



RECREATIONAL DIVING FATALITIES: HARVESTERS VERSUS NON-HARVESTERS

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Introduction

- Marine life harvesting is popular in North America among mainly male recreational divers.¹
- Additional risks faced, compared with recreational non-harvesters, remain unquantified.
- Recreational harvesting may be defined as using equipment and/or tools to catch marine life such as lobster, abalone or fish while non-commercially diving within recreational diving limits.
- Legal harvesting occurs during designated locations and days of the year.
- In Florida there is a 'sport season' which lasts just two days, ahead of the regular season, which lasts eight months.

Methods

- Records for adult male divers (n=774) in North America from 2004-2014 were identified from the DAN Diving Fatality Database.
- Non-recreational divers and trainees were excluded, as were divers in dive parks.
- Divers engaged in harvesting (hunters, n=110, 27%) were compared with non-hunters (n=290, 73%) using SAS version 9.3.
- Database included cases involving US and Canadian recreational divers only.
- Information is obtained from news reports, law enforcement agencies, medical examiners, witnesses and next of kin.

Results

- Of the 400 fatalities, 39 (10%) were in Canada and 361 (90%) the US.
- In the US Florida (n=51, 46%) and California (n=27, 25%) accounted for the majority of hunters (n=78, 71%).
- The two-day sport-season in Florida accounted for 22/51 (43%) of underwater hunting deaths in that state, a mean of two per year.
- There was a mean of 10 hunting fatalities per year in total (Fig 1).
- Anthropometry and dive history of hunters and non-hunters are shown in Table 1.

Table 1. Recreational divers (n=400) anthropometry and dive history by hunting status

		Hunters (n=110)	Non- Hunters (n=290)	Overall (n=400)
Anthropometric				
Age (years)	\bar{x} (SD)	46 (13)	49 (12)	48 (12)
BMI (kg·m ⁻²)	\bar{x} (SD)	30 (5)	29 (6)	30 (6)
Marital status	n (% single)	56 (51)	142 (49)	198 (50)
Dive History				
>61 dives experience	n (%)	36 (33)	76 (26)	112 (28)
Dives in last year	\bar{x} (SD)	16 (15)	24 (31)	22 (27)
Max depth fatal dive	\bar{x} fsw (SD)	67 (51)	80 (66)	76 (62)
	\bar{x} msw (SD)	20 (16)	24 (20)	23 (19)

