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THE FIRST U.S. SCUBA TRAINING

by

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Abstract

In 1949 information applicable to understanding SCUBA equipment, SCUBA diving physiology, field applications using SCUBA, appropriate safety procedures, and training standards was sparse or non-existent. The infrastructure that has evolved since the introduction of SCUBA to the U. S. now includes professional instructors and diver certification to validate levels of competence, fully equipped dive stores offering equipment, safe air supplies, services and training. To fill a key infrastructure void the first U.S. SCUBA training syllabus and formal training was developed and evaluated at the Scripps Institution of Oceanography in 1950. Its content was created from scratch by volunteers and the training program content included a lot of intuition, good judgement and experimentation. In retrospect it is gratifying to find that the U.S. SCUBA training continues to utilize the basics developed for the first syllabus and that millions of divers continue to be trained and certified by the SCUBA diving community--a unique accomplishment.

When I offered to present this paper I did not consider that it might be the first time that it has been given in this much detail and more importantly that it likely will be the last. Confirmation of my recall was substantiated by historical information contained in the valuable Archives of the Scripps Institution of Oceanography Library. I, along with Conrad (Connie) Linbaugh, were the first to establish a formal SCUBA training course and to train scientists to use SCUBA for research, both basic and applied. Unfortunately Connie died just ten short years after we started diving together in 1950. That leaves me as the U.S. scientist with the longest use SCUBA for science. Making such a strong statement will likely bring out a refutation. Perhaps surprisingly, I hope that might occur. It is indicative of how weak our documentation of the early days of SCUBA diving depends on the memories of those that hit the water over four decades ago. I will gladly yield to anyone that can convince me that the situation was different than that reported herein. After forty-four years I have likely locked in on some facts that are now what I remember; not what someone else might remember. With this caveat I will proceed to document here how I remember the first U.S. SCUBA training effort. There is no doubt that it was at the Scripps Institution of Oceanography. A testimonial that it was a good training course has been its adoption by virtually all modern SCUBA diver training programs. Their success and the success of SCUBA training to minimize injury or fatalities has given me great satisfaction. Finally, at 69 and after forty five years of SCUBA diving, this might be my last contributed paper on this subject

An overview of what it was like during the period of genesis of SCUBA diving and SCUBA training in the U.S. is not unlike attempting to describe in a few paragraphs what it must have been like when the first automobiles were introduced. Who knew anything about these new contraptions and more importantly how to operate them. Where could one conveniently buy gasoline, oil and other replenishment and services. Driving etiquette and the essential rules of the road had to be established. What was it like to bootstrap SCUBA through its infancy; not any easy task, but fun. A few of us are still around that recall the start for SCUBA in the U.S. and enjoy telling sea stories about how it was in the beginning.

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Actually, I was not present for the beginning of diving for science at the Scripps Institution of Oceanography (SIO); although some claim I am old enough to have been there. Frank Haymaker was hard hat diving for Dr. Francis Shepherd when I arrive at SIO, January 1947. His classic U. S. Navy equipment was lost to the bottom of the sea when the SIO war surplus U. S. Navy Utility Boat turned broke loose from its anchor in a storm sea and sank off La Jolla. I was to have taken my first hard hat diving lesson from Haymaker on that fateful day! I never donned that type of equipment, even in its modern form. Haymaker's diving for science terminated with the loss of his equipment. In the fall of 1947 I transferred to UCLA for the formal course work required of a Ph.D. candidate.

In the spring of 1950 Conrad "Connie" Limbaugh and I transferred, as graduate students, to SIO from UCLA with two Aqua-Lung regulators, one triple tank unit and one single tank. They were the third and fourth regulators sold in the U.S. (units one and two were purchased by brothers in New York, NY) and ours were purchased from Rene Bussoz's, Westwood sporting goods store using funds by Professor Dr. Boyd Walker UCLA Zoology Department. Regretfully those first two regulators and their tanks have been lost. At the time no owner's manual or any other kind of instructions accompanied these items. We were on our own to experience entering the ocean with these novel self-contained air supply packages. Clearing your ears, clearing a flooded face plate, clearing the mouthpiece, finding a need for a weight belt and learning to swim primarily with fins rather than arms and fins were all new. Adding clothing and skin coatings were soon sought to ward off the cold of La Jolla waters. We adapted to SCUBA and its use quickly and fortunately without any serious accidents; there were "close calls" and these we conveniently called experiences to ward off any curtailment of our activities by higher authority.

The real start of using SCUBA for science began at SIO in the summer of 1950 when Connie Limbaugh and I, as graduate students, began formal investigations of the kelp beds and general exploration into the submarine canyons. The term scientific diving had not been coined yet, nor had the acronym SCUBA. Funding support for the kelp bed surveys came from the Kelco Company who had concern for the health and well being of the Southern California kelp beds as a harvestable resource.

