FINDING OF CORONER
UNDER CORONERS ACT 1988

I, Catherine Heather Ayrton, Coroner at Hokianga/Bay of Islands

Hereby certify that at an Inquest completed on the 10th day of June, 2005 -at the Kaikohe District Courthouse, **having enquired into the time, place, causes and circumstances of how** Winifred Hazel ABSALOM, of 15 Woolmer Drive, Willesborough, Ashford, Kent, United Kingdom, a 53 year old tourist, (date of birth 26/07/1951) **Died; I found;** That her death was primarily the result of a stomach rupture while recreationally diving at the site of the Rainbow Warrior off the Cavalli Islands in Northland, (New Zealand) on February 10, 2005.

And pursuant to section 15 (1) (b) of the Coroners Act 1988 I make the following recommendations or comments;
Such rupture is a documented rare complication of scuba diving. The cause of the rupture was found to be the result of the pressure of gas in the peritoneal cavity which inflated her abdominal cavity causing an upward displacement of the diaphragm impairing her breathing and leading to asphyxiation.
The pressure of gas possibly originated from swallowing air in short gasps and expanding on ascent could have caused rupture of the stomach wall but the possibility of an inherent weakness of the stomach lining is not discounted.
Although there was no evidence of significant gastritis, focalized weakening cannot be excluded.

The Court is satisfied that normal dive procedures were in place and that the equipment being used conformed to professional requirement standards. The suggestions of Sergeant Zane Smith of the Police National Dive Squad at regular medicals are needed to make sure that a diver is up to the task and that they have not developed medical conditions that make them unfit to dive and that such medicals need to be completed either by the diver's own General Practitioner who would be fully aware of their past and present medical condition or by a Doctor specializing in diving; And that there should be more specific detailed standardized medical/screening questionaires for charter and training groups with such questionaires written in consultation with Industry groups, including Medical and representatives from Diver Training organizations are commended as recommendations to be heeded by people associated with the dive industry and those intending to dive, especially those who have or have had medical problems or are of a relatively older age group.

Dated at Kaikohe this 8th day of August 2005.

C. H. Ayrton Coroner

Inquest into the Death of **Winifred Hazel ABSALOM.**
Of 15 Woolmer Drive, Willesborough, Ashford, Kent, United Kingdom. Coroner's Notes;

The possible causes and circumstances surrounding the death of this 53 year old woman have been the subject of detailed investigations.

Inquiries began after she evidently was seen to have not been breathing and was limp in the water at the 5 metre decompression level during ascent on an organized scuba dive at the sunken Rainbow Warrior off the Cavalli Islands from the Northland Coast of New Zealand shortly before 11.20am on February 10, 2005.

Her dive buddy was a Metropolitan Police Officer from Woking Surrey, United Kingdom, Paul Gerald Stephenson.
In his evidence he described how members of the group on the Paihia Dive Boat going out to the Rainbow Warrior were given Health and Safety and Emergency briefing and an assessment made of the level of the diving skills of the 8 or 9 customers. Details including weighing were recorded on the Dive Master's Log and there was also a pre-dive briefing.

He said Ms Absalom had told him that she was an Advanced Diver of some 20 dives. He said she was in good spirits and her hired wet suit seemed to fit her well. He said that during the 25-26 metre dive she had shown no signs of stress or tension and that when they were around the Rainbow Warrior, he always received a clear response as they signalled to each other.
He said that as they were heading toward the dive line he had noticed that Ms Absalom was consuming 'quite a bit of air but nothing major'.
She had posed for a photo at the stem of the Rainbow Warrior.
At about an 18 metre depth during the ascent he said he had positive responses from her. At the 5 metre mark had signalled for her to level off.
He said she was rising above the 5 metre mark and that he had signalled to her to 'come down.'
He said. he grabbed her Buoyancy compensator to keep her at the 5 metre level and that he had to lock his legs around the dive line to stop himself from being carried up by her. When he checked her after about three minutes on the line he said that her eyes were open but that he 'got no response.'

