

## SAFE LIMITS: AN INTERNATIONAL DIVE SYMPOSIUM

[Continued from SPUMS J 1995; 25 (3): pages 153-179]

### AN ASSESSMENT OF RISK FOR RECREATIONAL DIVE INSTRUCTORS AT WORK

Drew Richardson

At PADI, diving accident and fatality reports are closely monitored. This information is collected from accident reports submitted by members for any injury they either witness or are involved in. An association standard requiring this type of reporting is also written into the warranties of professional liability insurance coverage. For these reasons we are able to measure with a reasonable degree of confidence, occupational injuries and incidents for PADI Members. The data in this report represent those accidents collected by PADI that involve injury to a PADI Member experienced while at work. "At work" is defined as activities in and around the training and supervision of divers including both in-water and out-of-water activities. This paper does not include injury experienced by PADI Members outside of the workplace environment (i.e. pleasure diving, etc.)

Over the years, scuba diving has experienced an improvement in its safety record as reflected in Table 1, published by the Divers Alert Network. In comparison with other activities, scuba diving is relatively safe as indicated in Tables 2.1 and 2.2. Dive instructors are producing well-trained, safety conscious divers.

However, what of the professional dive instructor and guide in and around the work place? Occupationally, we face greater exposures than recreational divers at large. We dive with greater frequency, in varying conditions and circumstances while performing specialised tasks, such as

TABLE 2.1

### OCCURENCE OF INJURIES IN VARIOUS SPORTS

Sport	Number of participants	Reported injuries	Incidence (%)
US football	14,700,000	319,157	2.17
Baseball	15,400,000	321,806	2.09
Basketball	26,200,000	486,920	1.86
Soccer	11,200,000	101,946	0.91
Volleyball	25,100,000	92,961	0.37
Waterskiing	10,800,000	21,499	0.2
Racquetball	8,200,000	13,795	0.17
Tennis	18,800,000	22,507	0.12
Swimming	70,500,000	65,757	0.09
Bowling	40,800,000	17,351	0.04
Scuba	2,600,000	1,044	0.04

*Source. Accident Facts, 1991 Edition: National Safety Council. Numbers represent individuals who participated in the sport more than once during the year and injury represents someone who was treated in an emergency room of an accident relating to the sport or involving sporting equipment. The scuba numbers reflect reports collected by the Divers Alert Network.*

multiple ascent training. It is important to recognise that there may be increased risk to the instructor when performing his job. The purpose of this paper is to put these risks in perspective by reporting the actual accidents that professionals at work have experienced during a period extending from January 1989 to December 1993 within the PADI membership.

TABLE 1

### ESTIMATED DIVING FATALITY RATES 1976 AND 1986-1991

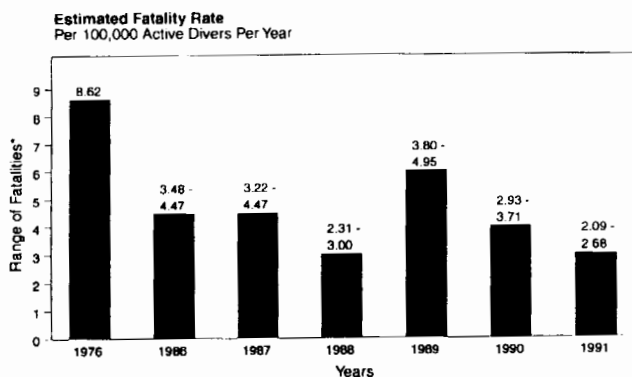
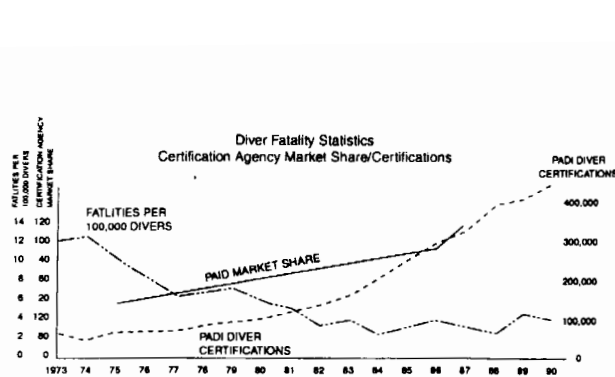