Connie was a bachelor, with little money, and frequently used his car for sleeping and housing for six week stretches. As an alternative to a cold car he slept on the open beach just north of the Beach and Tennis Club until he found more permanent quarters at Wind-n-Sea which he shared with a couple of SIO research ship technicians. I was married, with little money, and had to find a place to live for wife Martha and son David. We, along with other Scripps graduate students, luckily found accommodations in the surplus Camp Callan WWII housing complex that remained after WWII. At Scripps our diving equipment list was limited to two sets: two regulators, two tanks, weight belt, fins and facemask, (no wet suits because they hadn't been invented yet!).

Lacking any sea going conveyance we loaded our equipment into Connie's Kaiser automobile and headed for a beach entry in the green clunker. The summer diving of 1950 gave us a new insight to the underwater world of Southern California. Converting our recognition of preserved fish specimens to identifying the living animal was challenging. Like bird watching we soon learned that certain species are associated certain distinct habitats, that their swimming motions and behavior were unique to each, and that rare species were often common when you enter their habit. Older collecting and observation techniques were so deficient common species were listed in the textbooks as rare. What a joy to add new knowledge about some many topics. It was easy to make new discoveries; putting it down for publication was a much more onerous task for we wanted to be in the field underwater and not in our graduate student cubicles. Using five tine frog spears we augmented our diet of horse meat filets from a local pet store with speared fish. Abalone were easily found and wrested from their rocky lairs with a large screw driver. The screw driver was used extensively before "diving" knives purchased from

military surplus stores became popular. Other tools for collecting specimens remained to be developed or adapted; mostly from items we found in war surplus stores.

To better understand our equipment, our diving procedures, and improving our time underwater we were constantly seeking advice and leads to equipment that could be added to our meager dive locker. We sorely needed a more readily available supply of breathable air. All of our air had to come from Los Angeles in 160 cu.ft. tanks. We had but six of these tanks. They were purchased to ensure that we would have containers. All others were being converted to other gases as there was an inadequate market for compressed air. When our tanks were empty they had to be shipped to Los Angeles for filling. For a week or more we were without an air supply to replenish our SCUBA tanks. This was a great inconvenience. The ocean water off La Jolla is cold much of the year and particularly below the thermocline where we frequently ventured. To combat the discomfort and energy sapping we sought cold protection by trying various kinds of clothing (long johns), greasy skin coatings, and surplus Air Force survival suits (similar to early foam rubber wet suits). Some years later we were glad to be among the first to welcome the advent of the Hugh Bradner/Stuart Mackay, DevelCo foam rubber wet suit.

DIVING PROTOCOL AND DIVING OPERATIONS INFRASTRUCTURE

The original SIO SCUBA diver list included only Connie and myself. (Yes, Jim Stewart was not an "official" part of the SIO team in the very beginning. He was hanging around and soon became the well known and highly respected SIO Diving Supervisor). To help other graduate students, staff and faculty become acquainted with scuba we recognized that our time and talent would be diverted away from graduate studies. However, we were so impressed with the potential of scientific diving and knew from our limited experiences that it would mean opening new horizons for discoveries in each of the oceanographic disciplines. We decided to make our time and talent available to them at no cost! Thus the first U.S. SCUBA diver training was initiated and was carried out at no cost for the first couple of years. We faced limitations in facilities and know how; particularly how to successfully train others. Undaunted we proceeded to incrementally develop the content of a training program that has proved to be on target and long lived.

First there was the facilities and equipment problem:

- No air compressor or local supply-six 160 cubic foot storage tanks.
- No dedicated dive boat.
- No regulator maintenance and repair manuals-- Jim Snodgrass, Frank Hetzel and Roy Pruitt, Advanced

Developments department dismantled our cherished regulators, developed a repair manual and gave us hand made tools for assembling and disassembling them.

- No diving instructions manual or diving protocol.
- To this equipment list we added bastardized regulators, surplus tanks, surplus life vests for retrieving fish;

not divers, weight belts, long johns, collecting devices.

• No wet suits until Drs. Hugh Bradner & Stuart Mackay. To stay warm we tried a spectrum of ideas, most of which were unsuccessful; like vaseline as a cold protection layer.

- No dive shops or campus dive locker--Connie's cubicle in Scripps Building.
- No Diving Officer and no one fully qualified for the position.
- No SIO Dive Committee.
- No dive log. Dr. Carl Hubbs' scientific record log form served as the format for our first dive log.
- No training syllabus or staff.

- No SCUBA diving clubs.

Second was the problem of no ready reference documents or SCUBA experienced personnel. Connie and I "volunteered" our time and talent to train others in our newly found means to conduct scientific research inside the environment that was essentially alien to earlier oceanographers. From our field experience and training program we assembled the facts and methods that lead to the development of a training course syllabus and hands-on training.

