consumption. The Spoiler Fin is a venturi design, while the Scubamaster is a vented design, and the Turbofin is designed with

Table I—Approximate Average Consumption of Oxygen

RANK/BRAND	MILILITERS PER KILOGRAM
1. Scubamaster	9.66
2. Turbofin	10.03
3. Venturi	10.89
4. Spoiler.	11.46
5. Otarie	11.58

Table II—Heart Rate

RANK/BRAND	BEATS PER MINUTE
1. Scubamaster	84.8
2. Venturi	86.6
3. Turbofin	87.4
4. Otarie	91.1
5. Spoiler	98.4

Table III—25-Yard Times

RANK/BRAND	SECONDS
1. Otarie	13.67
2. Venturi	14.90
3. Scubamaster	15.10
4. Turbofin	15.40
5. Spoiler	16.50

only large surface area. The increased stiffness of the Spoiler Fin may not only increase the effort necessary for the down-kick, but also may dramatically increase the effort of the up-kick.

The leg strength is an additional consideration. There is less available strength in the muscles used for the up-kick than there is in the quadriceps used for the down-kick. A more flexible fin, the Turbofin, would allow for a small portion of the water to slide off the fin blade, therefore decreasing the effort but still maintaining propulsion. The vents in the Scubamaster would allow a small portion of the water to pass through the fin unobstructed and therefore decrease the effort placed on the Achilles tendon and hamstrings. It would seem that the venturi design of the Spoilers *does not* improve their performance so much as the vented design.

Trials using the Venturi Fins were not significantly different in average oxygen consumption from trials using any of the other fins. There may be two possible reasons for this "non-difference." First, the fins may be *too* flexible. Of the fins tested, the Venturis were the most flexible.

Second, the value of the design of the venturi in the fin may be questionable. In order for a venturi to be effective, water must enter an opening larger than the one it exits. Therefore, the speed of the water moving through the fin will be increased, thus adding to the forward propulsion. The design of the Venturi Fin is such that the water enters an opening smaller than the one it exits, thus allowing for a dissipation of forces within the venturi tube.

The fastest times for the 22.86 meters (25 yards) kick were obtained with the conventional Otaries,

which were significantly faster than the recorded times for the Scubamaster, Turbofin or Spoiler Fins. Speed was statistically determined to be directly related to flexibility and not significantly affected by fin surface area. The increased flexibility of the fin would decrease the resistance of the fin to the water and therefore increase the speed of the kick cycle.

In summary, the most efficient fins were the Scubamaster and Turbofins. These proved significantly more efficient at an average workload than the conventional Otaries. The "sophisticated" venturi designs of the Spoiler and Venturi Fins yielded results similar to the conventional Otaries.

When purchasing fins, the surface area and flexibility should be taken into consideration. The surface area of the fins is inversely related to oxygen consumption. As the surface area increases, the oxygen consumption decreases. The flexibility of the fins is directly related to the speed attained: the more flexible the fin, the greater the speed. The diver, when purchasing fins, should also consider whether he is a leisurely diver who likes to poke in every crack and crevice or one who wants to get where he is going quickly. The purchaser should also consider the strength of his legs as a stiffer fin takes more strength to operate properly.

The author, Robert G. McMurray, has a Ph.D. in Human Performance from Indiana University, and is now completing post-doctoral studies at the Institute for Environmental Stress at the University of California, Santa Barbara. He has been diving since 1960, has been a NAUI instructor since 1970, and has worked as a research diver for Ocean Systems. An expanded version of the article, complete with statistical design and methodology, may be found in *Proceedings of the Eighth International Conference on Underwater Education* (1976), available for \$15 from NAUI, PO Box 630, Colton, CA 92324.

Is A Dry Suit for You?

Reader responses to the *Undercurrent* Survey on Wet Suits (see Nov/Dec, 1976) indicated that the new dry suits are beginning to make an impact on the diving community. But so far, the users are few. People involved professionally in diving and individuals making dives frequently in very cold water seem to comprise the market. Only 25 people responding to the survey indicated that they owned dry suits, roughly 2.5 per cent of the total.

With so few dry suit respondents, we have insufficient data to generalize about the suits themselves. We can thus offer no conclusions about the differences between brands. Suffice it to say, those who responded indicated widespread satisfaction with their dry suits. As Fred Calhoun of Boston, Massachusetts poetically stated: "I have a Supersuit and even with a little seeping present, it doesn't dampen my enthusiasm for it." Mild seepage does seem to be a problem in a fairly high percentage of suits, but users still recommend them strongly. Diver Bill Dunn of Cummings, Georgia, says: "I am experiencing slight leakage through a few

Followup to the wet suit survey.

seams of my Bayley, but it keeps me warmer than any wet suit."