TABLE 2.2

### DIVER FATALITY STATISTICS, PADI MARKET SHARE AND CERTIFICATIONS 1973-1990



### General working conditions for scuba instructors

Instructors of amateur recreational scuba divers are a distinct group with specialised systems and procedures. Generally, this group's diving operation at work can be categorised as falling into three areas:

- 1 Performed solely for instructional or educational purposes or diving tours,
- 2 using open circuit, compressed air scuba, and,
- 3 conducted within the time and depth limits of no stage decompression air diving, generally less than 30 metres deep.

The working conditions of other groups of divers at work, such as commercial divers, differ widely from those of instructors of amateur recreational scuba divers and therefore, are not comparable. The latter do not use surface supplied equipment or mixed gases, do not engage in diving requiring stage decompression, bells or saturation techniques, do not use or handle construction tools, explosives, burning or welding equipment or perform under heavy workloads. They do not engage in situations exposed to adverse sea conditions or otherwise less than optimal working conditions. The scuba diving instructor may be an employee or independent operator. He is student oriented, diver oriented and training oriented, not task oriented.

The dive site is not generally determined by the location of a particular job as it is in commercial diving, where operations must be conducted under environmental conditions that are often adverse.

The scuba instructor, by contrast, selects a location which is relatively shallow and conducive to training diving students. The scuba instructor is free to use personal judgement and professional expertise in choosing a workplace free from recognised hazards in evaluating any natural or artificial body of water. Scuba instructors also have the ability to discontinue the dive at any point.

PADI Instructors follow well-published codes of practice and guidelines. These divers at work consult the various training standards compendium of the affiliated organization for guidelines and standards. These materials help govern the appropriate choice of the diving site and important measures at the site for safe diving, and have been developed over the last few decades.

### PADI membership and activity for 1989-1994

Table 3 outlines the total number of PADI Members by year. PADI members are divemasters, assistant instructors and instructors. The growth in this community went from 27,543 in 1989 to 55,387 individuals in 1993 operating in more than 170 countries throughout the world.

**TABLE 3**

#### PADI MEMBERSHIP BY YEAR WORLDWIDE 1989-1993

Year	Members
1989	27,543
1990	35,138
1991	44,252
1992	55,435
1993	55,387

**TABLE 4**

#### PADI CERTIFICATION ISSUED BY YEAR AND LEVEL WORLDWIDE 1989-1993

	Entry/OWD	Other	All
<b>1989</b>	276,065	121,663	<b>397,728</b>
<b>1990</b>	304,352	127,282	<b>431,634</b>
<b>1991</b>	319,708	146,190	<b>465,898</b>
<b>1992</b>	351,443	160,655	<b>512,098</b>
<b>1993</b>	384,039	179,033	<b>563,072</b>

OWD = Open Water Diver

During this period, PADI Members have conducted training and certified thousands of individuals as reflected in Table 4.

It is difficult to determine the exact number of hours at work or occupational diving exposures for PADI professionals for the period. However, it is reasonable to estimate the number of hours at work during this period at several million.

For example, the number of hours at work may be estimated as follows for each level:

1993 Open Water Diver certifications were 384,039 individuals. To estimate hours at work, first estimate the number of classes conducted. To do this, we must estimate what the average class size is. For this example we have chosen six people per class.

The total number of certifications issued by level divided by the estimated average class size equals the estimated number of classes conducted.

We then take this number and multiply it by the minimum time required to conduct this course by standards as follows:

Estimated number of classes conducted x required minimum course hours equals the estimated hours at work spent by PADI Members for this level of training

In 1993, approximately how much time were PADI members at work training Open Water Divers?