We began the training process by applying common sense. Did the candidate appear physically healthy, could the individual swim around the 1000 foot long Scripps pier. Later we added a very touchy and subject means to evaluate each persons psychological aptitude for diving. We negotiated with the La Jolla Beach & Tennis Club to use their swimming pool early in the morning before their regular members were interested in using it. We started by a short briefing about the equipment and what it would feel like to breath underwater. Gearing up the students at pool side followed within minutes. First we had them sit on the pool steps and then slowly lower themselves underwater. Later we began removing and replacing the mouth piece underwater. The early regulators had no check valve in the mouth piece so clearing procedures were found by the instructors and the techniques passed onto the students. Accidental underwater loss of a face plate appeared to be a good possibility. Again we instructors removed our face plate underwater, learned to breath without holding our nose, replacing the flooded face plate and established how to clear a face plate that was not equipped with a nonreturn valve (none had this feature at the time). As confidence was building we started the procedure of donning the gear underwater. The gear was placed on the bottom of the pool so that a free dive was required to reach the equipment. Later this confidence builder was taken to deeper water adjacent to the pier. Water entry methods were developed by trial and error by instructors and students. Some students did not return after the first exposure so we assume they were uncomfortable and chose to eliminate themselves from scuba diving.

With the above experience Connie and I then drafted the first SIO training procedures, operation and safety rules. Some of the greats we certified were Bev Morgan, Al Tillman, Mel Fisher, Bill and Bob Meistrell, Dr. Robert Dill, Dr. Edwin Hamilton, Dr. Robert Dietz, and others at the Naval Electronics Laboratory. The development of a refined syllabus and rules for prudent diving progressively got better as Connie and I found time to jot down what worked well and what didn't. No all of our subjects passed even under such loose formal training. One student was turned down for "psychological" reasons. We were not sure just what was wrong with the student or exactly what we meant by psychological unstable. He did not exhibit good SCUBA skills and displayed characteristics that prompted both of us to declare that we would not wish to dive with him as a buddy. Connie took on the responsibility of informing the student that he would not be certified. His reaction was a threat to kill Connie. That clinched our decision that he should not be certified.

- No certification standards or restrictions existed against SCUBA at SIO until the loss of a UC Berkeley student brought changes by the University officialdom.
- There were no restrictions either on the use of SCUBA to spearfish or harvest abalone and lobster until the a local, but oldest in the nation, skin diving club aided in getting state legislated restrictions on the use of SCUBA for taking lobsters and abalone. Logic prevailed and it was rescinded later.
- No science procedures or scientific tools. Early tools included screw drivers, five tine frog spear, bottles and handnets, net bags and soon quantitative mensuration devices were developed.
- No equipment or guidelines for underwater photography. NO camera housings; housings for 16mm and 35 mm motion picture and still cameras were one of a kind home built units of plexiglass, fiberglass and aluminum castings. Underwater correction lenses, light compensation filters, and exposure values had not been developed or tested.
- No Skin Diver or any other magazine devoted to skin and SCUBA diving.

- Little faculty support, Carl Hubbs, at the advanced age of 55 made but a single dive with us, but was an avid, 5swimmer, and supported us in our SCUBA diving program. At that time \$500 was required to outfit a student diver. Mrs. Hubbs frequently complained about the strain on her husbands' budget.

- No U. S. Navy experience with SCUBA. U.S. Navy sub tender decompression chamber was used to test divers and to develop protocols for handling civilian SCUBA divers with bends or embolisms.

- No dive tables for SCUBA. Repetitive dive tables were generated for SCUBA by the U.S. Navy as the technique was being slowly adapted by that agency.

- Competent diving medicine physicians for conducting physical examinations, emergency treatment and therapy were scarce

THE ORIGINAL ORGANIZED U.S. SCUBA TRAINING PROGRAM CONTENT

- Physical Examination
 - Medical physician examination
 - Decompression Chamber Dive
- Swimming Test
 - Pool, laps
 - Underwater lap
 - Open-Water around the pier
 - Water treading
- Classroom
 - Rudiments of Diving Physics
 - Rudiments on Equipment Operation and Maintenance
- Pool and Open-Water Training
 - Equalization of air spaces
 - Mask clearing and equalization
 - Snorkel clearing
 - Air supply interruption
 - Proper use of weight belt
 - Water entries and surface dives
 - Underwater donning of mask, snorkel, and fins
 - Buddy breathing
 - Rescue carries
 - Ascent procedures
 - Hazardous marine life
 - Environmental hazards
 - Underwater hand signals
 - Underwater navigation
 - Safe ascent
 - Balancing buoyancy

It is gratifying to note that on audit of present day training manuals that the above training content has not changed

significantly since our "SCUBA basics" course was initiated in the early fifties.

