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EDUCATION

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Stathis Avramidis and Eleftheria Avramidou

Drowning is the third leading cause of unintentional injury death after motor vehicle collisions and falls (World Health Organization, 2004). According to the 4W model, a drowning incident might happen to Whomever (Who1: rescuer, Who2: victim), wherever and under whatever circumstances if there is an aquatic environment and human activity in, around, or above it (Avramidis, Butterly, Llewellyn, 2007). Although a large amount of published literature describes how to prevent an aquatic disaster or drowning (Carrera, 1997; Hunsucker, 1993; Morgan, 1999; Vlasich, 1989), many accidents are unpreventable (Vogelsong, Griffiths & Steel, 2000). Therefore, a greater emphasis on effective rescue remains necessary.

As lifeguard or rescue intervention in open water is very often the last option, rescuers are always the hidden victims of a disaster (Jones, 1985; Raphael et al., 1983; Shepherd & Hodgkinson, 1990). First, very frequently the lifeguards or rescuers are placed in danger due to extreme weather conditions. Aquatic emergencies might take part during the night, in fog, while it is raining, snowing, when visibility is poor and the waves high, or the tide is strong. In other words, apart from the victims, the rescuers are also likely to be in danger of being drowned (Avramidis, Butterly, Llewellyn, 2007). Second, even in cases where the rescuers are not drowned, they can be seriously injured while performing a rescue (Morizot, 2007). Finally, there is a possibility of developing post traumatic stress disorder (Grosse, 2001) with negative consequences for their psychological health (Goleman, 1995; Hidalgo & Davidson, 2000; Howsepian, 1998).

Consideration of these facts raises a series of questions about what measures the water safety organizations have taken to protect the aquatic professionals. Can we improve survivability of victim and rescuer by making better use of the existing rescue equipment or even by developing new ones? Alternatively, what types of rescue could be used that would not require any intervention by a beach lifeguard or rescuer when weather conditions are not safe for performing a rescue? Can we use animals when rescuing drowning victims or at least can we use some of their specific characteristics (e.g., vision, swimming speed, strength) to help us detect more easily or approach more quickly a drowning victim?

Researchers and water safety organizations have worked in both these directions in an effort to protect both the victim and the rescuer from drowning.

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Unfortunately, only a limited number of studies have been devoted to researching various types of rescue equipment (e.g., rescue tubes, swimming fins, etc.; Abraldes, Soares, Lima, Fernandes & Vilas-Boas, 2007; Leclerc, 2007). At the same time, several organizations have suggested or used animals during a rescue (e.g., Atkinson, Atkinson, Smith, Bem, & Hilgard, 1990; Betancourt, 1998; Hope, 1994; Marden & Horwitz, 1997). For example, Avramidis and Avramidis (2005) have suggested the use of horses for rescuing drowning victims in poor remote areas where other means of rescue are unlikely to exist, while for many years others have actually used dogs for rescuing drowning victims (Mott, 2003).

Although a review of the literature on the contribution of animals to rescue might initially seem irrelevant to aquatic research and education, the above two examples show that it is very relevant, because animals either have been used or it has been suggested that they could be used as "tools" (like fins, rescue tubes, etc.) for rescuing a casualty, using their vision or power or as rescuers (like human lifeguards and rescuers) for actually saving drowning victims. Therefore, because the knowledge of the existence and use of animals as tools or rescuers for an effective rescue intervention might increase safety for both the rescuer and the victim, a literature review aiming to identify animals that have been reported to perform or play their part during a rescue seems vital.

The Use of Pigeons in the Rescue Process

Pigeons have been used or suggested as a useful tool for detecting drowning casualties in the sea. In good illumination, pigeons have acuity of about 18 cycles/deg, which corresponds to 20/33 (6/10) while normal human acuity is 20/20 (6/6; Hodos, 1993). To use pigeons, they need specific training. For that purpose, Pavlov's "learning with substitution" was used (Pavlov tried in his experiments to teach dogs by manipulating the stimuli) as well as Skinner's "conducive learning" (providing more freedom of movement for the dog in an effort to avoid a passive attitude from the animal during the experiment but to gain more active participation; Danassis, 1991).