He said he came to the conclusion that he had a potential unconscious diver under water and had to get her into the boat as a matter of priority.
When he could neither hear or feel her breathing, or see her chest rising, he immediately provided two rescue breaths whilst still in the water but that there was no obvious response.

Mr Stephenson assisted other people to lift her out of the water and on to the dive boat where CPR was begun.

When the Northland Rescue helicopter arrived at the Dive boat at approximately 12.10pm she could not be revived.

She was flown to the Whangarei hospital Mortuary and a CT scan and then a Post Mortem were performed.

Pathologist Dr Julian de Beer MBChB, Mmed Path stated in his preliminary report that in his opinion that her death was due to Barotrauma caused by Scuba diving accident pending further investigation.

In his final summary he detailed;

1. Severe pneumoperitoneum with associated rupture of the smaller curvature of the stomach;
2. Moderate atherosclerosis of left descending coronary artery;
3. Surgical emphysema of the mediastinum and skin over chest as well as soft tissue around stomach;
4. Evidence of resuscitation attempts.

A report by Dr Kim Shepherd on the CT head and chest scan prior to autopsy had confirmed the presence of air in the subarachnoid space and in the vessels of the mediastium and liver, features of which the report stated were stated to be in keeping with extensive air emboli related to barotrauma

Dr de Beer concluded that in his opinion the findings of the post mortem would be consistent with the death due to severe pneumoperitoneum causing upward displacement of the diaphragm, imparing breathing.
He stated that the severe pneumoperitoneum was caused by rupture of the stomach along the small curvature with subsequent leakage of air into the peritoneal cavity which he stated that was described as a rare occurrence in rapidly ascending scuba divers.

And he attached a copy of an article from the Croatian Medical Journal 43 (10 42-44 (2002) Gastric Rupture in a Diver Due to Rapid Ascent describing stomach rupture as an extremely rare diving accident and which if not recognized in time may have serious consequences.

The Pathologist also stated that the significance of the moderate atherosclerosis of the left coronary artery of the decedent was difficult to determine but may have led to an episode of heart ischaemia and loss of consciousness.

Dr Christopher Sames, Medical Officer at the Hyperbaric Unit at the Royal New Zealand Naval Unit at Devonport, New Zealand examined information relating to the circumstances surrounding the death and perused extracts of the postmortem report, a report from her general practitioner in Great Britain and examined a list of medication found in her property after her death.

He drew the conclusions;
That the post mortem evidence of pneumoperitoneum (air in the abdominal cavity) meant it was possible that the immediate cause of death was either septic shock, leading to cardiac arrest because of the rupture to her stomach, or because of the large amount of air under the diaphragm, impeding the lungs to the point where she was unable to breathe;
That it is possible that her heart condition contributed, leading to cardiac arrest.;
That with the CT evidence of air in the blood vessels of the brain (a cerebral artery gas embolism) she may have suffered a pulmonary barotrauma, which allowed air to enter arterial circulation.
Referring to the cause of the stomach rupture, he said that if a large volume of air is in the stomach from gulping/swallowing air, it could expand on ascent and cause rupture of the stomach.
He said that would be a very rare occurrence but would be more likely if there was a weakness in the stomach wall.
He said that if the deceased had been taking Voltaren (as found in her property) or any other non-steroidal anti-inflammatory medication, this could have affected the integrity of the stomach wall.
He also said that a rupture of the stomach or bowel is rare in diving but that risk factors are bowel surgery stomach stapling or Nissen fundoplication.

Dr Sames also said that anyone with a history of hypertension and hypercholesterolaemia should have had a cardiology workup, including exercise ECG, prior to being declared fit ,~to dive and that people on centrally acting medication such as Sumatriptan, Prochlorperazine and people who suffer

migraine headaches should not be diving and that people with ischaemic heart disease should not be on Sumatripan even if they have controlled hypertension.
The medications had been found in the property of the deceased.

