

undercurrent®

THE PRIVATE, EXCLUSIVE GUIDE FOR SERIOUS DIVERS

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The Sea Of Cortez, Mexico

-- *The Marisla, The Santa Barbara*

The Sea of Cortez, that beautiful body of water lying between Mexico's mainland and it's Baja Peninsula, has yet to be discovered as a major dive destination. One can spend a week aboard a dive boat there and never see other divers--or other tourists, for that matter. I suppose by the next decade that solitude will all end. Some of the reefs will be as populated by dive boats as is Cayman's Balboa or Maui's Molokini. And there are good reasons.

Fish life in the Sea, especially in the southern waters, is incomparable. Here reside a range of pelagics, tropicals and marine mammals unparalleled in the Northern Hemisphere save for the Red Sea. Compared to the Caribbean, there are scores of species never seen and great clouds of fish seldom found. And there are sharks and seals, porpoises and whales.

The Sea of Cortez is as handy for divers from the southwest and California as the Caribbean is for Florida divers. Live-aboards embark from as far north as San Carlos, near Guaymas (less than an hour's flying time from Tucson), as well as La Paz near the tip of Baja. Although one can find day boats at some sites, live-aboards are the only way to dive these reefs, which are scattered from hell to breakfast throughout the 800 mile length of the sea. We wrote about one of those trips aboard the Marisla in our January, 1984 issue, and recently returned for a second review. This time, however, we decided to compare her to a second craft running from another port, so we dispatched another writer to review the Santa Barbara. These are their reports.

C.C., travel editor

I definitely had a reason to return to the Marisla and the Sea of Cortez. I loved it the first time. Was my trip and anomaly or could my experience be repeated? During my diving in 1983, El Nino had shoved its hot water currents up the Pacific and into the Sea. Did that bring remarkable fish life or was the Sea diving outstanding even without the infusion of the little child? And then there seemed to be a problem with the agency that booked the trip, Beverley International. Some readers complained that when they called them they could learn nothing about the craft. What was that all about?

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If you happen to be one of our long time subscribers, as most of our 13,000 member family are, let me refer you to the intitial Marisla article before perusing this report (or you may order it by sending \$4 to the publisher, ATCOM). In January, 1984, I reported on my trip day by day; since then, as I've learned, little has changed. It was August, 1983, when I took that first trip. Each day was a delight. Each day in 1985, this time September, was an equal delight. Let me be more specific:

The Trip: Nothing can be more delightful than the price. For \$1295, I was aboard the Marisla for seven and half days logging 28 dives; I was put up in a nice La Paz hotel for a night on each end of the trip; and the tab included round trip air fare from Los Angeles. I don't think I spent another \$50 the whole time I was gone.

The Boat: The 121 foot Marisla, a remodeled U.S. Coast Guard buoy tender, has eight double staterooms, each with a double and single bunk. Each has its own bathroom and sink, permitting privacy not always found on these live-aboards. An overhead fan kept my room cool, even on the hottest days. Plenty of fresh water allowed me a warm shower or cold water after-dive wash down on deck. The fantail lounge provided a nice place for relaxing, telling lies about the dives (though the diving is such that no tall tales are necessary), or sipping a cold beer. The dining room had been nicely remodeled since my last voyage. Indeed, although the Marisla is no spring chicken, she provides very civilized living.

The Captain and the Crew: Richard Adcock directs this show and a fine director is he. Having been in these waters since 1956, he can find any site, any seamount, any small underwater feature, even in the dead of the night. His wife, Marylou, handles the culinary duties with the assistance of three senioritas. Francisco was the only crew member who remained from my first trip, yet this new crew performed admirably.

The Food: Good and plentiful. Full breakfasts with eggs and sausages, pancakes, fruit, hot coffee. Lunches of tacos or chicken salads, or fried catch of the day, hauled out only an hour or two before its hits the plate. Dinners of lobster or roast beef or snapper, rice or potatoes--and fresh vegetables imported from the U.S. so one doesn't have to risk the revenge, a scourge to land travelers, but no problem aboard this craft.

Diving Equipment and Rules: The group I joined was led by Roger Bilyea, who has ridden the Marisla nine consecutive years. When you dive you're on your own. The nearest recompression chamber is in San Diego, 1,000 miles away, so with unlimited diving one must be facile with the tables. There are tanks, packs and weights, but one needs everything else, including lights and chemlights for night dives and spare parts such as fin straps.

The Water: In September 81-83^o; its much cooler early in the year and full wet suits are essential. The visibility stayed near 100 feet. The big fish are best found during May and June, but the visibility is much lower due to plankton blooming.

Diving: In a word, superb. I reported on abundant fish life two years ago. It seemed more abundant now, thanks to the water having returned to its normal tem-

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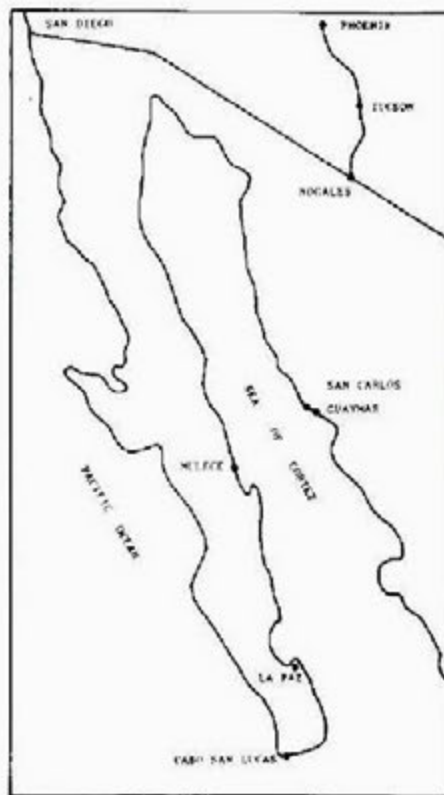
perature after the ebbing of El Nino. I began with a dive on the ferry boat Salvatierra, sunk for ten years now, but already nicely overgrown with gorgonia, juvenile black coral and other fauna. As I cruised the wreck I couldn't help but marvel at the fish life, large and small, and not just a range of what I might call the common tropicals, but plenty of those critters which I always feel privileged to see: coronet fish, puffers, boxfish, scorpions, and morays and octopus in the nooks and crannies.

Dives at Adcock's seamount were spectacular, with water so clear the top of the seamount, 55 feet below, could be seen through the surface. Here I frolicked among a covey of sealions, the younger ones drifting up to within an arm's length for closer study of this humanoid. Such an astonishing experience! Through the mount runs a large tunnel, filled with a million shining baitfish opening and closing to let visitors pass. Fish here were in masses: pompano, groupers, snappers, jacks, ocean triggers and others feeding on the upwelling nutrients. I stopped to observe a large triton while it attacked and consumed the animal inside a beautiful murex shell. Since I don't take live shells I considered waiting for the triton to finish his work, but there was too much to see. I moved on.

At Bonith and Judith Rocks large schools of angelfish, great hordes of Cortez barracudas, large bumphead parrots, and once again a number of sea lions showing off for my cameras. At night at Punta San Eviaristo brownish and white banded eel like critters and six inch ribbon worms; no one could identify either. At Isla San Diego, beautiful large rock formations covered with multicolored fans and gorgonia, large turtles, hammerheads, angel sharks, stingrays, beautiful golden groupers, lobsters and again plenty of tropicals. Here I encountered a pair of Zebra morays, completely entwined, with the front half of their bodies rising vertically, as if they were two skinny kids necking. Off Isla Espiritu Santa on a drift dive I ran into a solid wall of mantas, at least fifty, maybe seventy five, heading north. As this spectacular squadron flapped by I imagined a run over Berlin, forty years ago.

While between Isla San Jose and the Baja, enroute to dive the former luxury ship Cantamar, many porpoises swam at the bow of the ship and large numbers of frigate birds, boobies and shearwaters overhead. Richard said we could expect to see finback whales as we approached Punta Nopolo Sur, and within one minute of his predicted time, there they were! A pod of several finbacks allowed the ship to approach rather closely before sounding. No sooner had they disappeared when a vast school of feeding porpoises appeared stretching from horizon to horizon. As if that were not enough, a large pod of pilot whales appeared 30 minutes later.

Conclusion: My first trip aboard the Marisla was no fluke, and neither is the Sea of Cortez. That it exists such a short ways from California and other western states seems the fluke, since all the dive magazines, all the tour operators either want to schlep us to the Caribbean or half way around the world. A number of dive boats are now plying these waters and to facilitate your trip I've provided a sidebar with relevant information. Here, at Undercurrent, we have received few comments about these boats, but those we have received are generally positive. If you have contrary experiences, let us hear.