384,039 certifications divided by 6 divers/class = 64,007 PADI Open Water Diver classes conducted in 1993.

64,007 classes estimated x 31 required course hours = 1,984,201.5 estimated hours at work for PADI Members training open water divers in 1993.

The portion of this time spent in and around the water work place may be approximated as follows for the PADI Open Water Diver course:

Five confined water sessions at approximately 2 hours each = 10 hours per course. Four open water training sessions at approximately 3 hours each = 12 hours per course. Approximate number of hours per course spent in and around the water is 22 hours.. Twenty-two water related course hours x 64,007 classes estimated = 1,408,154 hours estimated as water related work for PADI Members training Open Water Divers in 1993.

This rough method could be used for all levels within a year to approximate total hours at work training. In addition to hours at work spent in the training, there is a very large amount of time spent at work in the supervision of already certified divers. Common sense would indicate millions of supervisory dives were conducted among this group for the same period when one considers the daily scuba diving tours that occur as a routine part of employment throughout the world in resorts and dive centres.

### **Occurrence of work-related injury and fatality 1989-1993**

For the period, there were 49 cases where an injury or fatality involving a PADI Member was reported while at work. These reports are summarised in Tables 5 and 6.

### **Discussion of Table 5 reported fatalities for PADI Members at work 1989-1993**

There were four fatalities for PADI Members while at work during this period. The victims were three instructors and one divemaster. One of these fatalities is classified as during training, two occurred while the member was supervising divers on a tour, the other fatality occurred when an instructor was working on a rope tangled in a boat prop. Descriptions of the fatalities are found in Table 7. The fatality rate for the population at work is reflected by year in Table 5 and for the five year period shows a range of 0 percent to .0000363 percent.

### **Discussion of Table 6 reported non-fatal injuries for PADI Members at work 1989-1993**

There were 45 non-fatal injuries to PADI Members at work for the period. They can be generally subdivided into decompression illness (DCI) or other categories. The other categories include any non-DCI injury such as cuts, ear injury and other.

For the period, the injuries are reported as follows:

Decompression Illness	28
(27 instructors, 1 divemaster)	
Other Injuries	17
(12 instructors, 5 divemasters)	
<b>Total</b>	<b>45</b>

The victims were 39 PADI Instructors and six PADI Divemasters. Twenty-three injuries occurred during diver training (19 decompression illness, four other). Eleven occurred while the member was supervising divers in water (nine decompression illness, two other), and 11 occurred in other non-diving circumstances as noted. Seven of the decompression illness injuries could be attributed to the instructor making multiple ascents during training. Tables 8 and 9 provide descriptions of each case.

Table 6 describes the rate of DCI for the population by year and also the total injury rate for the population by year. The five year rate of DCI ranged from .000054% to .00020%. The five year rate of injury ranged from .000144% to .00029%.

### **An assessment of risk in multiple ascents for PADI Instructors at work**

To certify an individual as a diver, it is necessary to conduct training ascents. With many students in each open water class and every student being required to master the various ascent skills on any given training dive, an instructor may have to make numerous ascents, especially if he has a large class. After a weekend of escorting several pairs of students to the surface on alternative air source ascents, buddy breathing ascents, emergency swimming ascents and other general ascents, an instructor may begin to feel like that popular toy on a string, a yo-yo.

What additional risks does the instructor face by making multiple ascents during a single training session? Does escorting students up and down through their training as required by industry standards pose additional safety hazards to the instructor? What about the student? These questions have been argued in educational, medical and training circles for some time, with little operational data.

