

SOUTH



AUSTRALIA

## FINDING OF INQUEST

*An Inquest taken on behalf of our Sovereign Lady the Queen at Adelaide in the State of South Australia, on the 23rd, 24th, 25th and 25th of February 2004 and the 6<sup>th</sup> day of April 2004, before Wayne Cromwell Chivell, a Coroner for the said State, concerning the death of Rex Alexander John Humberstone.*

*I, the said Coroner, find that, Rex Alexander John Humberstone aged 52 years, late of 28 Chipper Court, Victor Harbor, South Australia died at near Marion Bay, South Australia on the 10<sup>th</sup> day of March 2002 as a result of salt water drowning.*

### 1. **Introduction**

- 1.1. On Sunday 10 March 2002 Rex Alexander John Humberstone went diving with his friends David Mills and Paul Guppy. Messrs Mills and Guppy had not met before that day.
- 1.2. Mr Humberstone's son Cain has stated that his father was 'fit and healthy', and that 'he has been diving most of his life and has never had any problems' (Exhibit C13a). Mr Mills said that he and Mr Humberstone had attended a diving course together about 18 years earlier (T120).
- 1.3. The three men left in Mr Humberstone's boat from Marion Bay, at the southern end of Yorke Peninsula and headed for Chinamans Hat Island. The trip took 10 to 15 minutes.
- 1.4. Mr Mills described the day as 'excellent for diving'. It was about 22°C, a slight North-Easterly was blowing, the sea was calm and the water was clear - visibility was about 20-30 feet (Exhibit C57, p2).

- 1.5. The men were using 'hookah' gear, consisting of a motor-driven air compressor on the boat connected by lines to the divers, separated by a 'Y' piece, breathing the air through regulators. Mr Mills said that Mr Humberstone checked the gear before the dive, he drained the air lines, cleared the charcoal filters and drained the water trap. He started the motor and checked the air pressure.
- 1.6. Mr Humberstone and Mr Mills dived at Chinamans Hat for 30 to 45 minutes. Mr Guppy remained in the boat as an observer (a suitable precaution - see Hill and Dawson, inquest number 53/93). When the divers did not find crayfish, they discontinued and Mr Humberstone took the boat around to Reef Head, a journey of about 30 minutes, and they began diving again. Mr Mills described what happened then:

'We both jumped in the water. We swam together the whole time looking for crays. We were checking out reefs and ledges. We had been down for about 15 minutes and had got some abalone's and crayfish. We were in sight of each other the whole time. My ears started to hurt a little bit and I was getting a slight pain on the side of my temple. I cleared my ears which helped but there was still a slight pain. I've been diving long for years and have had this before. I didn't want to risk any injury to my ears and Rex and I already had a couple of crays, so I thought that it was time to go up, I signalled to Rex using my thumb indicating to go up and he signalled back with his thumb. We were down about 20-25 feet and were slowly (sic) ascending. Once at the surface we were swimming side by side back to the boat. We were about 10-12 feet from the boat. On getting to the side of the boat, I looked back and suddenly couldn't see Rex any more. I quickly looked around and then looked under water and saw him on the sea bed, he was lying on his back. He had both arms up in front of him with his palms up, there was no air coming out of his regulator and he wasn't moving at all. I still was getting air through my regulator and was not having any trouble breathing. I went and swam straight down to him and I could see that (his) face looked different. He is fairly well tanned and I noticed that even under water he looked pale and pinkish. I think his eyes were open. I grabbed him on the chest and shook him and there was no movement and I got no other response. I then unclipped his BCD vest and unbuckled his weight belt. I had to get his arms out of the harness and vest. This took a bit of time and was difficult. I just dropped all that gear and then I lifted him straight to the surface. At the side of the boat I got him half in and I got Paul to grab hold of him. I went around the ladder at the rear of the boat and hoisted myself in and Paul and me pulled Rex into the boat.'

(Exhibit C57, pp3-4)

- 1.7. When they managed to get Mr Humberstone into the boat, they noticed that he was not breathing, there was no pulse, and there was a blue tinge to his face and mouth. They attempted cardio-pulmonary resuscitation but when they did not get a response,

Mr Mills decided to get back to Marion Bay as quickly as possible. The trip took about 30 minutes.