As for the Marisla, Beverly International no longer represents it. Adcock says he severed the relationship because the agency did a lousy job and tried to book people on other trips, while the owner of Beverly, Gene Baskevitch, claims that he could not get the kind of advance booking information he needed from Adcock to represent him properly. So there are two sides. All I know is my own experience. Beverly booked our roundtrip flights. When we went to the airport for our return home we learned the flight we were booked on was non-existent; it had been discontinued the previous month. Beverly agents had not done their homework, causing several of us to get home a day later--and at much greater expense--than we had expected. So far they've refused to refund us.

Finally, I must add that when one goes on a trip like this he must be careful not only to take all the equipment he needs and the tools to make repairs, but also backup equipment is essential. This year has been a real bitch for me and my equipment. Either I've been unusually unlucky or the entire industry is in serious decline. I bought a new Ikelite Sub Strobe 150 TTL and it failed the first time I turned it on. My brand new Scuba-Pro AIR II power inflator failed the second day. The o-ring, a special Scuba-Pro o-ring, broke. My new Mares graphite Power Planar fins split at the top of the foot piece after only two days of diving. My new Nikonos SB-103 Speedlight failed to charge after only 5 days of diving. On the bright side, I had just purchased a Sea-Quest ADV jacked and it is magnificent. It's easy to don and doff, very comfortable and simple to adjust to my shape. One out of five, however, is no record for the industry to be proud of.

<u>Marisla</u>	
Diving for Experienced	★ ★ ★ ★ ★
Diving for Beginners	not for beginners
Accommodations & Boat	★ ★ ★ ★ ½
Food	★ ★ ★ ★
Moneysworth	★ ★ ★ ★ ★
<small>★ poor, ★★ fair, ★★★ average, ★★★★ good, ★★★★★ excellent</small>	

I envy my Florida friends. Not only can they drive to warm water diving, but also they're within an hours flying time for long weekend diving. Not that I can afford to fly off frequently for a weekend sojourn, but once in a blue moon I've been haunted by the vacuum created by a forthcoming three day weekend and would have given my last tankful of air to bounce down to a few reefs, sans wet suit, and then lay about in the tropical sun. I'll bet more than one west coast diver has shared the same fantasy.

You can imagine my glee, then, when I discovered that indeed there are weekend boats running in Mexico's Sea of Cortez and they can be reached by air for \$95 in less than an hour, or by car from Tucson in seven hours. So I signed up for a mid-October, four night, four plus day trip aboard the Santa Barbara, which departs not from La Paz on the Baja Peninsula, but from San Carlos, a small town much farther north and on the Mexican mainland, a 15 minute car ride from Cuaymas. I knew this craft would not reach the legendary waters further south, but I speculated there could be fine diving in the central Sea. At a price of \$295 for four days (that is, \$75/day) of unlimited, diving, accomodations and meals what could I loose?

The Santa Barbara, built for divers in 1983, is 63 footer, trawler hull, sleeping twelve comfortably below deck. Midships there's a cabin with six bunks, a head and a sink, and forward a cabin sleeping four. One private double cabin has its own head, sink, shower and even a sitting area (request this if you're a couple). On the main deck are the wheel house, dining room, galley; the back deck provides room to suit up. Water entry is by a step through the transom onto the dive platform; a ladder provides easy return.

The first night was an overnight trip to isolated and desolate snowy white Martir Island, reminiscent of a member of the Galapagos Island chain. But this island is desolated only because humans rarely reach it. It's great bluffs and craggy cliffs are heavily populated with thousands of brown boobies, gulls, frigates and the once-endangered brown pelican. The air is filled with the cries of the birds and the bark of sea lions lounging on the island's rocky beaches.

As I looked into the water I felt initial disappointment in the low visibility--about 40 feet (though it did reach 100 feet by the trip's end). The usually clear waters had been fouled by hurricane Waldo which had passed only a couple of days before. I sunk slowly down the side of the island. The walls were barren, with some coral here and there and plenty of rock. My first thought was of Hawaii, where the coral does not offer the color found in the Caribbean and elsewhere. But I was struck by the fish life. Scores of species, many of which I was unfamiliar with, floated at

different depths. And look at the size of these groupers and snappers and sea bass! And there, against the lavender submarine cliff, were bright flames moving about, the so-called golden grouper, indeed a beautiful fish.

Sea Of Cortez Dive Boats

To take a dive trip on the Sea of Cortez, you may contact:

Marisla II: Booked through Gary Allen at (619/755-0375).

Silent Experiences: This is Lane Larson's operation (he led the tour on the *Santa Barbara*). He has several other boats operating out of San Carlos and offers trips of differing durations: 2901 E. Speedway Blvd., Tucson, AZ 85716 (602/327-9293; 602/299-1047).

Sea Safaris: This agency books two boats out of La Paz, the *Rio Rita* (a day boat) and *Baja Explorador* (a live-aboard): 3770 Highland Ave., Manhattan Beach, CA 90266 (213/543-2464).

Baja Expeditions: The live-aboard *Don Jose* out of La Paz can be booked through this agency: PO Box 3725, San Diego, CA 92103 (619/297-0506).

Gary's Place: Gary Goldstein has several boats in San Carlos which can be booked only by calling Mexico directly: 011-52-622-6-00-24 or 011-52-622-6-00-49.

Here was my first opportunity to dive with sea lions, a thrill alone worth the entire trip.

As we hit the water many left the beach to come greet the divers and "play catch me if you can." I tried hard to catch them in my lens as they barreled towards me at great speed, then veered away at the last second. Or, as they nosed into my mask, while my bubbles rose along their underside, apparently pleasantly tickling these friendly critters.

Throughout the four days water temperature ranged from 79° to 82° F, making a wet suit top a comfortable addition. It was especially welcome when I hit the ubiquitous thermocline. Although I could usually see the shimmery effect that occurs when warm water meets cold, if I missed the visual warning signs the icy water was enough to chase me right back to the warmer water.

For most of dives the backdrop remained the same, but the fish life differed, remaining abundant virtually through every dive. One day I followed a rugged cliff line, again amazed at the profusion of grouper, sea bass, snapper and angel fish. Another

day I dived off a small islet near Martir to watch a dozen huge grouper, surely in the 50 lb. class, swim back and forth along the wall. When I returned to the boat everyone aboard was excitedly shouting about a whale that had been right next to the boat just moments before. Alas, I didn't see it. On another dive I came across an enormous school of glimmering bait-fish. I swam into the school expecting to quickly come out the other side. But the deeper into the school I swam, the deeper the school seemed. Everywhere shining bodies sparkled before me. I kicked a few more stokes and still no end. But now, which way was up? Which way was down? I was disoriented and dizzy, I saw nothing but flashing fish. I stopped to catch my self, then rose up and out of these millions.

I made two night dives, finding puffers so sleepy they didn't even inflate when I held them. Lobsters studded with jewel-like colors pranced about the reef. Morays, nudibranch and huge starfish, in pink and purple, gold and grey, and splashed with

red dots, provided enough to keep me interested and busy. But I'm glad I didn't stay too busy. On one dive my buddy scooted along the bottom, so close his console often caught in crevices. He slowed himself to rest and began to put his hand down to steady himself. I grabbed his shoulder, jerking him violently upward. He was about to steady himself on the poisonous dorsal of a sizeable stonefish.

I dove as often as I wished, as long as I had a buddy and stayed within the dive table limits. An inflatable is available to pick up tired divers or those caught in a current. Some drift dives were arranged, but we tried to dive as often as possible at slack tide or in areas with little or no current. Currents here are unpredictable and can change rapidly. After one dive, three of us were lazily swimming back to the boat when I suddenly realized that we weren't making headway. The current grew stronger by the second. We were losing ground fast. One managed to grab the ladder, but two of us had to be "rescued" by the dinghy, just 15 yards from the boat!

I should add that visibility improved every day. By my last dive, 2½ hours from San Carlos, at San Pedro Nalaso Island, the water had become quite clear. At this site, reached by day boats from San Carlos, the water was thick with fish.

Diving is not the only entertainment. One day the dinghy took us to a small island to climb and hike. Cardon Cacti covered the higher reaches, looking like giant organ pipes. Some small scrub bushes shaded boobies and lizards. I had only seen brown boobies from below, but higher I discovered very tame blue-footed boobies and roosting tropic birds.

There's said to be an unusual species of diamond-back rattlesnake here, but I didn't find one. Guano is everywhere. I returned to the boat foul smelling and dusted white.

Now I suppose that the diving is more spectacular farther south. I saw no sharks, no mantas, for example. But that may be peculiar only to this trip and this visibility. Still, for the time and price I couldn't imagine a better deal. And the ambiance and meals of the Santa Barbara made the experience special. Crew member Lisa Jylli prepared excellent meals, the main course usually fresh fish or lobster, which was never more than two hours between sea to stomach. Barbecued chicken, tortillas with beans and freshly made salsa, great Italian spaghetti with meat and mushroom sauce and fresh tossed salad were further examples of her culinary delights. At cocktail time (and cocktails such as margaritas one night pina coladas another were on the house) freshly made ceviche or guacamole was served as an appetizer.