Theoretically, the instructor's risk of DCI in this situation may be greater. In this sense, we can consider it an "occupational risk," which we accept or we choose to

TABLE 5

## FOUR FATAL INJURIES TO PADI MEMBERS AT WORK 1989-1993

Fatal injury at work	1989	1990	1991	1992	1993
Other	1	0	0	0	0
During training	0	0	0	0	1
Supervising	0	1	1	0	0
<b>Total deaths</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>1</b>
Fatality rate for PADI membership	1 in 27,543 0.0000363%	1 in 35,138 0.0000284%	1 in 44,252 0.0000225%	0 in 55,435 0.0%	1 in 55,387 0.000018%

TABLE 6

## 45 NON-FATAL INJURIES TO PADI MEMBERS AT WORK 1989-1993

Non-fatal injury	1989	1990	1991	1992	1993	Total
DCI while supervising	2	1	3	3	1	10
DCI while training	2	6	6	1	3	18
Other injury while training	0	1	1	0	2	4
Other injury while supervising	0	0	0	1	0	1
Other injury (non-diving)	4	1	1	5	1	12
<b>Total</b>	<b>8</b>	<b>9</b>	<b>11</b>	<b>10</b>	<b>7</b>	<b>45</b>
DCI rate for PADI membership	4 in 27,543 0.000145%	7 in 35,138 0.000193%	9 in 44,252 0.000203%	4 in 55,435 0.000072%	4 in 55,387 0.000072%	
Injury rate for PADI membership	8 in 27,543 0.000290%	9 in 35,138 0.000256%	11 in 44,252 0.000248%	10 in 55,435 0.000180%	7 in 55,387 0.000126%	

stop teaching and find alternative occupations or avocations other than certifying scuba divers. It becomes important, then, to attempt to assess the risk involved with this area.

To evaluate risk, it is important to look at available accident data for instructors and students involved in ascent training. The purpose of this assessment is to share data collected by PADI for its worldwide operations in this area.

In 1993, SPUMS conducted a workshop on Emergency Ascent Training which resulted in a Society Policy published in the *SPUMS Journal* (1993; 23 (4): 136-139). The workshop identified an associated injury rate of approximately 1:100,000 ascents for trainees, and an associated fatality rate of about 1:2,000,000 ascents for trainees.

The scope of the workshop, however, was limited to trainees and not professional instructors. What is the

TABLE 10

## AN ASSESSMENT OF RISK FOR PADI INSTRUCTORS AT WORK CONDUCTING ASCENT TRAINING

In the 1989-1993 period, PADI trained 1,635,607 entry level divers worldwide.

Each diver was required to perform a minimum of three emergency ascents.

Therefore, 4,906,821 escorted emergency ascents occurred in this period.

There were 18 cases of DCI in instructors while conducting training reported to PADI for the same period. If we assume all were the result of Multiple Ascent Training (they were not) this would accommodate under-reporting, if any.

18 cases of DCI reported in Instructors divided by 4,906,821 ascents conducted = 0.0000036.

Injury per 100,000 ascents = 0.0036.

**TABLE 7****DESCRIPTION OF REPORTED FATAL INJURIES TO PADI MEMBERS AT WORK 1989-1993**

<b>Case</b>	<b>Date</b>	<b>Victim</b>	<b>Level</b>	<b>Age</b>	<b>Location</b>	<b>Category</b>	<b>Details</b>
1	June 1989	Female	Instructor	Unknown	British West Indies	Boat Operation	The Instructor was killed while trying to untangle a line from the ship's prop. The prop was engaged mistakenly with the instructor in the proximity resulting in a fatal laceration to the head.
2	March 1990	Male	Divemaster	Unknown	Jamaica	Supervisory	Divemaster died while supervising divers on a scuba dive. The dive was planned to be conducted on a coral shelf at approximately 80 feet of seawater. It is believed that the divers in the boat were swept past the shelf over a wall. Upon entering the water, the divers swam to reach an expected depth of 24 m (80 feet) and continued to swim where their depth exceeded 280 feet of seawater. This incident resulted in three fatalities, one near drowning and one case of decompression illness. There is speculation that drug abuse may have been a factor. The divemaster was one of the fatalities.
3	July 1991	Male	Instructor	36	Illinois USA	Supervisory	Instructor died while attempting to rescue a diver on the surface. He was serving as a surface divemaster onboard a boat. The diver gave a distress signal and the Instructor jumped in to assist. He was not wearing any scuba or snorkel equipment. The instructor sank beneath the surface before reaching the diver, who was subsequently assisted by another diver.
4	July 1993	Female	Instructor	20	Wisconsin USA	Training Dive	Instructor was conducting a deep dive of an Advanced Open Water course with one student to a depth of 21 m (70 feet). It is not known exactly what occurred as both divers died on this dive.