- 1.8. When they arrived at Marion Bay, Mr Guppy went off to get assistance. He walked a short distance and began having breathing difficulties and sat down.
- 1.9. Several people arrived, some were off-duty ambulance officers, and cardio-pulmonary resuscitation was performed on Mr Guppy who had by this time collapsed (see Exhibits C17a, C18a). An ambulance arrived at about 2:30pm and continued resuscitation efforts on Mr Guppy, but this was discontinued at 2:45pm, and he was pronounced deceased.
- 1.10. Dr George Kokar later formally pronounced the lives of Mr Humberstone and Mr Guppy extinct at the Yorketown Hospital (see Exhibit C14a).

## **2. Cause of death**

- 2.1. A post-mortem examination of the body of Mr Humberstone was performed by Dr R A James, Chief Forensic Pathologist at the Royal Adelaide Hospital on 12 March 2002. Also present was Dr C J Acott, Director, Diving Medicine at the Royal Adelaide Hospital.
- 2.2. Dr James determined that the cause of death was salt water drowning (Exhibit C15a, p1). His comments were as follows:
  2. The post mortem has shown features of salt water drowning which presumably represents the immediate cause of death. The appearances of the lungs and the frothy fluid described by his dive partner support this cause of death.
  3. There is no known evidence of mechanical malfunction with the hooker gear. His CoHb level was only 2% and his dive partner apparently dived without any medical concern.
  4. There is no evidence of baro-trauma ascent either at post mortem or on the x-rays. Equally no air bubbles were found in the superficial cerebral vessels. The occasional bubble of air within the right pleural cavity is attributed to early putrefaction given the identified bacterial overgrowth on the lungs with histology.
  5. Certain precipitating factors are regarded as significant given his death by drowning. The background of medical disease is probably causally related to his death.
    - a) There was marked obesity with a body weight of 132kg.
    - b) There was existing emphysema with at least one large bulla in his left lung.

- c) There was severe fatty change in his liver probably reflecting his obesity.
- d) Moderate coronary atheroma was present with minor ischaemic cardiac fibrosis.

The deceased was wearing a tight two piece wet suit. It was apparently only able to be put on with considerable assistance. In addition it was very difficult to remove the leggings of the wet suit after death. A tight wet suit of this sort probably resulted in significant chest compression even when at rest and this is likely to be associated with significant hypoxia with exertion while swimming. While the precise mechanism of his drowning has not been established his less than optimal physical condition has allowed him to drown in a situation of exertion in a hostile aqueous environment.'

(Exhibit C31a, pp4-5)

- 2.3. Dr Acott's is a very experienced diver, and is one of Australia's leading experts in diving medicine. His comments were as follows:

'Mr Humberstone was obese. Post mortem examination showed:

1. coronary artery disease;
2. an enlarged heart; and
3. apical lung bullae.

(Apical bullae act in a similar way to pleural adhesions – the lung doesn't empty in a controlled way causing tearing of lung tissue).

He was also wearing a tight wet suit, which would have:

1. made it difficult for him to breathe;
2. diverted his blood supply away from his 'skin' (peripheral circulation) to his 'central' core increasing the work performed by his enlarged atherosclerotic hart.

Water immersion would magnify these effects. In addition, immersion decreases a diver's lung volumes hence decreasing the amount of oxygen available. Although this does not affect 'fit' divers it would have had considerable effect in Mr Humberstone.

The combined effect of lower oxygen content in his blood and an increase load on his dilated atherosclerotic heart would have caused either:

1. an arrhythmia;
2. acute heart failure; or
3. a combination of the 2.

He would have then become hypoxic leading to unconsciousness hence drowning. It is impossible at post mortem to detect if any of the fluid found in the lungs was due to cardiac failure.'

(Exhibit C66, p3)

- 2.4. Dr Acott said that if Mr Humberstone had undergone an appropriate diving medical examination recently, he would have been advised not to dive once a chest X-ray and exercise ECG revealed his enlarged heart, his chest pathology, and his obesity (T314).

### **3. Diving issues**

- 3.1. Mr Humberstone's diving equipment was recovered from the seabed by the Water Operations Unit of South Australia Police. It was inspected by Senior Constable Allen. He found the engine and compressor in good condition and operating correctly, airlines, the regulator and buoyancy control device (BCD) were functional and adequate for the task, although the automatic oral inflator valve malfunctioned.
- 3.2. The weight belt weighed 20kgs, which Senior Constable Allen described as 'exceptionally heavy'. The belt had been modified so that it had shoulder straps (no doubt to assist in carrying such a large weight) which Senior Constable Allen described as 'complete contradiction to safe diving practice' (Exhibit C21a, p7). This criticism arises from the fact that weight belts are designed so that they can be released quickly in an emergency. In this case, since the shoulder straps were under the BCD, they could not be released until the BCD was taken off. The statement of Mr Mills, quoted earlier, demonstrates the difficulty involved.