My expedition was organized and led by Tucson-based Caiman Expeditions, notably 32 year old Lane Larson the owner. In partnership with others, he owns and operates several boats out of San Carlos and offers a variety of trips. The Santa Barbara is not one of Lane's boats but was chartered for this trip. Two dive masters accompanied Lane, Mike Lord and Tom Barnes, who joined in many dives or offered themselves up if a diver without a partner needed one.

The Mexican crew of the Santa Barbara consisted of three: Captain Ricardo, Engineer Miguel and First Mate Carlos. Those three, along with four people representing Caiman Expeditions, comprised one of the nicest and most helpful crews I've encountered. Yet I must issue one complaint. The captain insisted on throwing our garbage overboard. When Lane politely asked him to refrain he did so only until our backs were turned. Then over it went. I find it disconcerting to see paper plates, non biodegradable plastic cups and beer cans go floating past me during a dive. And I

Santa Barbara

Diving for Experienced	★ ★ ★ ★ ½
Diving for Beginners	not for beginners
Accommodations & Boat	★ ★ ★ ★
Food	★ ★ ★ ★
Moneysworth	★ ★ ★ ★ ★

★ poor, ★★ fair, ★★★ average, ★★★★ good, ★★★★★ excellent

get angry when I think of how pristine areas of the world are continually under man's thoughtless assault.

The Sea of Cortez may soon feel that assault. Where it was once impossible to get decent diving this far north, the addition of a number of good boats and savvy management has now brought exciting diving in warm water much closer to thousands of divers. I'm headed back to San Carlos and no doubt hundreds, then thousands, will follow. We divers have an obligation to leave this raw beauty intact. It's quite a remarkable place. Let it not be the dive industry--and that includes you and me--that spoils it.

Within A Rainbow Sea

-- Indeed, A Remarkable Book

This book has been sitting on my coffee table for six months. I've been unable to write about it. In fact, I've been unwilling to do little more than sneak a peek at it, as if it were filled with shots of love and lust far too stimulating for more than a brief glance.

This book is *Within A Rainbow Sea*, undisputedly the most beautiful and stimulating collection of undersea photographs ever published. The photographer and author is Christopher Newbert, a man whose gentle eye and kindred connection with the undersea world has produced a remarkable vision of life within the rainbow sea.

When I first flipped to a photograph somewhere in the center of the volume I knew I held a masterpiece in my hands. I put the book down. Every couple of weeks I picked it up, looked at a few more photographs, then quietly placed the book back on my coffee table. I had a sense of joy. And sense of jealousy. Joy in the incredible beauty of the book, jealousy in that for all my hours firing away beneath the rainbow sea I had barely a single picture that even resembled the scores displayed by Newbert. Only now, six months after discovering these photos, am I able to sit and write about it. Before, I could only experience it, bit by bit.

The book's success is due first and foremost to the remarkable photography. Years ago remember marveling in the photographs of Carl Roessler in his book *Underwater Wilderness*, which I then wrote about in these pages. At that time, I was taken by Roessler's work. Now, as I put the two books side by side, Roessler's photographs pale. In no way is this a disrespectful comment about Roessler, for indeed he is a fine photographer and *Underwater Wilderness* was a remarkable step forward in published underwater photography.

Newbert's book is the next step forward. No, the next leap forward. Consider for a moment his photographs of Pacific spotted dolphins, the mothers swimming with their babies so close alongside they appear tethered. So perfect are these pictures, so

posed their subjects, they appear to be paintings by noted artist Richard Ellis.

Page after page of macro work, expertly centered and cropped, provide close up critter glimpses unparalleled in the books of others. A photo only of a goatfish eye is a brilliant display of purples, lavenders and magenta's. The details of the Crown of Thorn becomes a Tolkien-like view of this reef eater. Rugose coral, under Newbert's lens, becomes a crinkly pug-nosed fish. Shot after shot brings out the pyrotechnics of the undersea world, converting what the jaded diver will see as common undersea life, to what the more sensitive will recognize as sheer art.

Newbert's magic is not his camera alone. The book is interspersed with tales of his own diving and his own vision. Though Newbert occasionally overwrites, he registers his unique and occasionally common experiences for us to share. It gives the book a nice touch.

His most subtle contribution comes in collusion with his publisher. Together, they have employed a whole kit bag of delicate tricks to please the eye. I must confess as I wandered through this book over so long a period that they had me fully buffaloed. I was enraptured by the photos, yet I knew there was much more to the book I wasn't getting. After my months of playing with this book, as a cat plays with a fresh mouse, I decided to read the literature the publisher had provided.

And there was the answer.

The publishers first conceptualized a design for the book and then selected the pictures from Newbert's files (or in some cases required Newbert to produce new photos) cropping and placing them according to their plan. Here are their words:

"The pictures are arranged according to the colors of the rainbow, starting with blue then, in order, green, yellow, orange, red, purple and indigo. . . . a photo of a red fish with a green eye and a predominantly red background would be placed in

the green group, if the focal point of that picture was the fish's eye.

"Once the photos were placed in their color groups, the next subset of ordering was based on the real size of the subject represented in the photographs. To accentuate continuity and create a liquid wave-like pattern, we went from the largest blue to the smallest blue, then the smallest green to the largest green, the largest yellow, the smallest yellow, and so on...."

Of the 158 published photos, no two are the same size, the same dimension, or positioned exactly alike.

The result of this complicated layout was not obvious to me but no doubt had a subconscious effect. As I returned to the book with the design concept in mind I developed an entirely new view, not only of undersea life, but also of the symmetry of design.

And, I must also applaud the quality of the printed picture. No expense was spared in reproducing these photos; color separations and color renderings are as close to perfect as I've seen. So expert was this effort that *Within A Rainbowed Sea* was judged the Best Book of 1985 by the Printing Industry of America. It's artistic merit was recognized with two gold medals from the New York Art Director's Club.

But who is this guy Christopher Newbert to produce such a masterpiece the first time out? After all, his name is not a household word among divers or even amateur photographers, for that matter. We know Carl Roessler, Flip Schulke, Dave Doubilet. But Chris Newbert? A relative newcomer?

Not at all. Christopher Newbert has paid his dues. He worked on this book for ten years, having spent many more honing his skills in faraway places, including the Kona Coast where he now lives. His work has appeared in more than 40 national magazines, including the *National Geographic*. In addition, he has written two other books:

Aside from his apprenticeship, just who is Christopher Newbert? These excerpts from an interview which appeared in SURGE Newsletter will give you an idea.

"I don't approve of baiting subjects, of attracting them with food. I don't even want to be diving in areas where the animals are tame, because the animals are no longer interacting with their environment in a natural fashion; that to me is practically the

same as going to a zoo. I like to go diving to see nature in its natural state.

"I don't know if it's real or imagined, but I feel that I can establish an intimacy with the animals. I recognize that it could be an illusion, but I'm going to continue relating to them as though it was real, because then I seem to be able to get a more intense picture, a more meaningful picture out of it. But I can't go around the world saying 'I talk to the nudibranchs,' because people will lock me up, in short order...."

"I think a lot of people, when they get a camera in their hands, become the hunter. They put out the hunter vibe, and they're stalking with a camera. The animals seem to pick that up: they sense that they are being hunted. There is definitely a hunter mentality among many underwater photographers, which is why they get a lot of fish tail pictures. That's not to say that fish don't run away from me either, but I think there is a point of recognition of benign intentions. You have to get yourself into that kind of mind state, be willing to let something swim away from you, and not chase him down. Sometimes you'll be surprised, and those things will return when they're not being pursued."

Having contemplated Christopher Newbert's advice, I still know that I'll not get photos that rival his. But then again, I'm no longer reluctant to do more than just peek at the imperial shrimp on the sea cucumber, at the tidachna clam siphon, at the sea anemone underside. Now I study those photos and wonder why I've never seen such sights underwater -- although those sights have been right before my very eyes.

That's the secret of *Within A Rainbowed Sea*. Chris Newbert brings the undersea to divers in a way in which very few have ever seen it, and it's been there all along. I've often been blind to the color, to the nuances, to the delicacy of it all. As I looked at his marvelous, searching pictures, I was faced with my own shortcomings as an observer. Chris Newbert's book has given me the ability to see in a way I never had. That's quite a remarkable gift.

Ben Davison

The book, which has been out for several months, can be found in Walden Books or ordered directly from the publisher of Undercurrent. An order blank is enclosed with this issue.

The Curious Deals Behind Mel Fisher's Treasure

-- What Will The Investor's Really Get?

