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LIMBO DIVING - THE DANGERS OF FREE DESCENT CASE REPORTS OF TWO FATALITIES

Douglas Walker

SUMMARY

The dangers associated with scuba diving are well documented and the region of maximum danger has been identified as the surface itself. The critical factors influencing the course and outcome of all dives are discussed in all diving manuals and by all who instruct others, but all make the unstated assumption that the diver and his buddy are well orientated in regard to their surroundings. This assumption does not hold true where the descent is made in deep open water in the absence of either a direct sighting of the sea bed below or close contact with some other fixed and recognised object, such as a descent line. Most divers in such circumstances would discover that they were untrained to accommodate to such conditions and would experience a degree of

orientation and stress which would impair their responses to the problems they faced. Inappropriate responses due to diver error can very rapidly cascade into a situation of increasing danger. Two fatalities occurring in dives under such circumstances are presented.

Case Reports

Case 1.

All the divers taking part in this club-organised boat dive were trained and had some experience, though not necessarily of this type of dive. The two divers involved in this incident were probationary members of the club but had shown evidence of their training and had been watched during a dive that morning to 18m (60 fsw) for 44 minutes and judged to perform correctly. The afternoon dive was off a rocky reef, in calm water and fine weather. The dive boat had its anchor in 19.5m (65 fsw) deep water a little off the reef and the depth under its stern was 24-25.5m (80-85 feet). As there was some current flowing from the reef towards the boat the divers were advised to swim underwater towards the reef after making their water entry, they were also advised to limit their dive depth to no more than 18m (60 fsw).

The victim and her buddy were the last pair to enter the water and although the dive marshal suggested that they descend down the anchor line it is probable that they failed to follow this advice and made an open water "free descent". As they entered the water the first pair of divers surfaced, having aborted their dive after only 13 minutes, and reported the presence of a down-current which had swept them into 24m (80 fsw) deep water while they were adjusting their equipment underwater. They also mentioned that visibility was so poor that they did not see the sea bed until they reached it. Unfortunately the victim and her buddy probably never heard this report of the conditions they were to experience.

It is not known exactly what happened but it is apparent from the buddy's account that they found themselves forced down by this current, initially to 30m (100 fsw) depth and then deeper still until they found themselves on the sea bed at a depth of 39-42m (130-140 feet). Here the victim seemed to be experiencing a problem with her breathing and gave an "out of air" signal. Buddy-breathing was initiated but shortly afterwards the victim "blacked out" and the buddy "shot to the surface" and called for help. A surface search was maintained but the victim never surfaced, and subsequent underwater searches failed to find any trace of either the victim or her equipment. There was no immediate underwater search because it was recognised that there was no chance of finding the victim alive, and minimal chance of locating her in the low visibility conditions in the presence of the current and depth-dictated short dive time allowable. The duration of the dive had been 8 minutes.

TABLE 1

	Case 1	Case 2
Training, Experience	Trained, some experience, actual experience not stated.	Trained, experienced but only dives fairly close to shore.
Experienced in this type of dive	Probably not.	No.
Dive Organised by	Dive Club.	Dive Club.
Pre Dive Briefing	Advised of surface off-reef current, so were to swim underwater to reef.	Briefed about wreck depth and need to descend as soon as water was entered. No advice to ascend if wreck not seen by 18m (60 fsw).
Dive Platform	Boat anchored off the rocky reef.	Boat slowly moving over wreck.
Surface Current	Flow from reef to boat.	Slack water but liable here to strong currents.
Descent	Commenced near anchor line but strong downward current then took them deep in low visibility water. No FNT complaints.	Controlled descent without landmarks, adequately able to equalise ears, Buddy's depth gauge faulty, read 10 fsw (3 m).
Intended dive depth	18m.	18 m.
Actual dive depth	42m.	36 m.
At sea bed	Victim air hungry and felt heavy, attempted to buddy breathe then suddenly lost consciousness. Separation as buddy made rapid ascent.	Acute panic overbreathing reaction by victim, regained control and controlled ascent with buddy to 24 m (80 fsw) but then swam away and was lost to view.
Buoyancy vest	Apparently not inflated. Type of vest inflation not stated.	Partly inflated on sea bed. Type of vest inflation not stated.
Weight belt	Apparently not released.	Apparently not released.
Search	Not attempted because of current, depth, poor visibility.	Underwater search unsuccessful.