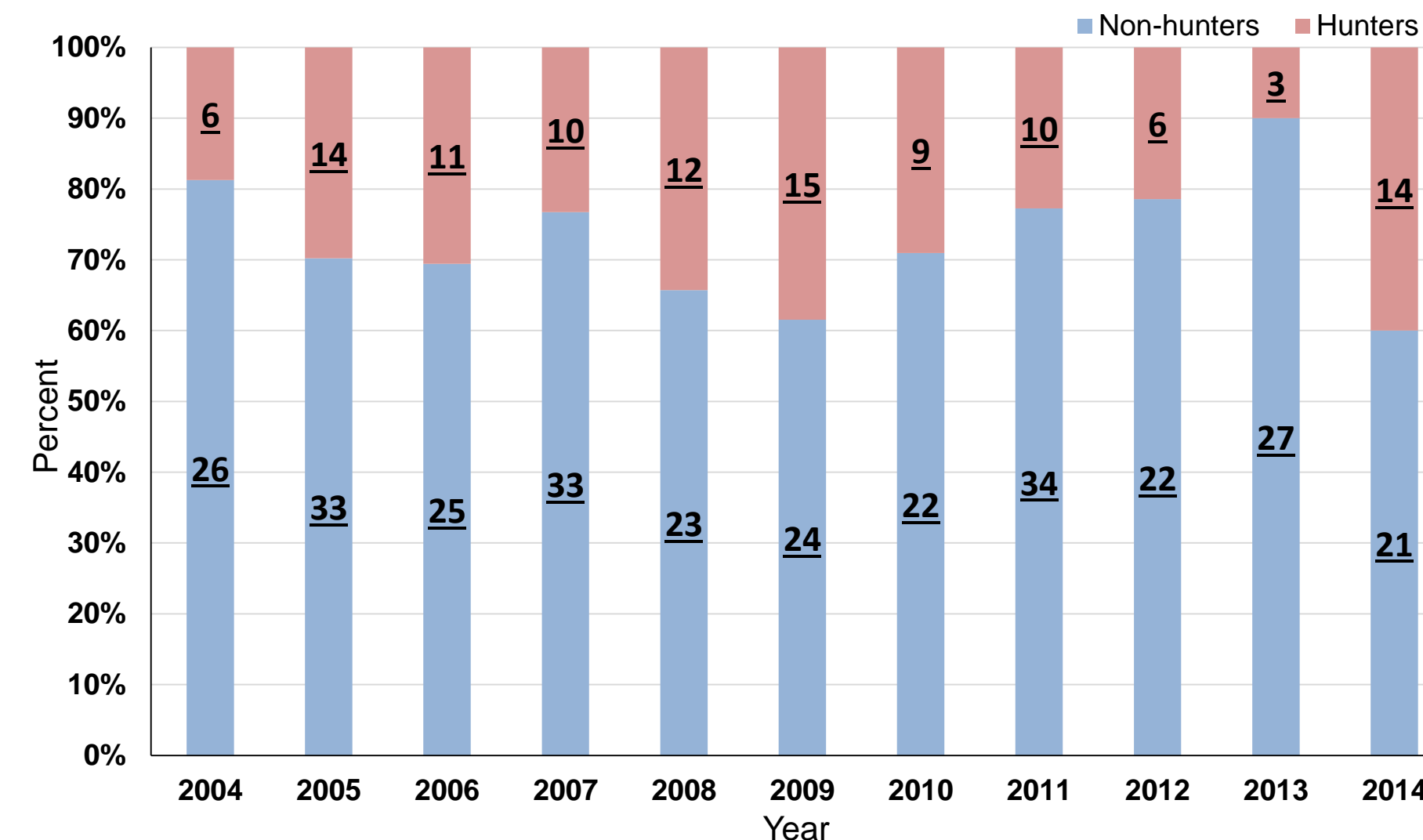


Figure 1. Fatalities of non-hunters (n=290) vs. hunters (n=110) by year, with n underlined

- Compared with non-hunters, the following were more common among hunters:
 - boat diving (n=92, 84% vs. n=167, 58%, p=0.0002)
 - solo diving (n=28, 25% vs. n=36, 12%, p=0.008)
 - night diving (n=13, 12% vs. n=8, 3%, p=0.001)
- Of the divers who were low-on or out-of breathing gas, n=20 (18%) were hunters and n=30 (10%) non-hunters (RR=1.9, p=0.04).
- Surface supply was more common among hunters (n=4, 4% vs. n=3, 1%), as was basic/open water certification (n=13, 12% vs. n=30, 10%).
- Fourteen hunters (13%) wore swim-suits or dive-skins compared with 7 (2%) non-hunters.
- At least 5 hunters (5%) were not certified divers, compared with 2 non-hunters (1%).
- Causes of death are shown in Table 2.

Table 2. Cause of death by hunting status

Cause of Death	Hunters n (Row %)	Non-Hunters n (Row %)	Overall n (Column %)
Drowning	45 (34)	87 (66)	132 (33)
Missing	44 (24)	141 (76)	185 (46)
Arterial gas embolism (AGE)	7 (32)	15 (68)	22 (6)
Body Not Recovered	6 (50)	6 (50)	12 (3)
Cardiac	5 (18)	23 (82)	28 (7)
Unknown/Unspecified	2 (15)	11 (85)	13 (3)
Propeller	1 (100)	0 (0)	1 (0)
Hypoxic Brain Injury	0 (0)	3 (100)	3 (1)
Decompression sickness	0 (0)	3 (100)	3 (1)
Lightning strike	0 (0)	1 (100)	3 (1)
Overall	110 (28)	290 (72)	400 (100)

Discussion

- Hunters were younger on average, compared with non-hunters, and there were fewer cardiac causes of death than expected in hunters.
- Hunters more commonly ran low-on or out-of breathing gas and hunters had slightly more AGE related causes of death than expected.
- Solo diving was more common in hunters and the proportion of cases where the body was not recovered was higher than expected.
- Propeller injuries were not over represented in either group but, due to the known higher boat congestion during the sport-season in Florida, propeller injuries may result in more hospital admissions in hunters but may not commonly result in death.
- Night diving was significantly more prevalent among hunting fatalities than non-hunting fatalities. This is the converse to what is found in other parts of the world where lobster are permitted to be hunted only during daylight hours.
- Though the numbers were small (n=8), hunters included a higher proportion of uncertified divers (5% vs. 1%), and elsewhere uncertified divers have breached more safety rules than certified divers.²

Limitations

- This study design is retrospective and likely did not capture all fatalities in the US and Canada during the study period.
- Given the delay between death and details being obtained, many case details were not able to be subsequently confirmed.
- No denominator has yet been established in order to estimate the absolute risk of dying while hunting underwater.
- Compared with non-hunters, however, some relative risk indicators suggest possible targets for safety interventions.

Conclusions

- Hunters and non-hunters share similar anthropometry but they differ in the circumstances of their death, therefore the act of hunting may influence cause of death.
- Most fatalities involving hunters occurred in Florida and California, therefore safety interventions should target those two states.

Future Work

- In addition to fatality data collection, injury data (incident reports, diver surveys, Emergency Department admissions, etc) should be collated, both to better identify hazards particular to hunting and to quantify the burden of diving injuries attributable to underwater hunting
- Public safety information targeting hazards associated with hunting lobster should be marketed ahead of the sport-season in Florida.
- The impact of making hunting licenses valid only when accompanied by proof of certification (e.g. a C-card) should be trialed and evaluated.

References

1. Pollock N, Denoble P, Chimiak J, Moore J, Trout B, Caruso J, et al. DAN Annual Diving Report - 2010 Edition (Based on 2008 data). Durham, NC: Divers Alert Network. 2010.
2. Buzzacott P, Rosenberg M, Pikora T. Western Australian recreational scuba diving fatalities, 1992 to 2005. Australian and New Zealand Journal of Public Health. 2009;33 (3); 212-4.