During a visit to Key West, Fla. last May, Phoenix printshop owner Art Edwardson, 53, and his then 17-year-old son, Matthew, wandered into one of the town's most popular tourist spots, Mel Fisher's

treasure museum. After they'd gazed upon the undersea lucra Fisher had found over the years, they were handed a prospectus: for \$1,000 they could have 1/10,000 of this year's haul of honest-to-goodness

sunken treasure. They bought in. Two months later, the value of each unit was \$20,000. Or was it \$40,000? Or was it a sum far smaller than either of those two? Problem is, nobody knows.

As it turned out, the Edwardsons had picked up two of the last available units in one of the greatest undersea treasure troves of all time: the long-sought cargo of the *Nuestra Senora de Atocha*, the Spanish galleon that foundered in a hurricane some 40 miles off Key West in 1622. It was located on July 20 by one of Fisher's search vessels beneath four feet of sand and 53 feet of cerulean seas. There, divers found gold bars, treasure chests crammed with silver coins and an estimated 47 tons of silver bullion. Fisher, 63, proclaimed the treasure's worth at \$400 million.

Most of the world, including an especially enthusiastic press corps, has joined in the celebration of Fisher's stirring exploit. After all, the onetime California chicken farmer had overcome many legal hurdles, near bankruptcy and the drowning of his son and daughter-in-law, before his 23-year, Ahab-like obsession found triumph. But so dazzled have reporters and investors been by the richness of the find that few have paused to ask several important questions. Among them:

"The often broke Fisher once signed away an interest in his business on a cocktail napkin, and on other occasions he paid bills with company stock."

•Who will make money from the Atocha? In addition to Fisher and his crew, untold backers -- such as the Edwardsons -- dating back 20 years or more have claims on pieces of the action. Two of his ventures alone have 862 investors, many of them tourists who wandered into Fisher's museum and signed up. The often broke Fisher once signed away an interest in his business on a cocktail napkin, and on other occasions he paid bills with company stock.

•When will they get paid? Several of Fisher's deals have limited investors' hauls to that brought ashore during a specified period. Investors like the Edwardsons, who own one-year partnership units, are entitled only to treasure pulled up in 1985. Fisher has already indicated that he plans to proceed slowly, citing archaeological priorities.

•How much will they get? Fisher's claim that the Atocha plunder is worth \$400 million is almost surely wrong. Every estimate of the value of the Atocha treasure has been made by Fisher or someone affiliated with him. Fisher's investors will be paid off in items of treasure, not cash. Fisher's uncritically accepted estimate of \$400 million is based on what he gets for similar items in his museum shop. When investors ultimately sell in the open market, they are very likely to find that the loot is worth a lot less.

Most people who know Fisher say they have little

reason to doubt his integrity; he commands intense loyalty from both his workers and investors. But his financial dealings are often unconventional, and seem to benefit Fisher and his colleagues more than the investors who support him. His dealing, in fact, have attracted the attention of the securities division of the Florida State Department of Banking and Finance, which has launched an investigation.

Over the years, Fisher has raised an estimated \$15 million from investors to finance his operations, which cost about \$1.2 million annually. He says he doesn't know how much treasure he's recovered, but he didn't make his first major strike until 1980. At that time, he discovered the *Margarita*, which went down in the same storm as the Atocha, with an estimated \$20 million aboard.

At the heart of Fisher's multifarious operations is Treasure Salvors Inc., and 1,016,000 shares of stock in this firm are outstanding. The stock is not registered with the Securities and Exchange Commission, which means the company does not have to comply with SEC disclosure rules but is limited in the number of investors to whom it may sell shares. Fisher ran afoul of similar Florida securities laws in 1973 and signed a consent order agreeing not to sell unregistered stock to more than the allowed number of investors.

Investors often trade shares through classified ads in the daily *Key West Citizen*. Recently, stockholders offered shares at prices ranging from \$20 to \$1,000. The stock has paid small dividends -- usually in items of treasure, not cash -- in years when Fisher has recovered booty. According to Fisher, shareholders will receive a total of 40% of the Atocha treasure as a dividend when the salvage operation is complete. If Fisher's \$400 million estimate of the value of the ship's cargo proves correct, that works out to roughly \$160 a share.

In recent years, however, Fisher has turned to limited partnerships to finance his treasure hunting. Currently, there are three principal limited partnerships with claims on the Atocha -- a 30-unit one with high-rolling investors and two 500-unit deals with \$1,000 minimums. The 30-unit deal, known as Treasure Co., was established in 1980 specifically to raise money to help find the Atocha and salvage the *Margarita*. (As a rule, Fisher has several operations going on at once; right now he has claims on five sites off the coast of Florida.) Each investor agreed to pay \$150,000 in exchange for a share in the partnership's claim on 10% of all the treasure taken from the two ships. They also got to write off 100% of their investment and take a 10% investment tax credit.

It seems likely that Treasure Co. partners will win big. According to Carl Paffendorf, president of Vanguard Ventures, Treasure Co.'s Glen Cove, N.Y. syndicating firm: "We've already received about \$4.5 million in treasure from Fisher, enough to pay back all the investors now." Most of this treasure

came from the Margarita. Paffendorf estimates that the Treasure Co. partnership will distribute about \$21 million worth of gold, silver and jewels among its investors when the salvage of both ships is complete -- roughly \$800,000 for each \$150,000 unit. Most investors have chosen to hold their profits in a trust set up by the partnership, expecting that so doing will qualify them for long-term capital-gains treatment. The bulk of the partnership's treasure is in the vault of a Glen Cove bank.

Far more interesting, however, are the \$1,000 deals like the one the Edwardsons bought into. Investors numbering 862 currently own units in these two limited partnerships. In one, unit holders divide up a 5% share of the haul from the Atocha, Margarita and a third wreck; in the other, they receive 10% of what's salvaged from five ships in a Spanish fleet Fisher is working off Vero Beach, Fla. That fleet is thought to contain \$180 million in gold and silver. The deals, both of which are now sold out, permit partners to write off 90% of their investment.

"Investors in the 1985 Atocha/Margarita deal get only what Fisher pulls up this year."

These partnerships have a highly unusual feature not shared with the Treasure Co. deal: they are only one year in duration. Since 1980, underwriter Jerome Burke, head of Underhill Associates of Red Bank, N.J. has launched several such self-destructing limited partnerships with Fisher. Under the terms of each year's program, investors receive only what Fisher and his crew salvage in that year. Investors in the 1984 one-year partnership to finance the Atocha and Margarita searches got only a couple of coins each. They will get nothing more, unless they re-upped. Investors in the 1985 Atocha/Margarita deal get only what Fisher pulls up this year. Fisher cites the detailed archaeological studies his staff is conducting on the wreck as the principal reason why it may take more than two years to bring up the whole cache. That work is supervised by a graduate of the University of London who, according to the prospectus, "has added to the value of artifacts by providing historical documentation."

Participants in this year's Atocha deal do have the right of first refusal on units in a program that will give them a share of what comes out of the Atocha in 1986. Fisher, however, is under no obligation to structure his 1986 program like 1985's. He's free to dilute each investor's return by setting up the partnership so that it gets a smaller share of the Atocha and a greater share of wrecks of undetermined value. By so doing, he could issue many more units at \$1,000 apiece. In fact, Burke plans a 12,000-unit partnership for 1986 that he likens to a mutual fund. It would distribute treasure from 10 wrecks, in-

cluding the Atocha. Fisher's current unit holders, however, seem unaware that next year's units may contain only small slivers of the Atocha. Carol Baker of West Deptford Township, N.J. has one 1985 unit and fully expects to renew in 1986: "Do I want to invest in a sure thing? You bet I do."

More Problems With Rechargeable Batteries

In April, Tekna recalled its Diver Propulsion Vehicle after a battery exploded in the face of a diver who was recharging the device. The problem was attributed to internal hydrogen buildup which was somehow ignited.

In August, Dacor discovered the same problem in its UL950 underwater light. Hydrogen, which is generated in all rechargeable batteries, was unable to escape. A spark could ignite the gas, causing the plastic lens to be forcibly thrown from the light and perhaps shattering the bulb. UL950 lights with a gray or orange foam pad inside the light body and between the bottom of the battery and the recharging port need to be returned to a Dacor dealer for repair. It's this pad, and the design of the unit, which prohibits the escape of gas. Units with a white foam pad need not be returned.

Although the problems are nearly identical, there is no connection between the problems at Tekna and Dacor. Any product with a rechargeable battery is prone to hydrogen buildup and potential explosion if the design does not permit proper gas ventilation. But divers need not be too concerned. We don't have evidence of the problem occurring in any other products. Nonetheless, one can exercise a few precautions when recharging any battery.