incidence of morbidity and mortality in the work place for PADI instructors conducting multiple ascent training? From the reports collected, no PADI Members conducting multiple ascents suffered a fatality. However, from the data collected, at least seven cases of DCI may be attributed to multiple ascents; one in 1989, two in 1990, three in 1991 and one in 1993. Given that there were nearly five million such ascents performed during this period, the risk of DCI for the instructor appears real, but extremely low as demonstrated in Table 10.

A PADI Instructor can look forward to making multiple ascents, particularly during PADI Open Water

Diver course training dives two, four and, depending on when one elects to perform the emergency swimming ascent, dive five. This also varies if he elects to or not to teach buddy breathing which is an optional skill. To help instructors reduce the risk to themselves, PADI offers the following suggestions:

Never exceed the maximum ascent rate as prescribed by the Slowly Ascend From Every Dive (S.A.F.E.) campaign of 18 m (60 feet) per minute. Slow your training ascents down to within this outer limit. Slower ascents are acceptable.

**TABLE 8****DESCRIPTION OF 28 CASES OF DCI FOR PADI MEMBERS AT WORK**

<b>Case</b>	<b>Date</b>	<b>Victim</b>	<b>Level</b>	<b>Age</b>	<b>Location</b>	<b>Category</b>	<b>Injury</b>	<b>Details</b>
1	January 1989	Male	Instructor	22	British Virgin Islands	Supervisory	DCI	Same profile 3-4 times a week since June 1987; 21 m (80 ft) 50 min, SI 1 hour 25 min, 18 m (60 ft) for 30 min.
2	September 1989	Female	Instructor	31	Victoria Australia	Training	DCI (multiple ascents)	Multiple ascents in shallow water conducting rescue course.
3	November 1989	Female	Instructor	Unknown	Bahamas	Supervisory	DCI	Bounce dive to 21 m (70 ft) for 6 min, preceded a dive to 23 m (77 ft) for 37 min, SI 2 hours, bounce dive to 18 m (60 ft) for 3 min, dive profile 27.3 m (91 ft) for 37 min, SI 1 hour 56 min, 27.6 m (92 ft) for 36 min, five min safety stop.
4	December 1989	Male	Instructor	42	Victoria Australia	Training	DCI	After conducting PADI Open Water training, instructor experienced mild pain in one elbow.
5	March 1990	Male	Instructor	29	Georgia USA	Training	DCI (multiple ascents)	Open water training dives with poor weather conditions, poor water conditions, worked with students one to one; "many ascents and descents."
6	March 1990	Male	Instructor	37	Jamaica	Supervisory	DCI	Instructor made 3 to 4 dives per day, 7 days per week, for 12-13 weeks; 13.5 m (45 ft) maximum depth, safety stop on all dives.
7	June 1990	Male	Instructor	28	Cairns Queensland Australia	Training	DCI	Student numbers required that the instructor Double Dive. He made 8 dives over 2 days each lasting 30 min, maximum depth 16 m (43 ft).
8	June 1990	Male	Instructor	30	Cairns Queensland Australia	Training	DCI	Two days after conducting PADI Open Water Diver course, pain in left elbow. Dive profile unavailable.
9	September 1990	Male	Instructor	34	Florida USA	Training	DCI (multiple ascents)	Instructor made a series of three dives; #1 pleasure, #2&3 open water training; 27 m (90 ft) for 38 min, safety stop at 3 m (10 ft) for 5 min, SI 24 min, 20 m (65 ft) for 30 min.