SCIENTIFIC DIVER TRAINING RESULTS

Scientific results began to emerge with "eye opening" discoveries that had remain elusive to surface dependent data acquisition techniques. Alice's magic mirror had been penetrated and a new world of discovery was available to the scientific disciplines that make up oceanography.

Examples:

- Scripps divers took advantage of every opportunity to visit a new site; shallow, deep, midwater, bay, shore, island, and inland.
- Many species considered to be rare were found by us to be common, solely because they were located in areas where classical collecting techniques rendered them safe from collectors. Learning to recognize living fishes was a new experience for all of us.
- A new species of butterfly fish, Chaetodon falcifer, was speared by me at a depth of 100 feet at Guadalupe Island, Mexico during a collecting trip. Jim Stewart was a part of the dive team. This species was named the scythe butterfly and has been adopted as the SIO Aquarium logo.
- Dike Rock north of the Scripps Institution pier was our first source of larval forms, lobsters, etc.
- Kelp beds were a key scientific study area for the first five years.
- Sand areas. Recovery of Indian artifacts, primarily from the surf zone in front of the Beach and Tennis Club, began a coast wide underwater search for stone metates, mortars, net weights and few monos. One metate was recovered from 80 feet on a canyon ledge and one granite bowl was recovered from 100 feet off Pt. La Jolla.
- Submarine canyon processes were studied by Limbaugh, Dill, Murray, Rechnitzer, Fleming, and others to support the efforts of Shepherd and Inman.
- Islands, Coronados, Guadalupe, Catalina, Gulf of California were explored and new ranges were established for a number of vertebrate and invertebrate species, as well as algae. Extended ranges, discovered new species, opened the way for shallow water ecology. Fager said "You can't be a marine ecologist unless you can SCUBA dive." Scientifically things were moving fast and our cup was full exploring, collecting, and enjoying the then pristine coastal diving. We lectured widely and displayed our underwater slides and movies to groups large and small.

Epilogue

From those genesis years has developed a major commercial field and a well established infrastructure that extends to the far reaches of the earth. How convenient it is to find competent personnel and well equipped dive facilities beckoning for customers throughout the world. We were privileged to be among the very first and to see the fruits of our volunteered labor having such a universal impact is most satisfying. Fortunately, there appear to remain more diving days ahead for this author.

After more than 40 years of diving I was instantly carried back to those meager beginnings at SIO. I went to Siberia in 1989 to conduct a series of scientific SCUBA dives. There I was proudly escorted into the U.S.S.R. Academy of Sciences, Limnological Institute, Lake Baikal, diving locker. The equipment and facilities were reminiscent of what we had first assembled to support us in the early 1950s! The two hose regulators were handmade copies of the Aqua-Lung! The CEDAM INTERNATIONAL scientific dive team from the U.S. came well equipped with new a new air compressor, tanks, regulators and other gear that was present to the Institute at the end of our dive program. Interesting too they do not normally practice

the buddy system, but employ tether lines from a surface tender to each diver. As they dive under the lake ice cover and in near freezing water they are reluctant to give up this successful signal and recovery system.

It is gratifying to see how much scientific SCUBA diving has contributed to our knowledge of the sea, lakes, and rivers, and that it is now a widely accepted tool for scientists world wide. Furthermore, SCUBA diver training can be credited with:

- Making scientific diving important to many scientific disciplines
- Ensuring that training and certification remains within the community and sustains an enviable diving safety record
- National and international diver certification organizations
- Diving equipment manufacturing industry growth
- Communication media, exhibitions and conferences
- Major tourist and recreational industry
- Strong environmental preservation code of ethics

I take ~~personal satisfaction~~ when I read that the early training procedures and protocols we implemented for the first time at the Scripps Institution of Oceanography have been sustained, with minor changes and albeit improvements, to provide millions of certifications from within our own community and not a public bureaucracy. SCUBA diving training organizations have taken over the training of all who wish to dive. I am grateful too that Connie and I were followed by Jim Stewart and the national and international cadre of scientists that have added SCUBA to their research capabilities. Leaving a legacy from one's efforts is worth more than money.

Clearly there is more to the story of the first U.S. SCUBA training than what has been presented above. Eric Hanauer, Zale Perry and Al Tillman, Ed Cargile, and others are setting into print some the experiences of the pioneers in our field. Earlier books and publications are references worth seeking out for tidbits of lore of how it was in the beginning in the U.S., Europe and elsewhere. This paper seeks to whet the appetite to locate seek more from those still living and the literature of yore. The evolution of diving gear needs to be available in the form of museum exhibits. Many of us have some of the original hardware that will likely be lost unless it finds its way to a permanent repository for preservation and display. In addition, the history of SCUBA diving is presently available in the memory banks of the early SCUBA divers. Their remaining time to relate what they remember is waning as memories fail and father time takes his toll.

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