### **4. Conclusions**

- 4.1. Senior Constable Allen concluded that Mr Humberstone's obesity, his lack of cardio-vascular fitness, his exceptionally heaving weight belt, his very tight wet suit which would have been compressed even more at depth, and his malfunctioning BCD, all contributed to Mr Humberstone's death. He postulated two scenarios, each of which could explain what happened.

#### **'Scenario One**

Humberstone commences swimming to the surface in company with Mills. Humberstone attempts to put air into his buoyancy control device to assist in his ascent not aware that vest is faulty. He has to work hard at swimming to make the surface and once on the surface has to fin hard to stay there. Humberstone is already restricted in his breathing due to the tight wetsuit. Humberstone suffers cardiac arrest, loses consciousness, sinks quickly to the seabed. He is now no longer keeping a tight seal with his mouth on the regulator, inhales water and drowns.

### **Scenario Two**

Humberstone swims to the surface in company with Mills. Both divers commence swimming to the boat. Humberstone is having difficulty staying on the surface due to his vest not functioning he falls back and out of sight of Mills. He is unable to release his weight belt due to the harness he is wearing. He becomes fatigued and ingests a small amount of water past his regulator causing a coughing reflex, sinks below the surface and drowns.'

(Exhibit C21, p12)

- 4.2. I agree with these conclusions. The finding of Dr James and Dr Acott are consistent with either of the above scenarios.
- 4.3. I find that Mr Humberstone became fatigued while diving, exacerbated by his obesity, tight wetsuit and water immersion, to the extent that he became hypoxic, unconscious leading to salt water drowning.

### **5. General considerations**

- 5.1. I have heard evidence in the inquests into the deaths of Robert Anthony Walker, Neville Arthur Kinnear, Rex Alexander John Humberstone, Deborah Christine Campbell and Jennifer Lee Barrington at the same time. These deaths occurred between 24 February 2001 and 21 April 2002. A startling number of similarities exist in these five cases:
- In three cases a CAGE (cerebral arterial gas embolism) was involved - Walker, Kinnear and Barrington;
  - In four cases a lack of cardio-vascular fitness was evident - Walker, Kinnear, Humberstone and Campbell;
  - Four of the deceased were obese - Walker, Kinnear, Humberstone and Campbell;
  - All of the deceased had medical conditions relevant to the cause of death which could have been detected in a properly conducted medical examination:
    - enlarged heart (cardiomegaly) - Walker, Kinnear, Humberstone;
    - other heart disease (myocarditis) - Walker;
    - lung disease - Kinnear, Humberstone, Barrington;
    - back problems - Campbell, Barrington;
    - oesophageal reflux - Campbell;
    - ear problems - Barrington.

- In four cases, the deceased wore a wet suit that was too tight, interfering with breathing and possibly causing reflux - Walker, Kinnear, Humberstone and Campbell;
- In two cases, the deceased wore a weight belt that was too heavy causing excessive fatigue – Campbell and Humberstone; and in one case, the weight belt could not be quickly released - Humberstone;
- In one case the BCD was faulty, also causing excessive fatigue - Humberstone;
- In only one case did the ‘buddy’ system break down - Barrington;
- In two cases, poor diving technique may have contributed to the death - Walker, Campbell;
- Two of the deceased had recent diving training but were inexperienced - Campbell, Barrington, and the other three were experienced but had not had recent training - Walker, Kinnear, Humberstone;
- Three of the deceased had recently seen a doctor - Walker had been told by his cardiologist not to dive but ignored the advice; Humberstone had recently seen his General Practitioner but not in relation to diving; and Barrington had ignored her General Practitioner’s advice to consult her surgeon, and had earlier misled the medical practitioner conducting the diving medical examination;

5.2. Dr Acott said that in his opinion all of these deaths were preventable. He said:

'A diving medical is required before a candidate commences scuba diving. This medical, in SA, does not have to be performed by a medical practitioner knowledgeable in diving medicine. (If the physics and unique physiology involved with diving and hence the problems are unknown the risks can't be discussed). Once the candidate is 'passed fit' he/she is fit for the rest of their lives. This is 'nonsense'. Commercial and professional divers are required to have an annual medical by a medical practitioner suitably qualified in diving medicine. However, annual diving medicals for 'recreational divers' are controversial. There needs to be some recommendation that states that if a diver suffers an illness or their medical or general fitness changes they should seek guidance from a suitably qualified medical practitioner regarding the risks that may be associated with continuing to dive. Perhaps annual self assessment forms should be introduced that will highlight problems which will then lead to a discussion with a suitably qualified medical practitioner.'