First, place the unit in a safe place while recharging it. Put it in the garage. Stick it in the corner of the room on the floor and out of the way of people and kids. Stick it in a drawer. Put the unit anywhere that affords some protection to passersby.

Second, don't hover over the unit during the recharging cycle. Plug it in, leave and go about your business. Return at the appropriate time to unplug the unit.

Third, don't produce any sparks around the unit -- which means don't light matches.

Finally, always follow the directions supplied by the manufacturer.

It's unlikely that you'll have any problems recharging your strobe, dive light or other devices. Nevertheless to be a safe diver means following a few rules above the surface as well as below.

Location being evaluated _____
 Date of your trip _____ Hotel _____ Dive shop _____
 What other resorts have you dived? _____

fish	<input type="checkbox"/> large ones plentiful	<input type="checkbox"/> a few big ones	<input type="checkbox"/> too small to eat
tropical fish	<input type="checkbox"/> abundant	<input type="checkbox"/> not bad	<input type="checkbox"/> sparse
kinds of tropicals	<input type="checkbox"/> impressive variety	<input type="checkbox"/> fairly interesting	<input type="checkbox"/> common ones only
hard coral	<input type="checkbox"/> plenty and colorful	<input type="checkbox"/> o.k.	<input type="checkbox"/> kind of a bore
soft coral	<input type="checkbox"/> plenty and colorful	<input type="checkbox"/> o.k.	<input type="checkbox"/> kind of a bore
sponges, gorgonia...	<input type="checkbox"/> very nice	<input type="checkbox"/> pretty average	<input type="checkbox"/> not much
caves, ledges...	<input type="checkbox"/> good variety	<input type="checkbox"/> some of interest	<input type="checkbox"/> none worth diving
wrecks	<input type="checkbox"/> exciting	<input type="checkbox"/> worth a tank or two	<input type="checkbox"/> none
sharks	<input type="checkbox"/> a couple for fun	<input type="checkbox"/> none	<input type="checkbox"/> too many
shelling	<input type="checkbox"/> excellent	<input type="checkbox"/> o.k.	<input type="checkbox"/> none or prohibited
snorkeling from beach	<input type="checkbox"/> some of the best	<input type="checkbox"/> not bad	<input type="checkbox"/> nothing to see
water temperature	<input type="checkbox"/> 80° +	<input type="checkbox"/> 74°-79°	<input type="checkbox"/> less than 74°
visibility	<input type="checkbox"/> 90 ft. or more	<input type="checkbox"/> 50-90 ft.	<input type="checkbox"/> less than 50 ft.

rules for experienced divers	<input type="checkbox"/> no restrictions	<input type="checkbox"/> a little tight	<input type="checkbox"/> treated as a novice
guides for new divers	<input type="checkbox"/> top-rated	<input type="checkbox"/> acceptable	<input type="checkbox"/> lousy
diving frequency	<input type="checkbox"/> 3 or more tanks/day	<input type="checkbox"/> 2 tanks per day	<input type="checkbox"/> one per day
night diving	<input type="checkbox"/> frequent	<input type="checkbox"/> 1-2 times/week	<input type="checkbox"/> none
boat diving	<input type="checkbox"/> two tanks under \$25	<input type="checkbox"/> \$25-\$35 for two	<input type="checkbox"/> over \$35 for two
beach diving	<input type="checkbox"/> as good as the boats	<input type="checkbox"/> fair possibilities	<input type="checkbox"/> no way
dive shop manager	<input type="checkbox"/> a great person	<input type="checkbox"/> just does the job	<input type="checkbox"/> a real bastard
air quality	<input type="checkbox"/> no problems	<input type="checkbox"/> I wondered	<input type="checkbox"/> I worried
air fills	<input type="checkbox"/> 3000 psi+	<input type="checkbox"/> 2250 psi+	<input type="checkbox"/> short-changed often
rental gear	<input type="checkbox"/> everything you need	<input type="checkbox"/> tanks, wt. belts...	<input type="checkbox"/> bring everything
repair capability	<input type="checkbox"/> can handle anything	<input type="checkbox"/> some repair capacity	<input type="checkbox"/> pray nothing breaks

hotel food	<input type="checkbox"/> gourmet	<input type="checkbox"/> not bad	<input type="checkbox"/> ugly!
nearby restaurants	<input type="checkbox"/> must try	<input type="checkbox"/> adequate	<input type="checkbox"/> better off fasting
accommodations	<input type="checkbox"/> luxury	<input type="checkbox"/> o.k., decent	<input type="checkbox"/> far below par
car needed	<input type="checkbox"/> of no use	<input type="checkbox"/> only for touring	<input type="checkbox"/> a daily must
nightlife	<input type="checkbox"/> swinging	<input type="checkbox"/> enough	<input type="checkbox"/> dead
locals	<input type="checkbox"/> helpful, friendly	<input type="checkbox"/> no complaints	<input type="checkbox"/> hostile
weather	<input type="checkbox"/> great every day	<input type="checkbox"/> o.k.	<input type="checkbox"/> many bad days
insects	<input type="checkbox"/> none	<input type="checkbox"/> now and then	<input type="checkbox"/> too many bites

Comments and comparison to other places: _____

Circle the number of stars applicable to your experience, from 0 to five (for the tops)

Diving for beginners	★	★	★	★	★
Diving for old pros	★	★	★	★	★
Beach snorkeling	★	★	★	★	★
Hotel meals	★	★	★	★	★
Hotel otherwise	★	★	★	★	★
Moneysworth	★	★	★	★	★

PLEASE RETURN THIS TO:
UNDERCURRENT, P.O. BOX 1658,
SAUSALITO, CA 94965

Name _____
 Address _____
 City _____ State _____
 Zip _____ Tel. _____

"If you are serious about investing, you can't read the prospectus without laughing. All the cards are in the hands of the general partner. He's the one saying how much is down there, how much comes up in a year and what your actual distribution is."

Such deals allow Fisher to keep the cash flowing in, while maintaining tight control over the payout. And the annual renewal feature gives steady business to Burke, who gets 10% in underwriting fees. Says Arnold Rudoff, a tax-shelter analyst at the accounting firm of Price Waterhouse in San Francisco: "If you are serious about investing, you can't read the prospectus without laughing. All the cards are in the hands of the general partner. He's the one saying how much is down there, how much comes up in a year and what your actual distribution is."

The Cocktail-Napkin Contract

If the deals aren't mainstream, neither are the partners your typical limited-partnership investors. The relatively low \$1,000 entry fee has permitted Fisher and Burke to mass-market the deal to people not necessarily inclined to examine it as a serious investment. For many, the thrill of being in on a treasure hunt is reward enough.

Richard Powell, 50, a Royersford, Pa. schoolteacher, stepped off a cruise ship in Key West last April, visited Fisher's museum and charged two units on his American Express card. Says Powell: "They showed a National Geographic movie about Mel on board before we docked, and when Mel told me that investors were welcome to scuba dive with his crews, I signed up."

In addition to the partnerships and the stock, over the years Fisher has traded away pieces of his projects in innumerable side transactions, many of them arranged casually. The deal sealed in the early '70s by a signature on a cocktail napkin is probably the best-known example: in it, Fisher sold 5% of the Atocha for \$9,000. A lot of investors came in by word of mouth -- usually Fisher's. Brooks White, 38, a Key West commercial fisherman, met Fisher in a bar in 1979. Since then, White has given Fisher a total of \$40,000 for a 1/400 share of the Atocha worth \$1 million by Fisher's estimate. Investors of this type included poultry mogul Frank Perdue, who heard about Fisher through friends and made a short-term investment he describes as minimal. Perdue chickened out though; the investment, he says, was too much of a gamble.

Fisher makes no apologies for his seemingly slapdash way of doing business, and he admits that over the years he's lost track of some details. For example: how many shares of stock did he hand out to settle debts with local tradesmen? Says he: "I have no idea.

PADI Instructors v. PADI: An Update

On June 24, 1985, Don Dibble and the other plaintiffs filed their initial complaint against PADI and the other specified defendants. This complaint was amended in late July. This just was covered in full in our September issue.

PADI responded August 23, 1985 by filing a counter suit and motions for dismissal of the suit and a change of venue due to lack of jurisdiction on the part of the State of Texas.

Four pre-trial hearings have been scheduled. Apparently none have taken place, but the opposing lawyers have met several times. The initial September 6, 1985 hearing was rescheduled for September 19th then rescheduled and rescheduled again. Rescheduling resulted from disagreements as to what documents the defendants would or could produce and from illness of the judge. PADI is fighting the release of requested documents by claiming they do not exist, they are trade secrets which could damage their ability to do business or they are not germane to the suit.

Pre-trial hearings are held to determine which of the various allegations have merit and become part of the trial and which will be dismissed. This procedural process defines the scope of a pending trial. The judge assigned to a case will determine, along with opposing attorney negotiations, what will actually be tried.