To our knowledge, it has not been reported if pigeons have actually been involved in a real rescue. However, the literature states that pigeons may take an active role within the rescue process. Instructors and organizations using knowledge from the above scientists trained pigeons to identify survivors at sea. The procedure adopted is a general recommendation (see Figure 1) that was referred to in a psychology text book (see Atkinson et al., 1990):

- The coast guard uses pigeons for identifying survivors.
- The pigeons are trained to react when they see the orange color (the international color of the life preservers, life rafts, and personal flotation devices) that is most visible in the sea (Malone, Sexton, & Farnsworth, 1951).
- Three pigeons remain in an appropriate place under the helicopter, watching in different directions (left, right, front).
- When a pigeon identifies an orange object or any other material floating above the water, it pecks with its beak an alarm button that is positioned under its face.
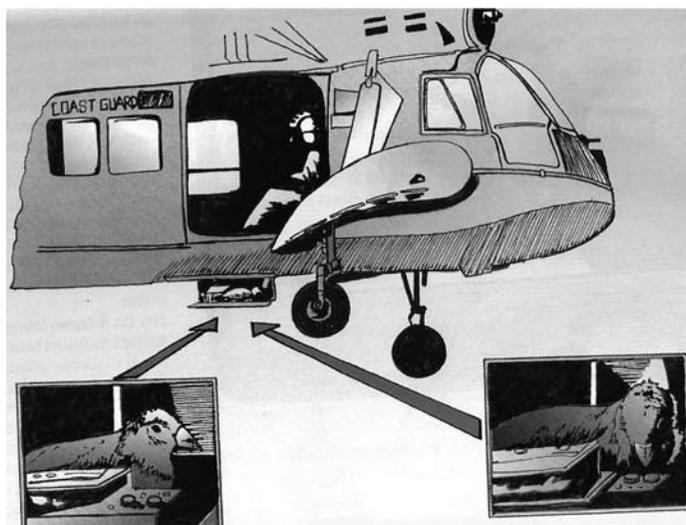
Figure 1 — How pigeons are positioned under the helicopter for detecting a survivor in the sea.

- The alarm sounds in the pilot's cabin.
- When the pilot receives this message, the helicopter changes its current course to the direction of the appropriate signal.
- Thus, action can begin immediately and due to the pigeons' training, the search becomes more focused.

The Use of Dogs in the Rescue Process

Dogs have been used for rescuing drowning victims. The Newfoundland is a dog that has great strength, intelligence, and excellent swimming ability (Aberman, 1979; Avramidis, 1999; Drury & Linn, 1997; Marden, & Horwitz, 1997; Parparias, 1993; Ransford, 1996). These advantages (combined with its social attitude toward other animals, people, and especially young children) established the Newfoundland dog at the turn of the 20th century as being a devoted partner for every sailor while also being an extremely able rescuer. When a person is in danger of drowning, the Newfoundland approaches and provides buoyancy to the victim (Avramidis, 1997; 2002) by (a) maintaining its head under the shoulders of the person, thus holding the victim above the water, which allows them to grab the body hair of the dog and (b) grabbing the unconscious victim's wrist with its mouth to tow him back to safety. The Newfoundland is assisted greatly by its tail that works like a helm. In a less stormy sea, the Newfoundland is able to tow a boat by its rope.

In contrast to pigeons, for which there is no real evidence of them actually being used in a rescue, Newfoundland dogs have been used successfully several times in the past. In noting some remarkable rescue incidents, one must mention

the rescue of Napoleon the Great; he escaped from the Island of Elba in 1815 (Winwar, 1953), aiming to sail to France. One night, the sea was extremely rough and suddenly Napoleon fell into the water. None of the sailors were willing to put themselves in danger to rescue him, but a fisherman's Newfoundland dog jumped into the water and rescued him (Avramidis, 1999; Wikepedia, 2007a). In 1800, every single coastal lifeguard station in New England had two Newfoundland dogs as part of the lifeguard team (Avramidis, 1999). A painting from the Victorian era (entitled "Saved") depicts two Newfoundland dogs holding a young boy by his arms. There are similar paintings by other artists (see Figure 2; Wikipedia, 2007b). Lord Byron wrote a poem, from which everybody can identify the love of Newfoundland dogs for the human race (Hope, 1994). Finally, in the early 1900s, a dog that is thought to have been a Newfoundland saved 92 people who were on a sinking ship in Newfoundland during a blizzard. The dog retrieved a rope thrown into the turbulent waters by those on deck and was able to bring the rope to people waiting on the beach. A breaches buoy was attached to the rope, and all those aboard the ship were able to get across to the shore (Wikipedia, 2007a).

The Use of Horses in the Rescue Process

Horses have also been used in the treatment of drowning victims. In 1812, horses were used on the beaches by lifeguards who pulled out drowning casualties. The unconscious victim was put on the horse's back and then the horse ran, presumably simulating the movement of inhalation-exhalation (Figure 3). The lifeguards kept one horse near the lifeguard tower. At that time, there were no other types of lifeguard equipment available. The outcome was thought to be positive. (Dworkin, 1999). Recently, Avramidis and Avramidis (2005) have suggested using

Figure 2 — A Newfoundland dog saves a young boy (Landseer 1802-1873).

