Unrecognized decompression sickness among breath-holding pearl divers in the Arabian Gulf

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Background

Prior to the development of the Japanese cultured pearling industry in the 1930s, pearl fishing throughout the Arabian Peninsula was a major enterprise. The labor-force behind the industry included many who were in various forms of economic servitude and in some instances even slavery, harvesting oysters from boats throughout the Arabian Gulf from the 650km of coast-line which now geographically constitute the United Arab Emirates and its neighboring countries.

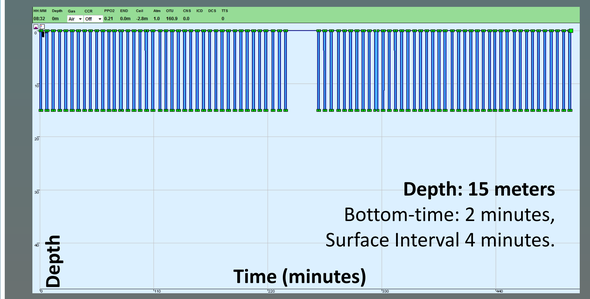
They retrieved pearls by making repeated breath-hold dives to depths of up to 30 meters, with surface intervals of a couple of minutes or less, for 12-14 hours each day. Longer surface intervals were infrequent, for the purposes of prayers or meals only. We hypothesize that these repeated breath-hold dives often resulted in unrecognized cases of decompression sickness. In anecdotal accounts, these pearl divers describe an array of neurological symptoms that would now be consistent with this diagnosis. This would correlate with the syndrome of Taravana found among breath-hold divers in the Tuamoto Archipelago in the South Pacific - a condition that is now widely recognized to be caused by decompression sickness as described in several papers by Craig, Lanphier and Paulev.

Methods

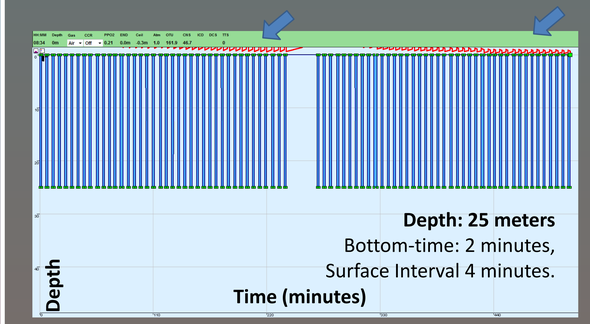
Through review of historical accounts of the pearlers' diving patterns, including first-hand interviews, the characteristics of their dive profiles including depth, bottom time, surface interval time and breaks in the day were identified. These data were then incorporated into a freely-available dive planning package which implements the previously-tested AB-2 decompression algorithm. Decompression ceilings were calculated for these dive profiles, and breaches of those ceilings were identified.

Results

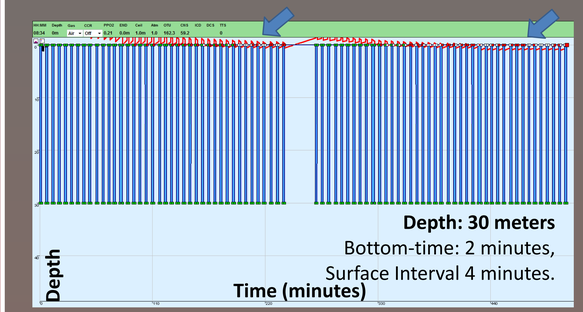
Several of the repetitive breath-hold dive profiles create unavoidable ceiling violations from which decompression sickness would be a plausible consequence.



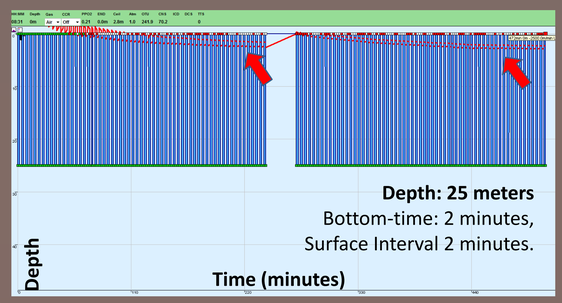
An example of a "safe" dive profile without risk of decompression sickness or ceiling violations. Dive time is represented by the blue segments. The profiles in this series are over an approximately 8 hour day with a 30 minute break/surface interval in the middle of the day.



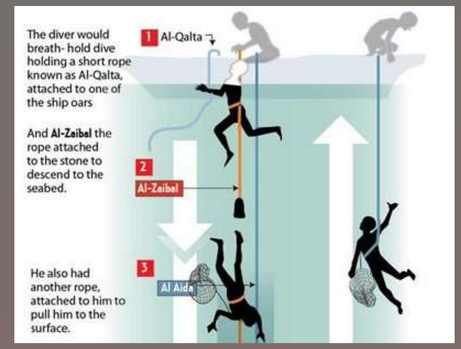
When the depth is increased to 25 meters from 15 meters, a dive pattern develops where decompression ceilings are encroached but not violated. This is represented in the graph by the red lines that appear after the beginning of each dive sequence adjacent to the arrows. Note the disappearance of the ceiling immediately after the longer 30 minute surface interval in the middle of the day.

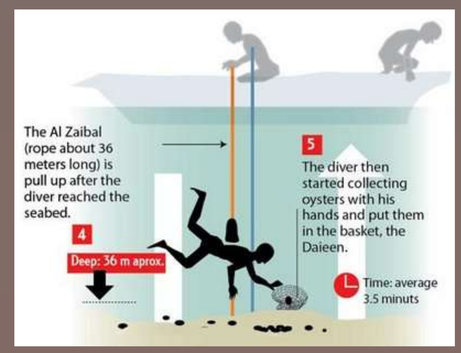


With the same bottom times and surface intervals as the two patterns above, increasing the depth to 30 meters results in the decompression ceiling becoming dangerously close to being violated by the diver.



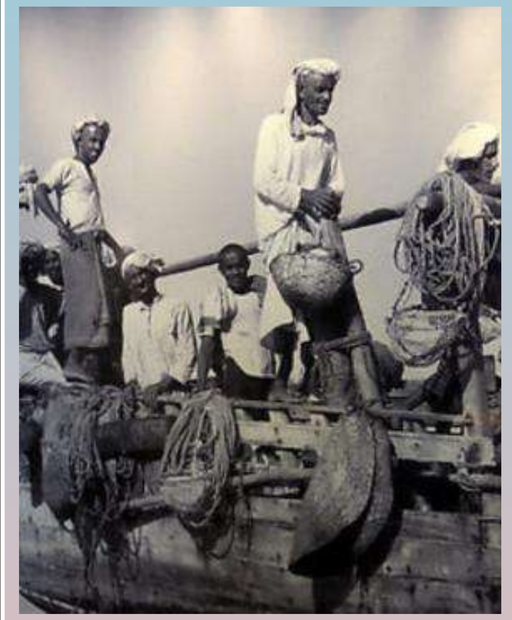
When the surface interval is shortened to 2 minutes, at depths of 25 meters with bottom-times of 2 minutes, decompression ceiling are clearly violated. As the surface intervals shorten, depth increases and bottom-times become longer, the likelihood of decompression illness continues to increase.





Conclusions

Pearl divers in the Arabian Peninsula were unwittingly and routinely subjected to decompression sickness as an occupational hazard.



References

Paulev, P. (1965, September). Decompression sickness following repeated breath-hold dives. Journal of Applied Physiology, Vol.20 no. 1028-1031.

Acknowledgements

DecoChek Dive Analyzer, version 2.04
www.decochek.com
Arterial Bubble Model Version 2