Case	Date	Victim	Level	Age	Location	Category	Injury	Details
								SI 25 min, 20 m (65 ft) for 30 min.
10	October 1990	Male	Instructor	30	Papua New Guinea	Training	DCI	Conducted advanced Open Water training over two days. Instructor suffered symptoms upon surfacing.
11	November 1990	Male	Instructor	22	Queensland Australia	Training	DCI	Seven days of multiple dives, two days ashore then four 12 m dives conducting Advanced Open Water program.
12	April 1991	Male	Divemaster	25	California USA	Supervisory	Suspected	27 m (90 ft) dive, no other details available.
13	April 1991	Female	Instructor	33	Townsville Queensland Australia	Training	DCI	Open Water Course numbers required instructor to double dive, four dives day 1; four dives day 2. Each dive approximately 30 min, 16 m maximum depth.
14	June 1991	Male	Instructor	38	Massachusetts USA	Training	DCI	Instructor attempted to slow the rapid ascent of a student from 29 m (98 ft).
15	July 1991	Male	Instructor	35	New Mexico USA	Training	DCI	Profile 19 m (63 ft) for 10 min. Instructor was assisting a student when the student activated low pressure inflator causing a rapid ascent.
16	August 1991	Male	Instructor	33	Washington USA	Supervisory	DCI (multiple ascents)	Open water training dives; multiple ascents; Saturday 13.5 m (45 ft) for 52 min, SI 1 hour 30 min, 12 m (40 ft) for 45 min, 7 Alternative Air Ascents. Sunday 15 m (50 ft) for 48 min, 7 Buddy Breathing ascents, SI 1 hour 30 min, 12 m (40 ft) for 45 min, safety stop for 3 min, 14 CESA ascents.
17	August 1991	Male	Instructor	30	New York USA	Training	DCI	Instructor conducted a search for a lost diver; 15 m (50 ft) for 32 min, 6 m (20 ft) for 60 min, 36 m (120 ft) for 10 min. SIs unknown.
18	October 1991	Female	Instructor	26	Cairns Queensland Australia	Training	DCI (multiple ascents)	Four dives over two days while training open water students. Day 1, 10 m for 35 min, SI 3 hours 15 min, 10 m for 40 min. Day 2 12 m for 35 min,

Case	Date	Victim	Level	Age	Location	Category	Injury	Details
								SI 2 hours 10 min, 10 m for 28 min. Was recovering from gastroenteritis; working very hard and suffering from fatigue.
19	October 1991	Male	Instructor	Unknown	South Australia Australia	Training	DCI (multiple ascents)	Symptoms appeared after ascent training in shallow (5 m) water.
20	December 1991	Male	Instructor	26	Hawaii USA	Supervisory	DCI	Five computer assisted, repetitive dives: 30 m (100 ft) for 18 min, SI 1 hour, 13 m (42 ft) for 35 min, SI 2 hours, 24 m (80 ft) for 19, SI 45 min, 8.6 m (28 ft) for 22 min, SI 45 min, 7.5 m (25 ft) for 42 min.
21	January 1992	Female	Instructor	26	Fiji	Training	DCI	Instructor made three dives over two days while conducting Open Water training. Strong current present and students' buoyancy problems, max depth 15 m.
22	May 1992	Male	Instructor	34	Honduras	Supervisory	DCI	Instructor made multiple dives over multiple days, unknown profiles, last dive to 31 m (103 ft).
23	June 1992	Female	Instructor	27	Townsville Queensland Australia	Training	DCI	Right shoulder pain two days after two Open Water training dives.
24	July 1992	Male	Instructor	23	Cairns Queensland Australia	Supervisory	DCI	Instructor descended with his buddy to secure a descent line. A moderate current meant hard work which caused him to empty his scuba tank. He made an emergency swimming ascent and later developed symptoms of DCI, 18 m for 12 min.
25	January 1993	Male	Master Instructor	42	Victoria Australia	Training	DCI	Running wreck and deep courses during an organised week long trip away. After returning home checked in for treatment of mild symptoms.
26	February 1993	Female	Instructor	23	Hawaii USA	Supervisory	DCI	Instructor was supervising/guiding divers who were diving with computers. Instructor did not have a computer. Square profiles; 31 m (102 ft) for 24 min, SI 1 hour 23 min, 29 m