ADVERSE FACTORS

Poor visibility. Lack of landmarks. Total inexperience at such depth. Failed to realise that there was a serious problem requiring that the dive be aborted. Nitrogen narcosis. Cold. Depth related lack of buoyancy. Anxiety panic. Failed to drop weight belt. Case 1 probably failed to inflate her buoyancy vest. Case 1 felt her air supply to be inadequate and attempted buddy breathing and probably inhaled some water. Case 2 buddy pair failed to follow the instructions to descend immediately.

Case 2.

This also was a club-organised dive. It was made from a boat whose skipper was familiar with taking divers to dive sites, though it was the first time either he or they had visited this wreck as it had been "closed" to divers until recently. There had been warnings issued that it was a dive for the experienced because of the poor visibility and the strong currents which frequently occurred in the area, and divers were still prohibited from any entry into the interior of the wreck. None of this inhibited the frequenting of the wreck by many dive boats. The wreck lay on its side, the uppermost side being at about 15m (50 feet) depth and the sea bed being at about 36m (120 feet) depth.

The victim had been trained several years previously and had dived frequently but her experience had been limited to close-to-shore dives. When the dive boat reached the wreck there were already several other boats there flying the "Divers Down" flag and anchored onto the wreck, so the skipper decided to drop the divers off over the wreck, remaining under slow movement in order to be free to pick up surfacing divers in an emergency without the delays resulting from being anchored. This was a practice he had found useful and safe. There had been a briefing concerning the wreck during the trip out to it and the divers had been told that they should reach it at 18m (60 fsw) or less but had not been specifically advised to abort their dive should they not find it by this depth. It was slack water as the pairs of divers were dropped off but they had been advised to descend at once and not to remain at the surface or they would be likely to drift from above the wreck. The skipper stated later that all save two pairs followed this advice. None of those divers descending at once encountered any recorded problem with their dives. Two couples appeared to delay their descent, that of the victim and her buddy and another pair. The latter reached 22.5m (75 fsw) without sighting the wreck so surfaced but the victim and her buddy continued down to the sea bed. The buddy was unaware of their depth until they were on the sea bed because her depth gauge malfunctioned and continued to show "10 fsw" (3m) throughout the dive. Divers from the anchored boats had the benefit of the anchor lines to guide them down, those from this boat had no such assistance.

When the buddy looked at the victim's depth gauge after they reached the sea bed she was surprised to see that it read 120 fsw (36m). When she showed this reading to the victim the latter reacted with panic and attempted to blow up her "compensator" in order to effect an emergency ascent but was calmed by the buddy and a more orderly ascent was commenced. It is probable that the victim now became aware of being overweighted (for this depth) and again panicked and spat her regulator mouthpiece out, but then replaced it. Her breathing was noted to be hurried "and her eyes showed panic". When they reached about 24m (80 feet) depth (an estimate as the buddy's depth gauge was still inoperative) the victim turned onto her back and started to fin

away horizontally or a little downwards, apparently towards the wreck because the buddy saw some ropes in the water. As the visibility was only 1.3m (4 feet) the buddy soon lost sight of the victim so continued to the surface alone, reporting what had occurred as soon as she was picked up by the dive boat. She was given another (full) tank and a diving instructor who was a member of the dive club group descended with her to see whether they could locate the missing diver. They saw some bubbles coming from a rent in the side of the wreck but the instructor recognised that these were evidence of his earlier dive when he had briefly entered the hole, which was at about 60 fsw depth. No trace of the victim or her equipment was ever found.

DISCUSSION

There were a number of factors and actions in each of these cases which adversely effected the safety of the dives concerned. In both the divers were without experience of deep diving (as far as is known) and will have been unlikely to have ever previously descended "into limbo". They must have experienced an increasing degree of stress as they descended without seeing any landmarks with which they could orientate themselves. The divers in Case 2 are known to have descended sufficiently slowly to equalise their ears at all times and there is nothing to suggest that the divers in Case 1 suffered any equalisation problems during their enforced descent.