As the older divers among us know, dry suits were used in the early days of diving, the 1950s. There was a U.S. Divers one-piece front-entry suit that required the diver to gather the entry hole together, twist it around several times (like one twists a towel), then tie it with rubber tubing.

It always leaked.

Another dry suit had a big, hard rubber ring. The diver would step through this contraption and hold it around his waist. Then he would stretch the top of his pants and the bottom of his top around it. Next he would slip a large rubber o-ring over the package for the purpose of forming a seal. It was like walking around with a hula hoop around your waist and under your pants. If the dry suit were torn and water got into the suit, your long johns got soaked and you packed around unwelcome weight. Since B.C.'s weren't available then, the ability to remain buoyant could become a problem. All the suits leaked somewhere—at the wrist, ankles, or

point of entry. By the end of a dive, most divers were shivering. It was not uncommon to see divers rushing to change from the wet underclothes to a dry set of clothes in front of a beach fire on a chill day. It might take an hour to warm up.

The new dry suits, of course, are neoprene (with one exception), have limited leakage problems, and are inflatable themselves from the diver's tank (although the addition of the B.C. is a precaution taken by many users). They have many advantages over today's wet suits.

- They are warmer.
- They are easier to put on and take off.
- The layer of air provides insulation even outside the water, a great advantage in cold weather. Some brands are cut to allow the diver to wear additional clothing under the suit for warmth.

There are disadvantages.

- They are more expensive than wet suits.
- For those suits with zippers, if a zipper breaks, you are out of business until it is repaired. Replacements can run between \$50 and \$100 for most suits.
- The bulky suits allow air to shift from the chest area to the feet, a disadvantage when you're upside down in a cave or when poking under a ledge.
- Surface swimming with an inflatable suit can be difficult.
- More weight is usually needed with a dry suit because air is the insulation instead of water. Many divers will need 30 pounds or more to overcome the added buoyancy.
- Since they're of little use for tropical diving, the traveler will still need a wet suit top or Farmer John-style bottoms for vacationing.
- Any tear in the rubber makes the suit useless until that tear is repaired.

Some suits do not have a zipper. You get into these by pulling the soft rubber at the neck area wide enough to step into the suit. The neck, arms and legs are sealed with smooth neoprene which forms a seal against the

skin when air is put into the suit. You have to be careful because it may be easy to tear the neoprene. While manufacturers provide repair kits and replacement rubber, it's more than inconvenient to make repairs while your buddies are already in the water.

Should you buy a dry suit? If you dive a lot in cold water and become uncomfortable, you should indeed consider it. We have insufficient data to make a judgement about brands, but the following charts should give you basic information for comparison. Remember, if your suit has a zipper across the back, you will probably need help getting into it. All of the suits are available with both oral and tank inflation devices. The Uni-suit is the only one advertised with the claim (from Poseidon/Parkway) that additional flotation is not needed. All suits listed are made of neoprene except the Viking Imports. It is made of rubber tricort. Prices are approximate, generally vary according to accessories and may vary according to shop discounts.

Suit Maker	Price	Zipper	Hood	Boots	Help Needed
Aquastatic Bayley	\$285- \$339	Front/ Back	Separate	Separate	Back Only
Viking Viking Impts.	About \$380	None	Separate	Attached	No
Bubble Imperial	About \$260	Back	Separate	Separate/ Attached	Yes
Super Suit O'Neill	\$300- \$350	Back	Separate	Separate	Yes
Uni-suit Psidn/Pky	\$380- \$430	Back	Attached	Attached	Yes
The Inflatable Sea Suits	This suit is no longer being made.				
Comfort Suit Sub-Aquatic	About \$365	Back	Separate	Separate	Yes
Dry Suit US Divers	About \$340	None	Separate	Attached	No
Thermal Dry White Stag	\$250- \$350	Shoulders	Separate	Optional	Yes/ No

Women, Diving and Sexism:

Since publishing Susan Banashek's article on "Sexism and Diving," we've received several letters supporting the points made, and a couple taking *Undercurrent* to task.

Recently, advertisements have shown a marked improvement in the way women are presented. In the January issue of *Skin Diver*, for example, Harvey, Parkway and White Stag each have advertisements picturing women as divers, not as doting admirers of some handsome brute. Those companies deserve credit for their egalitarian presentation of women in diving.

On the other hand, Aquacraft's 1977 catalog tells a slightly different story. By spreading the catalog so you can see the front and back covers at the same time, you can see a male diver on the left side, dressed in an

Some advances and one setback.