Case	Date	Victim	Level	Age	Location	Category	Injury	Details
								(98 ft) for 31 min. Drove to altitude after dives.
27	June 1993	Male	Instructor	35	British West Indies	Training	DCI	Instructor was conducting a photo course, multiple dives over multiple days. Range of dives: Day 1, 6 dives, max depth 30 m (100 ft); Day 2, 6 dives, max depth 30 m (100 ft); Day 3, 2 dives, max depth 28.5 m (95 ft); Day 4, 4 dives, max depth 25.5 m (85 ft); Day 5, 5 dives, max depth 32 m (107 ft); Day 6, 3 dives, max depth 30 m (99 ft) and a commercial flight 25 hours after last dive.
28	October 1993	Female	Instructor	30	Cairns Queensland Australia	Training	DCI (multiple ascents)	Open water course; no problems during training.

Note. Except for Cairns and Townsville (towns) all places named are states or countries.

**TABLE 9**

**DESCRIPTION OF 17 CASES OF OTHER (NON-DCI) INJURY FOR PADI MEMBERS AT WORK 1989-1993**

Case	Date	Victim	Level	Age	Location	Category	Injury	Details
1	January 1989	Male	Divemaster	41	Florida USA	Non-diving	Laceration to foot	Divemaster stepped on scupper cover while cleaning boat.
2	May 1989	Male	Divemaster	40	California USA	Non-diving	Muscle pull groin	Divemaster pulled groin muscle while pulling up boat anchor.
3	June 1989	Female	Instructor	40	Texas USA	Non-diving	Fractured nose	Instructor was walking on pool deck, collided with another instructor's tank.
4	November 1989	Male	Divemaster	Unknown	California USA	Non-diving	Laceration to ear	Divemaster slipped and fell on rocky beach.
5	March 1990	Male	Divemaster	40	Bahamas	Non-diving	Fractured leg	Divemaster fell down stairs on boat.
6	October 1990	Male	Instructor	38	Nevada USA	Training	Ear drum ruptured	Instructor was conducting CESA with open water student; injury due to reverse block and forced equalization, 7.5 m (25 ft) depth.

Case	Date	Victim	Level	Age	Location	Category	Injury	Details
7	January 1991	Male	Instructor	Unknown	England	Training	Blood clot on lung	Doctor said blood clot was not diving related, instructor was conducting a pool session prior to presenting to physician.
8	May 1991	Male	Instructor	22	Florida USA	Non-diving	Torn foot ligaments	Instructor slipped and fell on boat.
9	February 1992	Female	Instructor	Unknown	Hawaii USA	Non-diving	Knee injury	Instructor slipped and fell on boat.
10	February 1992	Female	Instructor	Unknown	Hawaii USA	Non-diving	Fractured hand	Instructor serving as boat crew, caught hand in anchor chain/winch.
11	March 1992	Male	Divemaster	37	Florida USA	Supervisory	Ear injury	Divemaster attempted to slow rapidly descending student to a depth of 18 m (60 ft).
12	April 1992	Male	Course Director	45	Florida USA	Non-diving	Puncture	Stepped on glass on beach. Wound to foot.
13	May 1992	Male	Instructor	33	Florida USA	Supervisory	Laceration to foot	Instructor cut foot on rocks at jetty.
14	March 1993	Male	Instructor	33	Jakarta Indonesia	Non-diving	Aspirated cockroach into lung	Instructor was conducting an academic session and explaining the importance of purging the second stage of the regulator before taking a breath from the regulator. He purged the second stage then took a breath from the Air II. He aspirated a cockroach, which was later surgically removed from his lung.
15	September 1993	Male	Instructor	36	Utah USA	Training	None loss of consciousness	Loss of consciousness at 6 m (20 ft) depth attributed to low blood sugar while conducting an open water class. Instructor was assisted by his students. Instructor has a history of diabetes and has been cleared for diving by his physician.
16	November 1993	Male	Instructor	Unknown	Hawaii USA	Non-diving	Foot injury	While exiting boat at dock, instructor slipped and fell between boat and dock, requiring physical therapy.
17	December 1993	Male	Instructor	29	Virginia USA	Training	Ear injury	Instructor was assisting with a class to 22 m (75 ft) depth.