On October 22, 1985 a hearing was held in the magistrates court in Ft. Worth. The decision of this court will not be released until after this issue of *Undercurrent* has gone to press. Among the pending actions are the initial suit, PADI's counter suit and possible contempt of court proceedings due to non-action of the part of the defendants.

"I've been giving it out for 20 years or so." Says Paffendorf: "His records aren't the world's greatest. Accounting is not his strength. A lot of his records sank with the old galleon he used to work in. His was a shoebox operation. The old ship sank. You could only see the mast."

Fisher scoffs at the notion that his books aren't in order, however: "Oh, no, I've got four computers and excellent, meticulous records." Fisher has repeatedly said he's willing to open his books to any investor. But when we asked if our accountants could examine the records, a company official said no. However many claims there are on Fisher's finds, they do seem to be more numerous than splinters of the true cross. In addition to investors, according to Fisher, the crews on the search vessels and company

employees will receive shares of the Atocha ranging from 0.01% to a full 1%, depending chiefly on their length of service; more than a few loyal tars expect to emerge as millionaires. And Fisher has put himself down for 5% -- \$20 million, according to his estimate.

Another question is whether the value assigned to the Atocha haul by Fisher is a reasonable one. No one but Fisher's staff handles the treasure; there has been no independent confirmation of what they've pulled out of the sea, nor has there been any outside appraisal of this year's take. Fisher's valuations, meanwhile, are debatable, based as they are on what he gets for similar items retailed through his museum shop. What the market will bear depends a great deal on location, and Fisher's museum gift shop is the retail bull's-eye. Recently, the shop was selling silver pieces of eight for as little as \$180 to as much as \$1,200, depending on the quality of their markings. Yet Joel Rettew's Rare Coin Gallery in Beverly Hills, which tends to be frequented by serious collectors as opposed to giddy tourists, is currently selling pieces of eight picked up along the trail that finally led to the Atocha for \$85. Tom Tesoriero, antiquities specialist at Joel D. Coen Inc., a rare-coin retailer in New York City, puts the top value of pieces of eight from around 1660 at \$300, but adds: "Those in less than top condition, which is often the case when they've been underwater, would be worth \$75 and down."

Paffendorf, the sponsor of the Treasure Co. partnership, says he routinely discounts Fisher's valuations of recovered treasure by a third. Fisher has offered to sell the partnership's share at museum prices, says Paffendorf, "but he wanted a 30% com-

mission." Moreover, if the Atocha's estimated cache of 225,000 pieces of eight hits the market all at once, the price could drop precipitously. Says Harvey Stack of Stacks' Rare Coins in New York City: "Obviously, quantity does not enhance value."

Next Stop: Guam?

In any case, it appears that Fisher has discovered nearly as much treasure ashore as under the sea. Tourists crowd into his museum (admission fee: \$4), leaving behind about \$500,000 a year. Fisher has generated publicity and no doubt tourist and investor interest by appearing on the likes of the Tonight Show, and Johnny Carson himself donned flippers and goggles to take a treasure-hunting dive with Mel. And even more fame and fortune may be in the offing. According to Fisher, a deal has been signed with a major film studio to make a movie of his life story. Would-be backers show up regularly, including, Fisher says, a group of Miami men who put down \$5 million last month.

Jerome Burke, for his part, continues to think big. Not only does he expect to launch more Florida treasure-hunting deals, but he has his eye on wrecks off Texas, Mexico, Guadalupe and Guam. Moreover, he has plans for a limited partnership to finance a traveling exposition of the Atocha treasure. Investors would get their profits from gate receipts. Fisher has indicated that he wants to retire within two or three years and dissolve his company. As for Burke's plans, he says: "Just wishful thinking."

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The Diver Of The Future: Part I

-- Equipment For The Year 2000

What equipment will the diver of the future be using. Automatic depth control devices? Collapsible snorkels? Gauges with pictures rather than numbers?

Ralph Osterhaut, the President of Tekna, and one of the truly innovative minds in the diving business, has speculated about the diver of the future in a two-part article for *Undercurrent*. Upon first examination Osterhaut's remarkable vision might seem to extend far beyond the year 2000. But then, one only needs to remember that less than 15 years ago divers were without automatic inflators, without decompression computers, without dry suits, without bottom timers. In the next 15 years, we may very well find that Osterhaut's future is indeed our reality.

Masks

Masks will become smaller and lighter: 6-10 oz. translucent silicone flanged with structural resin frames and instant strap locking mechanisms, allowing adjustment during a dive.

They will undergo a transition to ultra-compact 16-18 oz. full-face masks with instantly removable second stage regulators weighing only 4-6 oz. This will be necessary to eliminate jaw fatigue resulting from prolonged dives and greater distances traveled underwater when using self-propelled vehicles.

Next will come wireless diver-to-diver communications as an integral part of full face masks in the form

of an FM single side band transceiver with a microphone in the mask and an earphone in a disc-like unit attached to the head strap.

Small light headlights with krypton or xenon bulbs will be integrated into the mask, allowing 2-4 hours of white light wherever you look.

Fins

Plastic fins or ethylene vinyl acetate or polyethylene (characterized by their translucent white color) have swept the market, primarily because of their looks and reduced effort from their lighter weight (two lbs. per blade as opposed to three for the old black rubber ones). The next generation will be composite fins of translucent thermo plastic elastomer, stiffened with boron/graphite epoxy ribs. At 1-1.25 lbs./blade, they will be incredibly light weight, yet have the highest stiffness and strain-stored energy recovery of any material known. With the added convenience of heel straps and foot pockets that instantly adjust for length and width, the fin customizes to the user. Kicking effort is reduced by 40-50 percent.

Snorkels

Some self-draining snorkels work reasonably well, others are little more than a marketing prank.

The next trend will be toward low drag configurations including airfoil cross sections and collapsible designs to help the snorkel "disappear" when not needed.

Suits

Wetsuits are unlikely to see any significant change in the next five years. The biggest breakthrough has been the use of lycra, which is much more stretchy than nylon and allows greater freedom of movement. More important, its high surface lubricity makes it much easier to get on and off -- still the toughest part of diving.

The greater progress will come in dry suits with dramatically better thermal insulation and more mobility. Today, their principal drawback is the added weight required to neutralize the buoyancy of the air layer between suit and body, and their annoying tendency to allow the air to shift back and forth from the upper to lower extremities when one changes attitude underwater.

The solution will come by compartmentalizing the air throughout the suit; flexible weave fabric with ultra-low durometer urethane waterproof coatings that allow this. Body hugging designs will allow a high degree of freedom while remaining absolutely water tight.

The perfect fit in gloves and boots will come with

"ergonomically correct" shapes molded in one piece. With no seams to leak or irritate, they will afford the warmth and feel not duplicatable in sewn gloves and boots.

Tanks

Tanks will probably undergo the least changes. There is recurring talk of 4500 psi tanks to get more air, but that is unlikely. Aluminum dominates the tank market due to its immunity to rust, but it cannot hold the pressure by itself unless it is "filament wound," a process which drives up the price enormously. Moreover, the majority of dive shop compressors are designed for 3500 psi not 5000 psi (but this could be overcome by using an H.P. booster).

"The solution to the problem of getting more time underwater is not more air, but more efficient use of what we now have."

The solution to the problem of getting more time underwater is not more air, but more efficient use of what we now have. That will come by a combination of dive computers that monitor air consumption, more efficient fins, lower drag equipment and the use of self-propelled diver vehicles that eliminate kicking.

Regulators

The bulk, weight and greater effort of conventional regulators will give way to servo-assisted designs. Their breathing effort is typically 50 percent less and they do not get harder to breathe with depth.

The next major change might be in the form of fully self-adjusting tiny servo regulators that have synthetic ruby and sapphire combined with titanium nitrided valve mechanisms that never wear, corrode, or change in their performance characteristics and seldom if ever need service or replacement. Their inhalation and exhaust diaphragms will be of near inert fluorelastomeric compounds that are immune to deterioration. This new generation of regulators will have an inhalation effort of only 1" of water for their entire life!

Buoyancy Compensators

Today's BC's are reliable, colorful and relatively comfortable to wear. To rid the diver of excess straps and hoses, the designers have incorporated the shoulder straps and "over the shoulder buoyancy" into one. To get colors and cosmetics, the trend has been to two bag construction. But there are greater parts costs and much higher drag while swimming with a partially filled bag of water.

Ultimately, dual bags will give way to nearly indestructible single bag, glue-free, highly flexible thermoplastic elastomers. The buoyancy chambers will be modular and "snap-fit" in design, allowing dive stores to custom fit the chamber lengths and plumbing to the individual diver. The "Modular BC" will be cheaper and lighter, have lower drag and be more rugged.