The critical factor of greatest importance was undoubtedly the inexperience of the divers involved in relation to the type of dive they were making, open water dives being particularly stressful in low visibility conditions. They failed to recognise and respond appropriately to events which indicated that their dive was proceeding in a far different manner than that they had expected, so failed to take the necessary decision to abort their descent by ditching weights or inflating their buoyancy vests, allowing descent to continue unchecked until the sea bed was reached. Had the water been deeper, their predicament would have been worse. Cold, poor visibility, nitrogen narcosis, depth-related loss of buoyancy, and an anxiety-related air hunger, all contributed to a panic response which further reduced their ability to respond correctly. There is no information concerning the equipment worn, none of which was recovered, but it is more likely that anxiety rather than an incompletely opened tank valve was responsible for the victim in Case 1 attempting to buddy breathe, and under such circumstances inhalation of water would be very likely. The method of inflation of the buoyancy vests is unknown but in Case 2 may have been solely by oral inflation. If so the vest was one which was quite inappropriate for use by any diver.

A point of great significance was the failure of those involved in running these club dives to recognise the potential dangers, though this is entirely understandable in Case 1. Had the victim and her buddy followed normal practice and descended holding the anchor line this tragedy might never

have occurred. Others can learn from this case that common routine procedures may protect from unrecognised dangers as well as expected ones. In Case 2 there should have been a recognition that a “free descent” into deep water, particularly in an area known to be dangerous by reason of currents and poor visibility, was a procedure not to be undertaken without prior consideration. Possibly the divers had expected to descend a line but had not liked to expostulate when they were told that the boat would not be anchoring. However, the majority of those diving from this boat had no difficulty in finding the wreck, having followed the instructions to descend immediately. A line-holding descent should be treated as being mandatory whenever the “target” of sea bed or wreck is not plainly visible from the surface.

The difference in dive profiles which led to these fatalities in contrast to the successful dives made by their fellow club members was the unplanned depth, lack of visibility, and arriving at an unplanned destination whose location was uncertain in relation to the expected goal. It may be considered fortunate, in the circumstances, that the buddies survived.

A NEW RULE FOR AN OLD TABLE THE BS-AC CHANGES THE RULES FOR DIVES TO 9 M OR LESS

John Lippmann

The BS-AC has recently (March 1988) altered the procedure to be used when calculating the decompression required following a sequence of more than two dives, where the last dive is to a depth of 9 m or shallower.

Previously for a series of three dives where the third dive was 9 m or shallower, the RNPL/BS-AC “concession” (which allows some credit for surface intervals of two hours or more) could be used for the second dive. No further calculations were required for the third dive as it was 9 m or shallower. For a series of four dives where the third dive was deeper than 9 m and the fourth dive was 9 m or shallower, the “Multiple Dive Rule” (adding together all of the bottom times and decompressing for the deepest depth) was applied to the first three dives, and the fourth dive, being 9 m or shallower, did not require any decompression.

However, while researching the forthcoming new BS-AC tables, it was discovered that these procedures were incorrect. **Third (or subsequent) dives of 9 m or shallower must be taken into account**, which means that the “Multiple Dive Rule” should be used.

This will often make a third dive extremely difficult to plan within a day’s diving, and can also influence the next day’s diving, since the first dive of the next day may still be the third dive undertaken within a 24 hour sequence.

Table A can be used to plan a third dive to a maximum depth of 9 m without the need for decompression stops. It also indicates the surface interval which must follow that third dive in order to re-enter the RNPL/BS-AC table without penalty.

Using the new rule for a third dive to 9m or shallower

1. By referring to the central section of Table A, plan the surface interval preceeding the third dive. The choices are 0-30 minutes, 30-60 minutes, 60-90 minutes, 90 min - 4 hr and more than 4 hours.
2. Read down the column corresponding to the surface interval chosen to determine the maximum no-stop time for the third dive.
3. The final column shows the surface interval required after the third (9 m or shallower) dive so that the RNPL/BS-AC table can be re-entered without a time penalty.

EXAMPLE 1

You are planning the following sequence of dives:

The first is to 20 m for a bottom time of 30 minutes, followed three hours later by an 18 m no-stop dive. If you then wish to dive to 8 m two hours later, and begin a new day’s diving 13 hours after surfacing from the 8 m dive:

- (i) What is the maximum allowable bottom time for the second dive?
- (ii) What is the maximum allowable no-stop time for the third dive?

Since this is a sequence of more than two dives the “Multiple Dive Rule” must be used for the first two dives, but the new additional 9 m table can be consulted for the third dive.

Dive 1 requires no stop and Dive 2 can have a maximum bottom time of $(46-30) = 16$ minutes.

To find the allowable bottom time for Dive 3, enter Table A from the top at the column corresponding to a