Always conduct repetitive training dives so each successive dive is to a shallower depth.

When possible, consider conducting the emergency swimming ascent exercise on Dive 4 or 5 instead of Dive 2 when you must also conduct the alternative air source assisted ascent.

Never conduct emergency ascent/multi ascent training at the end of a dive series, or when gas loadings are higher than normal—be conservative.

Consider the benefits of team teaching with another qualified PADI Instructor and splitting up the ascent training, thereby reducing the number of times you personally have to conduct an ascent.

Pace yourself and be conservative by diving well within the limits of the table or computer you are using.

Use common sense, caution and judgement with matters of personal health.

## Discussion

It is important to acknowledge there is a risk to the professional dive instructor when performing his job in training and supervision. This paper has attempted to measure this risk so the problem receives a proper analysis. This paper cannot account for those cases that go unreported or undiagnosed and therefore, some under-reporting may be possible. However, the data suggest the occurrence of DCI and other injury are not disproportionately high to the PADI Instructor at work.

Ideally, safety is freedom from risk. Unfortunately, risk is unavoidable in any endeavour, and dive instruction is no exception. However, risk can be minimised and managed by applying good judgment, adopting a safety conscious attitude, and adhering to proven safe diving training practices.

## Bibliography

- 1992 Report on Diving Accidents and Fatalities.*  
Durham, North Carolina: Divers Alert Network, 1994
- Richardson D. Multiple dives over multiple days: an area of growing interest and concern. *Undersea Journal* 1988; 3rd Quarter: 14-15
- Richardson D. The ups and downs of teaching diving: are there risks to making multiple ascents during training? *Undersea Journal* 1989; 4th Quarter: 3
- Richardson D and Cummins T. A training agency perspective of emergency ascent training. *SPUMS*

*Journal* 1993; 23 (4): 225-230

Gorman D and Richardson D. The SPUMS workshop on emergency ascent training. *SPUMS J* 1993; 23 (4): 236-239.

## Key Words

Ascents, deaths, decompression illness, diving industry, instruction, safety, recreational diving, reprints.

*Drew Richardson is Vice-President, Training, Education and Memberships, PADI International, 1251 #100, East Dyer Road, Santa Ana, California 92705-5605, USA.*

*The above paper was presented at the Safe Limits Symposium held in Cairns, October 21st to 23rd 1994. It is reprinted by kind permission of the Division of Workplace Health and Safety of the Department of Employment, Vocational Education, Training and Industrial Relations of the Queensland Government, and of the author, from the symposium proceedings pages 73-85.*

*Drew Richardson presented a very similar paper, covering the same data, at the 1995 Annual Scientific Meeting, held at Castaway Island, Fiji.*

## **The Red Sea SCUBA MEDI-TECH '96 Conference 10th to 14th November 1996 Royal Beach Hotel, Eilat, Israel**

**Topics to be explored  
Diving Physiology,  
Gas Mixture Diving,  
Diving Safety,  
Scientific Diving  
and the**

**Underwater Environment-Diver Interaction**

Chaired by Dr Y Melamed and Dr Nic Flemming.  
Official language English

For further details contact Dan Knassim Ltd.,  
PO Box 1931, Ramat Gan, 52118,  
Israel.

Tel: (972)-3-613-3340.  
Fax: (972)-3-613-3341.