"The big breakthrough will come with automatic depth control."

The big breakthrough will come with automatic depth control. Fully controlled by an 8-bit microcomputer, this automatic inflator/deflator device will allow the diver to hover at any depth by simply pressing a button on this chest mounted module. It will sense the water pressure and convert it to a control signal that maintains the depth setting by slightly inflating or deflating the buoyancy modules if the diver begins to rise or sink. This "smart" controller will never cause an ascent faster than 60 feet/minute or descent faster than 75 feet/minute. It could be manually overridden in an instant by pushing the depth controller lever up or down to a newly selected depth.

Vehicles

With the advent of low cost, high reliability diver

vehicles, the sport will make its biggest leap in over a decade. The added capacity to effortlessly go 3-5 times as fast, travel 10 times as far, and cut air consumption in half will change the role of the sport diver from one of being a temporary hydrospace intruder whose forays are measured in minutes, to one of an explorer who pilots his way through hydrospace for hours, charting the unexplored reefs, wrecks and caves.

There is no way to reduce respiratory work in regulators or kicking efforts in fins to match or even approach the reduction in air consumption by the work reduction an underwater vehicle affords. One might liken the difference in effort between running 10 miles, or riding on a motor scooter for 10 miles.

Not only will this new wave of vehicles be more efficient, they will be so quiet that they will be virtually undetectable. These undersea shuttles will spawn a new generation of instruments that permit expanded journeys, such as a pictographic representation of a battery showing the "level" of charge remaining and bit-mapped graphics that show the relative position and actual heading from the starting point. An artificial flight map will be a guide to a safe return; simply pushing a button will generate the proper heading for the fastest way home.

(Continued Next Issue.)

Decompression Sickness And Air Embolism

-- New Findings On Symptoms And Severity

During 1981 and 1982, 117 cases of sport diving accidents with neurologic injury received treatment with the help of the National Diving Accident Network (D.A.N.). Often, symptoms did not match classical descriptions. Many divers complained of paresthesias (e.g., tingling or itching) without weakness, or cerebral symptoms without loss of consciousness. Relevant diving history was often uneventful. We therefore reviewed the course of illness in these 117 recreational divers by having the divers and their physicians complete questionnaires to assess preincident physical factors, dive history and incident details, including immediate symptoms and signs, treatment and outcome after 30 days and 6 months.

Cases were classified as either neurologic decompression sickness or cerebral air embolism. The diagnosis of decompression sickness was made if symptoms implicated a particular spinal cord region, if the symptoms followed a characteristic progression, if they began after the diver surfaced, or if the

diver's time at depth exceeded the maximum allowed in the US Navy diving tables. Exposures of less than one-half the allowable time were considered to exclude decompression sickness. Cases had to meet three of the four criteria.

The diagnosis of cerebral air embolism was made if the first symptoms were primarily cerebral, if there was panic or breath-holding during ascent and if the symptoms were already present on completion of the dive. A negative dive history did not exclude air embolism, because an embolism can occur after any dive to a depth exceeding 3 feet if compressed air is breathed.

Since there is no method for scoring severity of these injuries, we used our own grading scale for severity of decompression sickness. We could not construct a scale for cerebral air embolism because of the variety of symptoms. Therefore, cases of embolism were classified as loss of consciousness requiring CPR, loss of consciousness that did not require CPR, or no loss of consciousness.

Results:

Of the 117 cases studied, 70 had neurologic decompression sickness, and 39 had cerebral air embolism. Eight were unidentifiable.

Presentation of neurologic decompression sickness. Decompression sickness most commonly caused a progressive sensory or motor loss of the limbs. Characteristically, symptoms began with a warm or prickly feeling, often followed by regional numbness and occasionally with weakness or paralysis of the affected limbs. Both subjective and objective sensory loss were classified as numbness. Symptoms usually spread from distal to proximal, and later regressed in a reverse pattern.

Paresthesias and numbness were the most common symptoms. Limb weakness was more common than paralysis. Dizziness, nausea, mild headache and loss of coordination were common nonspecific findings. There was no case of weakness alone, and none involved loss of consciousness.

The sensory and motor dysfunction involved arms and legs with equal frequency. Paralysis was the most severe disorder, with rapid onset and persistent deficit. Symptoms affected only one side of the body in half our cases.

Diffuse nonlocalizable pain was encountered in the progression from paralysis to numbness in two cases. When diffuse nonlocalizable pain occurred in a limb that was the site of other neurologic symptoms, we considered the pain neurologic in origin.

Only 19% of these cases started within 10 minutes of surfacing. Almost one-half occurred one hour or more after the dive, and 28% at least six hours after the dive.

Table 1. Neurologic decompression sickness severity scale

Sensory symptoms		
Grade		
1	Paresthesia	- single limb or area
2	Paresthesias	- multiple regions
3	Numbness	- single region or limb
4	Numbness	- two regions or limbs
5	Numbness	- three or more limbs
Motor symptoms		
Grade		
1	Weakness	- single limb or muscle group
2	Weakness	- multiple limbs or muscle groups
3	Paralysis	- single limb or muscle group
4	Paralysis	- two limbs
5	Paralysis	- three or more limbs
10	Total possible score	

Typical case of mild decompression sickness. A 46-year-old woman, an experienced diver, surfaced after an uneventful dive to 110 feet for 27 minutes, conservatively decompressing for 13 minutes at 10 feet (only 7 minutes normally required). On climbing into the boat about 10 minutes after the dive, her right foot felt hot, then tingly (as if it were going to

sleep); the limb became progressively numb from foot to thigh over 20 minutes while the left leg also became warm and tingly, and she had low back pain. Reaching the shore after 30 minutes, she could not walk. She recovered sensation and strength while breathing pure oxygen for 60 minutes. For several days, her left leg felt strange, and there was some loss of feeling in the left foot, but she felt normal after one week.

Table 2. Neurologic symptoms in sport divers

	Decompression sickness (70 cases)	Cerebral air embolism (39 cases)
Progressive onset of:		
Limb paresthesias	24	
Neurogenic limb pain	6	
Limb numbness	39	1
Limb weakness	16	2
Limb paralysis	8	
Vertigo	2	2
Nausea	12	6
Dizziness	7	4
Ataxia	4	3
Mild headache	6	1
Severe headache		9
Blurred vision	2	3
Sudden acute onset of:		
Limb paresthesia		1
Limb numbness		8
Limb weakness		2
Limb paralysis		9
Loss of consciousness		16
Aphasia or dysarthria		6
Cranial nerve symptoms		4
Stupor		3
Blindness or visual loss		4
Diplopia		2
Seizures		3

Presentation of cerebral air embolism: In 41% of the incidents, patients with cerebral air embolism presented with unconsciousness, which almost always occurred within minutes of surfacing. Cognitive dysfunction was predominant, but occasionally sensory and motor dysfunction also occurred. Sensory or motor symptoms began suddenly, usually with anesthesia or paralysis. Severe headache was common, often accompanied by nausea and starting minutes or hours after the dive.

Sixty-nine percent of the patients with cerebral air embolism had symptoms upon surfacing from the dive, and 91% had symptoms within 10 minutes. Rarely, symptoms began as much as 12 hours after the dive.

Typical case of mild cerebral air embolism: A 43-year-old man, an experienced diver, surfaced from a 120-foot, 5-minute dive slightly faster than usual to avoid being carried by the current. About 10 minutes after surfacing, he experienced chest pain, slurred speech and difficulty "making words come out," but no loss in ability to think clearly. He also

became light-headed. His gait was unsteady, but there was no leg weakness. Symptoms resolved after he breathed 100% oxygen for 45 minutes on a Coast Guard vessel. He had only slowed mentation on examination within 2 hours.

Four divers in this study were adolescents; most were between ages 20 and 40, and eight were age 50 or older. Eighty-four were men and twenty-six were women, roughly the proportion of men and women enrolled in sport-diving courses. Most who suffered from decompression sickness were frequent divers; air embolism tended to effect less active divers. Almost all had taken basic sport-diving training courses. Fourteen had taken advanced courses, and seven were scuba instructors.

In decompression sickness, 22 patients gave histories of dives that exceeded accepted safety standards (US Navy diving tables), but 42 gave histories of dives that met these standards. In air embolism, 6 cases occurred in training; 10 other cases had determinable causes, but 18 cases (53%) occurred after apparently acceptable and reasonable dives. The most severe injuries occurred during or shortly after training.