Figure 3 — The use of a horse for resuscitation. Taken from Dworkin, 1999, with permission.

horses for rescuing drowning casualties in poor remote areas where other means of rescue are unlikely to exist. More specifically, they suggested that a trained horse could swim up to the point where the victim is, having round its neck a rescue tube that the casualty could grab; however, as far as we know, no organization has used horses for rescuing humans.

The Use of Dolphins in the Rescue Process

The use of dolphins in rescuing humans has been instinctive, rather than the result of formal training. Dolphins have rescued drowning victims or abandoned survivors by allowing them to ride on their back (Betancourt, 1998; Catton, 1990) or by psychologically encouraging them with their presence to continue their efforts to reach the shore (Waga News, 2001).

Dolphins have been reported to have rescued humans in both historical and mythological narratives. Specifically, a mythological narrative from 400 B.C. describes Taras, a young boy who was saved from drowning when a dolphin was sent by Poseidon to save him (Sekulovich, 2004). In another myth, Herodotus refers to the rescue of Arion, a male lyric poet, who was stolen and thrown into the sea by the seamen on the ship that was bringing him back to his country, Sicily,

after his successful participation in a contest. A group of dolphins following the ship heard his song, and when he was thrown into the water, they carried him safely to the shore (Cotterell & Storm, 2004).

However, dolphins did not rescue humans in mythological tales only, but also in reality. According to Plutarch, a local from the Island of Rhodes, saw some fishermen killing dolphins. He tried to negotiate for the dolphins to be set free. On his way back, while traveling between the Islands of Paros and Naxos, his boat capsized but eventually he was saved from drowning when a dolphin carried him on its back to the shore (Catton, 1990). Betancourt (1998) describes the rescue of a woman who had been swept out to sea by undertow, and she would either have drowned or been attacked by a shark when a dolphin appeared and saved her life. A similar narrative is reported in a video, where a girl who had gone with her buddy for snorkeling on an Australian beach, was encouraged by a group of dolphins (Figure 4) to carry on swimming back to the shore, despite the fact that she had been left alone, she was exhausted, and feared that she might be attacked by sharks (Waga News, 2001).

Discussion

Considering all the information above, and because the animals are not always trained for rescue, the first question that arises is how and why they rescue drowning victims? Any explanation is different from one that could be given for human rescuers. Two experts gave their explanations in a television program that discussed animal rescues. According to the first expert, Dr Hart, "It shouldn't surprise us too much. A Newfoundland is very comfortable in the water and so it was, I think, very natural for a Newfoundland that loves the water and, again, perhaps sees humans as part of his family, to go and help someone that is floundering in the water" (Waga News, 2001).

The second explanation was given by Mr. Jeffrey (Center for Animals in Society) who added, "I don't believe that a dog saves somebody by instinct. You cannot say that it is in the breed, and that we bred for that, because there are many dogs that are bred for that and don't do it, and there are many that aren't bred for

Figure 4 — A girl who was saved by a group of dolphins while she was snorkeling.

that and do it. We have hundreds believe that there are guardian angels out there, and I think dogs are capable of doing the various kinds of things that we hope a guardian angel would do" (Waga News, 2001). One can easily give a similar explanation for dolphins. No report has been found of an instinctive rescue initiative by horses or pigeons. Therefore it seems that animals can rescue humans either by instinct or by being trained for rescue.

A second issue that was raised from the current review was that animals rescued drowning victims either when they were completely helpless due to lack of human assistance (e.g., Waga News, 2001; Wikipedia, 2007a) or in cases where despite human presence, the weather conditions were too extreme for a human to initiate a rescue (e.g., Betancourt, 1998; Wikepedia, 2007a). Those cases demonstrate animals' superiority over humans in given moments of emergency and show clearly the benefit of training and using animals in rescue.

Given the existence of very sophisticated rescue methods, equipment, quality, and number of professional rescuers (lifeguards or lifesavers), there will, nevertheless, always be the likelihood of experiencing a drowning incident where no rescuer is on duty to respond, thus the contribution and training of animals in aquatic rescue seems vital. The more animals that are trained in rescuing humans, the more chances one might have of being rescued by one of them, when other more professional help is not available or is unable to be effective.

Conclusion

Dogs, horses, dolphins, and pigeons have either been used successfully or suggested as rescuers for aquatic emergencies involving drowning. Among these, dogs are still serving humanity and belong to special clubs that use them for Search and Rescue operations. While other rescue methods have already replaced the old methods of identifying and rescuing a victim, with the use of more modern rescue equipment, it still seems reasonable to use animals in rescues where usually humans would not be able to be effective.

Acknowledgment

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