

DIVERS ALERT NETWORK BREATH-HOLD INCIDENT DATABASE REVIEW: 2006-2011



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Introduction

- Breath-hold diving, in-water activity with a mask but without the use of scuba or surface-supply breathing gas, has grown in popularity as an underwater activity with numerous sub-disciplines.
- While generally safe, the aquatic realm is unforgiving and serious injury or death can occur. Learning from breath-hold incidents is important to increase diver awareness and promote safety.

Methods

- Divers Alert Network (DAN) developed a dedicated database to collect breath-hold incidents from 2004 forward.
- Cases are identified through automated keyword internet searches and voluntary submission. Incidents are followed up through requests to participants or local authorities.
 - We reviewed cases from 2006 through 2011.
- Data are reported as number (n) of cases and/or mean±SD with ranges.
 - The percentage of known data is specified for variables with incomplete records.

Results

- A total of 417 cases were captured; 308 fatal and 109 non-fatal.
 - 51±9 (40-63) fatal cases annually (Figure 1).
- Incidents were reported from 56 countries.
 - 46% in America; 11% in Australia; and single digits elsewhere.
- Victims were 41±17 (5-93) years of age (92% known) (Figure 2).
 - Most victims were male (86%).
- Dive activity was described as snorkeling (46%), spearfishing (25%), freediving (18%) and collecting (11%) (92% known).
- Incidents were reported in ocean (90%), swimming pools (3.6%), lakes/quarries (3.3%), rivers/springs (1.8%) and other (1.3%) (94% known).
- Witnesses were present in 61% of cases (64% known) but generally with incomplete details of the event.
- The majority of victims were diving with a partner or group (59% known) (Figure 3).
- Disabling injuries were most obvious with acute animal or boat trauma. The most common disabling agent was loss of consciousness, typically intuited in fatal cases from witness reports and/or circumstances due to the lack of physical evidence.
- Initial triggers were frequently impossible to confirm in fatal cases.
 - Excessive hyperventilation was most frequently suspected.
 - Health issues implicated for many older victims.