O'Neill Supersuit. On the right side (the front cover) is an attractive female diver, sporting a single tank, complete with regulator and three-instrument console and a weight belt. But, no B.C. However, she's wearing bikini bottoms—but no bikini top.

Come to think of it, Aquacraft doesn't sell B.C.'s, so there's no reason to push equipment the company doesn't offer. But, we don't believe the company sells breasts either. But the company does use breasts to sell equipment. Or so the executives believe.

Frankly, the model is lovely and the photograph tasteful. It would look nice hanging in a study, but it has no place on the cover of an equipment catalog. Aquacraft, apparently in response to criticisms from a few dive shop owners, is now providing a sticker to

cover the unmentionables. It seems that the attitudes of Aquacraft executives have not kept pace with the 1970s. We hope their gear has.

A Reader Reacts

Some divers disagree with the notion that the sexism women divers experience is worth comment. Soon-to-be ex-reader Scott Kemper of Sacramento, California, represents those who disagree:

"The prime reason for *Undercurrent's* existence is that it maintains complete objectivity with regard to its subject matter. As far as I am concerned, this was lost when you published your recent article on 'Women and Diving.' This piece of writing is completely slanted by an individual who is apparently a fanatic on the subject.

"In the first place, the major dive magazine, *Skin Diver*, does not show one woman without B.C. equipment in the last two issues—this sport probably has more reason to show girls [sic] in bikinis than any other, and actually shows less. I think it's because most people dive for the diving experience rather than the sex angle—maybe later, but how can someone look sexy in a wet suit? . . .

"The equipment selection is made to fit the market—if there were as many female divers, there would be

more equipment available . . .

"I do not feel that *Undercurrent* should be used for political or quasi-political reasons. Of course you can put in whatever you wish . . . and of course I do not have to subscribe, which I will not when this subscription has expired. Too bad. I thoroughly enjoyed your concept."

Yes, it is too bad. We don't agree with everything that *Time Magazine* has to say (or even agree with our spouses each day), but then we have no intention of cancelling. Actually, Scott, you missed the point. Some men do.

Another View

Polly Agee from Falls Church, Virginia, adds her support to Ms. Banashek:

"I am not a radical and don't think of myself as a feminist. But, I am tired of women being exploited for their bodies, while their skills and brains are ignored. Ms. Banashek's article made several important points, some of which I don't expect all men who run diving businesses to understand. Yet I'm sure the women will. I hope the article does something to raise the consciousness of the industry."

Thanks for giving the men a chance to hear the woman diver's side. *Pacem in Maribus.*

Underwater Photography:

At last, a manual of strobe techniques and troubleshooting.

Have you considered buying a strobe for your underwater camera and found it confusing to determine the correct strobe for your needs? Did you finally buy a strobe, then struggle through rolls of film to gain any consistency in exposure? Have you had maintenance or repair problems that left you without light on that once-in-a-lifetime dive trip?

Having no source book for technical information, most amateur photographers have puzzled over each step in buying, operating and maintaining a strobe. Now, with the publication of *Underwater Strobe Photography* by Jim and Cathy Church, photographers have a solid basic manual for operating a strobe and preventing and solving those knotty problems plaguing their photographic forays.

For the beginner, chapters on the basics of the strobe and the pros and cons of housed strobes versus submersible strobes are available. Chapters on exposure and single and multiple techniques have valuable information for just about everyone but the professionals among us. Information about lighting techniques, balancing strobe and sunlight and using automatic exposures can help improve anyone's exposures. For example, learning how to black out unwanted backgrounds by altering the f-stop can lead to excellent subject shots by eliminating extraneous background matter.

Regardless of your prowess, the most useful chapter is bound to be the section on trouble shooting. It's not

uncommon for a strobe to refuse to work under water (sometimes even if it works on the surface) and rather than scrubbing the entire trip, the Church's may just become your saviour. By following their advice about the kind of repair tools to pack along, and employing the systematic processes suggested to check out each of the possible problems, you'll see how their little paperback becomes invaluable.

Anyone who has found his strobe conking out on the initial dive on a week's vacation in Roatan is usually overwhelmed at the sense of loss. It's comforting to know that if this book were stashed in your dive bag, and you had come prepared, there's a good chance you'll have light on your next plunge.

By now, the book should be available in most dive shops. If not, you may order it directly from Aquacraft for \$5.95; 3280 Kurtz St., San Diego, CA 92110.

(P.S.: Our only regret is that the book is not printed on waterproof stock. The quality of the excellent color photographs would be impaired if printed on such stock, but the purpose and value of the manual would indeed be enhanced.

Correspondents located strategically in the major diving areas of the world as well as on all coasts and major inland waters of the continental United States.

The editors welcome comments, suggestions and manuscripts from the readers of *Undercurrent*.