(Exhibit C66, p4)

5.3. Dr Acott suggested that:

- Recreational diving medical examinations should be conducted by medical practitioners who are trained in diving medicine;
- The medical practitioner conducting the recreational diving medical examination (if he/she is not the subject's regular medical practitioner) should require the subject to produce a referral letter detailing the subject's medical history as far as it is known;
- Candidates should be made aware by the medical practitioner that health factors are a concern and are potentially lethal not only to the patient but to their 'buddies' in the water, so they are under a duty to disclose them.

5.4. Senior Constable Allen suggested that a public awareness campaign should be conducted to remind divers of the dangers associated with hookah equipment (Exhibit C21a, p13). Mr Humberstone's hookah equipment (as distinct from the BCD and weight belt) was not faulty and did not cause Mr Humberstone's death, so I am prevented by Section 25(2) of the Coroner's Act from making such a recommendation.

5.5. Senior Constable Allen also recommended that all recreational divers should undergo a regular medical examination (Exhibit C4a, p25).

5.6. Senior Constable Wright suggested that there are three options available to address these issues:

1. Do nothing;
2. Conduct an educational or public awareness campaign about the dangers of diving with a medical condition and recommending regular checkups;
3. Make periodic medical examinations compulsory.

5.7. Senior Constable Wright also pointed to the fact that occupational divers are required to undergo an annual medical examination by a medical practitioner trained in hyperbaric medicine.

5.8. The difficulties with option 3 are:

- Resentment from recreational divers;
- Expense;
- The lack of sufficiently trained medical practitioners;
- Unenforceability.

5.9. Senior Constable Wright commented:

'As recreational SCUBA diving is just that, a recreation, it is my opinion that it should remain as free from legislation and regulation as is safely possible. My preferred option would be Option 2, for the recreational diving industry to take steps to promote safe diving practices by the development of an education programme specifically aimed at the need for divers to maintain a good level of fitness.'

(Exhibit C65a, p16)

5.10. Senior Constable Allen made a similar recommendation (Exhibit C4a, p25). I agree.

## 6. **Recommendations**

6.1. Section 25(2) of the Coroner's Act 1975 empowers me to make recommendations in certain circumstances following an inquest. The section reads:

'A coroner may add to his or her finding any recommendation that might, in his or her opinion, prevent, or reduce the likelihood of, a recurrence of an event similar to the event that was the subject of the inquest.'

6.2. Pursuant to that Section, I make the following recommendations:

1. All persons engaged in recreational underwater diving should undergo an examination by a registered general medical practitioner trained in hyperbaric medicine on a regular basis, preferably annually but not less frequently than every two years.
2. Medical practitioners should decline to conduct such examinations unless they are appropriately qualified to do so.
3. Medical practitioners conducting such examinations should, if they are not the subject's regular medical practitioner, require the subject to produce a referral letter detailing the subject's medical history as far as it is known.

4. Medical practitioners conducting such examinations should warn the subject that diving is a potentially lethal activity if undertaken by a person with certain medical conditions, and that absolute honesty in providing background medical history is called for.
5. If there is any doubt about the subject's health, the medical practitioner should arrange such follow-up tests as chest X-rays, hypertonic saline tests, or whatever else may be indicated, before passing the subject as fit to dive. Any doubt should be resolved against passing the subject as fit, until such follow-up tests demonstrate fitness to dive.
6. The recreational diving industry should conduct an awareness campaign among its member organisations and the diving public about the dangers of diving with certain medical conditions, the need for regular medical examinations at least every two years, the need for absolute honesty during such examinations, and the responsibility a diver has both personally and to his or her diving colleagues to ensure that he or she is fit to dive.

*Key Words: Drowning; CAGE; Underwater Diving; Hyperbaric Medicine*

*In witness whereof the said Coroner has hereunto set and subscribed his hand and*

*Seal the 6<sup>th</sup> day of April, 2004.*

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*Coroner*