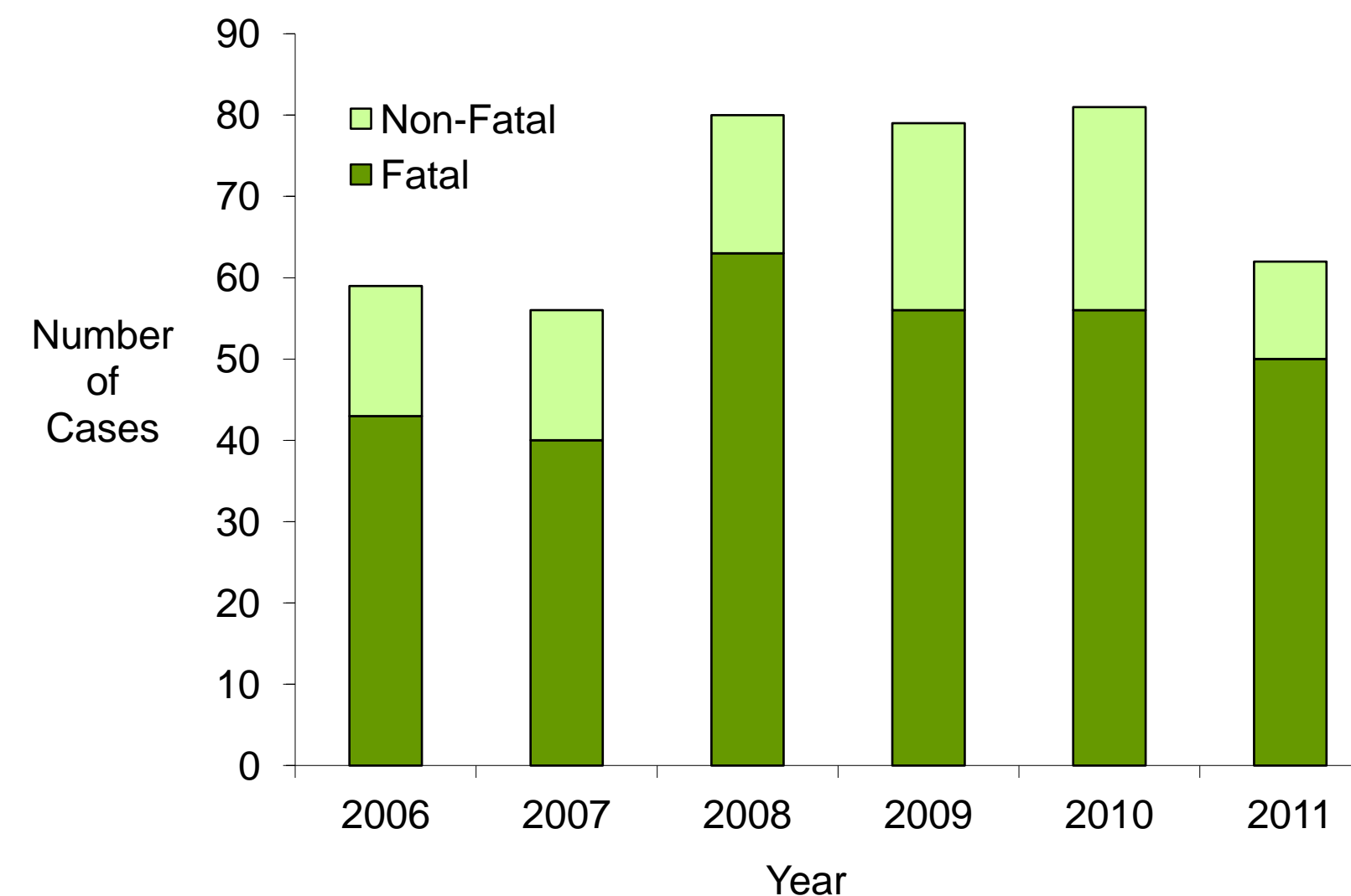


Figure 1: Case capture by year (n=417)