Table 3. Symptom onset time after dive

	Decompression sickness	Cerebral air embolism
On surfacing from dive	0	27
Surfacing to 10 minutes	12	5
11 to 30 minutes	14	2
31 to 60 minutes	5	1
61 minutes to 6 hours	13	1
6 to 24 hours	15	1
Over 24 hours	2	0
Unknown or unclear	9	2
Total	70	39

Treatment: The primary treatment of decompression sickness and air embolism is recompression therapy. The outcome of mild decompression sickness, rated as less than 3/10 on our severity scale, was generally excellent, whether divers were treated or not. With a severity rating of 4 to 6, 14 of 16 cases were treated, and 4 of these had residual deficits for up to 1 month. With scores of 7 to 10, therapy was seldom successful, and residual symptoms were commonly present at 6 months. Symptoms improved for 4 to 6 months after the episode. In one atypical case with a score of 9, there was spontaneous and complete symptom regression. Residual symptoms included limb weakness, sensory loss, emotional instability and irritability. The average delay between onset of symptoms of decompression sickness and recompression treatment was 30 hours. The shortest treatment delay, of 4 hours, occurred when the diver was in the immediate vicinity of a recompression facility.

Of the 39 individuals with cerebral air embolism, 8

lost consciousness immediately and required CPR. Five of them died and one had persistent cognitive impairment. Of eight patients who lost consciousness but did not require CPR, none died, but three had residual deficits. Twenty-three remaining cases with no loss of consciousness all resolved without residual symptoms. In eight of them, symptoms improved rapidly and the patients declined treatment. The average treatment delay among the other 31 cases of air embolism was 12 hours.

Table 4. Diving frequency in divers with neurologic symptoms

Dives per year	Decompression sickness	Cerebral air embolism
Under 10	6	17
10 to 50	29	3
Over 50	18	3
Unknown	17	16
Total	70	39

Discussion

Textbooks on diving medicine describe injuries from early studies of severe cases. When scuba first became popular, severe injuries occurred in untrained divers who pioneered diving as a sport. Emphasis on severity has been continued by the annual publication of fatality statistics of scuba divers. Reports from recompression chambers are also biased because only patients with severe injuries travel to a recompression chamber.

We encountered many less severely injured subjects. Diagnosis was often delayed because symptoms did not fit the classic picture of major neurologic dysfunction or loss of consciousness on surfacing. Both the divers and their physicians ignored mild symptoms because of the expectation that neurologic loss from diving injuries should be severe.

The most common presenting symptoms in our subjects with decompression sickness were paresthesias and sensory loss. Weakness was less common and paralysis was rare. Decompression sickness was not fatal.

Table 5. Causes of air embolism in sport divers

Errors during training	6
Running out of air during dive	4
Breathing equipment malfunction	2
Panic due to diver inexperience	2
Medical predisposition	1
Carelessness	1
No identifiable cause	18
Inadequate data to assess cause	5
Total	39

Diver Survey: 60% Got Into Trouble

A study of scuba diving practices and accidents conducted during 1982-1983 was recently released by Daniel Duran, assistant professor, Department of Health, Education and Recreation, Penn State University. Duran analyzed questionnaires of some 343 respondents (618 divers received questionnaires) from New York, New Jersey, Pennsylvania, Delaware, Maryland and Virginia.

Duran found that a remarkably high percentage of divers -- 60% -- needed assistance at least once during the previous three years, while 18% required assistance more than once.

Assistance ranged from a swimming tow, release of entanglement, equipment failure and rescue from high seas. Several divers experienced difficulty with being thrown against rocks and from rough surf. Human error, lack of conditioning and improper maintenance of equipment were significant factors attributing to the divers requiring assistance.

Eighty percent of the divers indicated that another diver in their group needed assistance at least once in the past year. From this data, Duran concluded that a diver will require assistance in one out of four dives.

Six percent of the sample required medical aid as a direct result from a dive. Specific medical problems encountered were: pneumothorax, ear and sinus barotrauma, excessive nitrogen supply in the blood stream and carbonmonoxide contamination.

The divers represented seemed quite typical of the diving population, ranging from 16 to 49 years old, with a mean of 26 years. Their diving experience varied, but the mean was four years, with an average of four dives each year. Of the dives, 97% were completed in the ocean; 15% of the divers carried a reserve scuba system while 6% used an octopus.

Duran found three major contributors to the need for assistance:

Poor diver preparation: diving classes failed to prepare the diver for basic situations that arise while diving. Underwater communication, conditioning and the controversial "buddy system" need vast improvement in instructional programs.

Poor equipment condition: A considerable number of divers failed to maintain their equipment in good condition.

Equipment design: Diving equipment is cumbersome and not always a panacea for the rigors of the sport. Divers must know the limitations of their own equipment and that of their partners. Each diver should be aware of his partner's equipment and release mechanisms.

Cerebral air embolism most commonly presented with cognitive symptoms; consciousness was lost in only 41% of patients with cerebral air embolism. The five deaths occurred in divers who lost consciousness while they were still in the water after surfacing.

Dive-related causes of accidents were often inapparent. Although negligent diving certainly leads to injury, the average injured sport diver in our study had been diving responsibly. More divers with decompression sickness were following accepted safety standards than were breaking them, although a tendency to report a milder diving exposure was occasionally observed. Some cases of decompression sickness followed dives that lasted less than one-half the allowable time. One case occurred after a prolonged dive to only 20 feet, a depth considered so safe that there is no time limit. This does not imply that diving tables are "unsafe." It is more likely that no amount of caution can completely eliminate the recognized small risk of occasional decompression injuries.

Similarly, in over one-half the cases of cerebral air embolism, the dive history was innocent. Air embolism tended to occur more often in people who

dove less frequently. As in fatality studies, the most severe air embolisms occurred in inexperienced divers. Divers who were being trained were also a high-risk group. It would therefore be important to train scuba instructors and assistants in CPR.

The milder symptoms and common lack of diver error as a cause of injury contrasted to traditional teaching, probably because diver training programs have expanded so rapidly. These programs have aimed at reducing diving injuries from negligent or unsafe practices. Lack of training or unsafe dive practices were only a minor cause of injury in our study. When there was departure from safe diving techniques, the injury was more severe, resembling those reported in earlier studies. A dive-related injury should not be dismissed after an apparently safe dive.

Treatment of both decompression sickness and cerebral air embolism has centered on recompression therapy, which is successful in acute circumstances. In sport diving, we found that long delays in obtaining recompression therapy were unavoidable and probably responsible for the poor outcome in divers with severe (scores of 7 to 10) decompression sickness. Delayed recompression therapy may still be

Table 6. Treatment outcome in individuals with decompression sickness

Severity grade	Treatment	None	Residual symptoms	
			At 1 month	At 6 months
1-3	Recompression	24	0	0
	No recompression	10	1	1
4-6	Recompression	10	4	0
	No recompression	1	0	1
7-10	Recompression	1	1	4
	No recompression	1	0	1

beneficial. The 10 cases of spontaneous resolution in our mild (scores of 1 to 3) decompression sickness group do not indicate that therapy is not needed for mild symptoms. Many cases with mild symptoms may resolve promptly with recompression therapy. However, we found that untreated injuries, with only paresthesias and no worsening for 12 hours or more,

often resolved within 3 weeks if there was no further provocation such as diving or flying. Symptoms of cerebral air embolism also sometimes improved in the acute phase, but only rarely if symptoms had been present for more than 2 hours.

Although no controlled studies have been done to examine the benefit of early breathing of 100% oxygen in these injuries, we observed prompt improvement in the few cases when injured divers breathed oxygen immediately after onset of neurologic symptoms from either decompression sickness or air embolism. The role of early oxygen breathing deserves emphasis and further study.

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FREEFLOW

Divers don't learn. Last year off the coast of Northern California one diver was killed by a great white and another was maimed. Nonetheless, thrill seekers ignore their possible presence and continue to dive in low visibility water (down to 10 or 15 feet at times) in the great whites' homeland. So far in 1985 there have been no deaths, but Marin County resident, Rolf Ridge, went face-to-face with what he claims was a 12 footer in early October. "I had my speargun looking for rockfish," he said, then saw lots of perch. I came up for air, then dove back to the same spot. That's when I got nudged hard, right in the rump." He turned around and looked right into a giant mouth and rows of deadly teeth. The white, after a taste of the metal of the spear gun, swam off.

"Meet the Underwater Assassin," so read the head of the most tasteless ad we've seen in scuba magazines in a long, long time. The ad directed toward retailers and placed in the NASDS Diving Retailer, goes on: "It's designed to travel in its secret traveling kit. It will kill silently and skillfully with four different killing tips. Pick the death head that you feel will do the best job on the victim. The Assassin can be used in a combination of lengths. Sell them to your killing customers and let them enjoy a great fish dinner." Such advertisements demonstrate perfectly what happens when you link an amateur company with an amateur copy writer. They produced embarrassing copy, with a highly resolved stench. They, themselves, having caught a whiff of their work, tried to bail out with this concluding sentence: "If this ad offends you, try selling a camera with this margin of profit." Thank you. We will do just that.

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