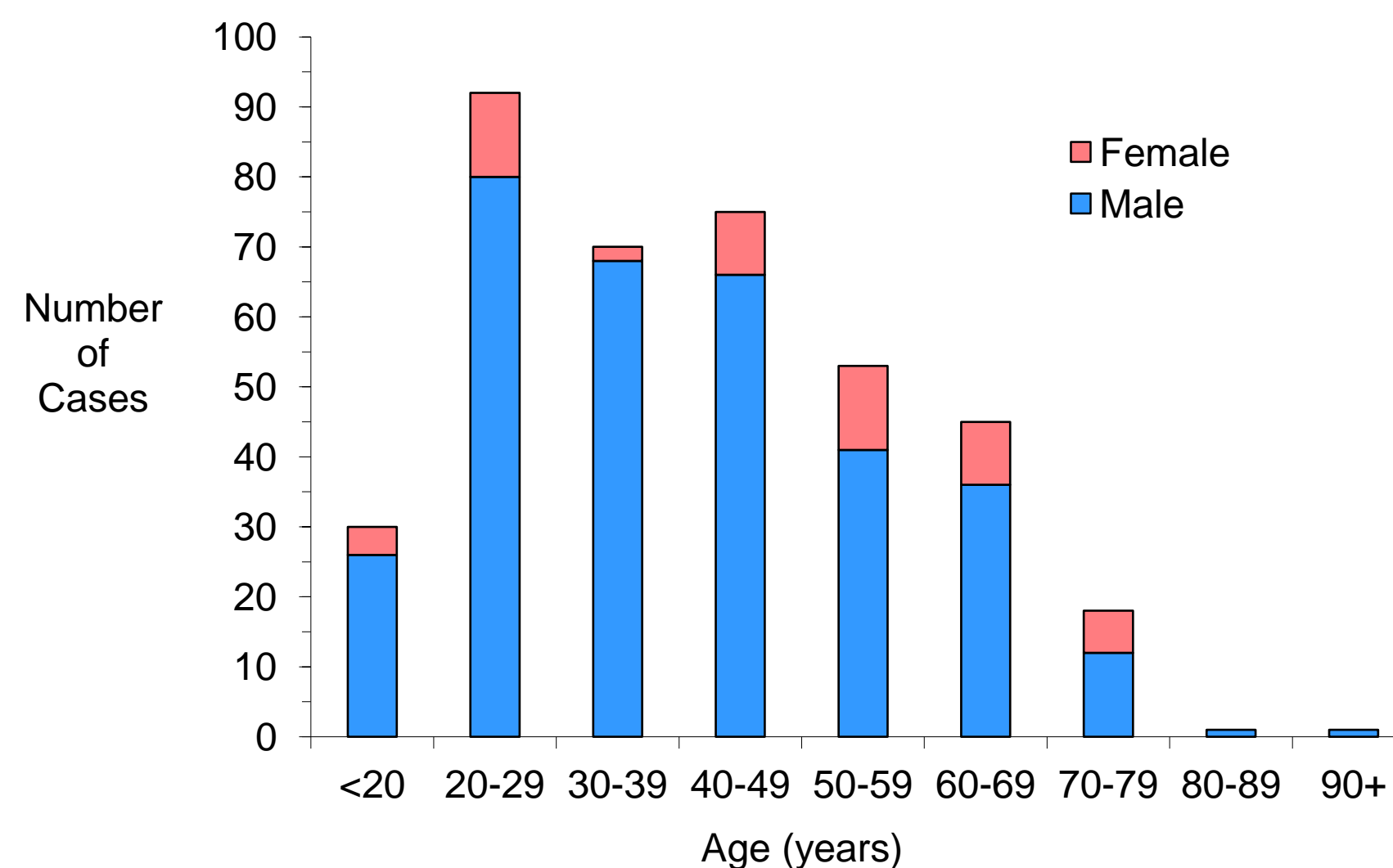


Figure 2: Age and gender distribution of victims (n=385)

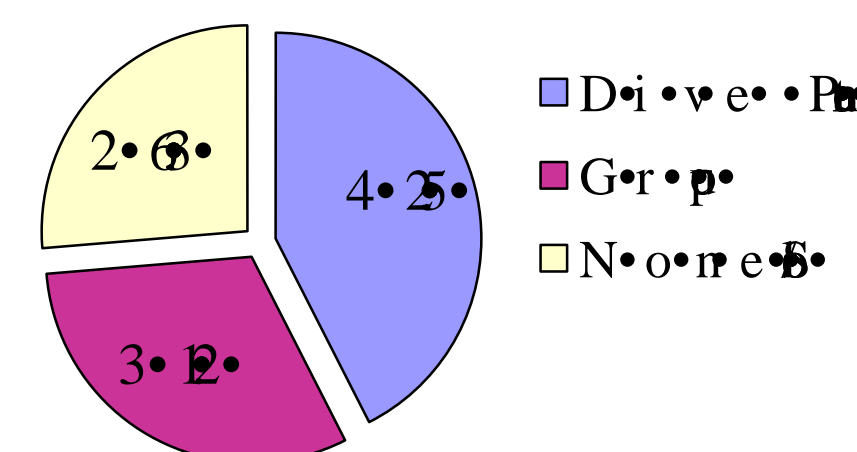


Figure 3: Dive support available to victims (%) (n=247).

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Discussion

- Breath-hold diving can be conducted with minimal equipment and training, attracting participants from novice to elite competitive.
- Identifying the root cause of accidents is critical to incident analyses.
 - Deficiencies in witness reports and the frequent lack of physical evidence make evaluation of fatal events difficult.
 - Triggers and disabling injuries are often difficult to ascertain.
 - Excessive hyperventilation is the most common trigger found.
- Capture of non-fatal incident data for which firsthand information can provide a more complete picture of contributing factors is essential to improve our understanding.
 - This requires a recognizable and convenient means to submit incident data and community support.

Conclusions

- Breath-hold incidents frequently present with incomplete history and poor physical evidence.
 - Excessive hyperventilation is the most commonly identified risk.
- Additional information is required to identify triggers and disabling injuries. Fully detailed non-fatal case reporting will likely be critical to improve our understanding of contributing factors.

New Initiatives

- Augmenting the ongoing case capture program, DAN has developed an online reporting system to collect case reports for which more complete information may be available.
 - Subgroup focus on breath-hold, rebreather and open-circuit modes.
 - <http://DAN.org/IncidentReport>