Results of toxicology undertaken by the Institute of Environmental Science & Research Ltd., at Porirua, Wellington, New Zealand found no evidence of recent use of opiate type drugs, methamphetamine, MDMA (Ecstasy), cocaine or cannabis, nor alcohol was detected in the blood.
A detected level of quinine was less than that associated with therapeutic use of quinine as an anti-malarial drug but, the report stated could have arisen from drinking tonic water.

Evidence from her New Zealand host, Andrew Dyson that she had not drunk any alcohol the night before the dive has been noted.

Apart from the quinine, no medicinal drugs that affect the mind, alter mood or cause sleep and no common analgesics, including diclofenac (Volatren) were detected.
A special test had been requested to determine whether 25mg dosage of voltaren that the decedent had been using might have been of significance.

The contents of the Dive Cylinder were analysed and it was reported that the cylinder was received in good condition with a positive gaseous pressure.
It was reported that 'The contents of the cylinder **does** conform to NZs 2299.1.1999 for compressed breathing air, and **does** conform to BS 4001. -

Turning now to the diving experience of the deceased.

Mr Dyson said in his evidence that he was aware that Miss Absalom had dived at the Great Barrier Reef while she was in Australia while travelling around Australia before arriving in New Zealand and he said he knew she had done a Dive Refresher Course in the Red Sea in September 2004.
He said he believed she was a reasonably experienced Diver.

Mr Dyson said she was showing no signs of distress.

But she had mentioned that she had taken some anti histamines for mosquito bites.

He also said that he had located some Voltaren Rapid tablets in her room but he did not know if she had been taking them.

The comprehensive report of Sergeant Zane Smith, Officer of the Police National Dive Squad is a most important part of the evidence provided for this Inquest.

Particular points from the report that the Court has noted are that;

The witness Mr Le Couteur, owner of Bay of Islands Dive, has stated that the deceased told him she was a 'bit of a gas guzzler' and had requested, a 15 litre tank while the remainder of the charter group, but not the instructors used 12 litre cylinders.
The staff and instructors used, 15 litre cylinders in case they needed it to assist others in the dive;
NB;Mr Le Couteur told the Coroner during the **Inquest that Ms Absalom had in fact used a 12 litre tank.**

Sergeant Smith said in his report that he found the deceased's cylinder contained 75 bar and she had ample air left in her cylinder to complete a safe ascent and the planned safety stop at five metres for three minutes.
He did not believe the cylinder or its contents were a contributing factor to the death; The BCD (buoyancy Compensating Device) regulator and gauges were received correctly assembled in the

cylinder;

The positioning of the regulator LP hose and second stage LP whip were positioned would not have affected the function of the equipment and was not likely to *have* been a contributing factor to the deceased's death;

The lever on the deceased's diving equipment was adjusted slightly off centre towards the positive indicator;

He did not consider the contents gauge of the BCD to be a contributing factor to the death;

He did not believe the weight belt or the amount of weight that the deceased had was a factor in the death;

That the deceased held a PADI Advanced Open Water Certificate that had been issued by the Emperor Scuba Schools in Sharm El Sheikh, Egypt on 24 September 2004;

That prior to completing the course she had completed a medical questionnaire and was examined by a Doctor and received a medical clearance;
That after completing the course, the deceased had dived in Australia with her dive book showing that she completed 18 additional dives.

The deceased's dive on February 10 2005 was within the limits outliend in DCIEM tables;

That he believed that the deceased did not have a rapid ascent and had followed standard diving practices;

That swallowing of air would be unlikely to be the result of mechanical malfunction in this case and rather involuntary error on the diver's part;

Increased air available to the diver may have made it easier for her to swallow or gulp air but he considered this to be diver error as opposed to a mechanical fault

That dive plan that the deceased followed fits in within standard diving practice and he considered it to be a relatively straight forward dive;

She was likely to have worn a heavier wet suit than normal and the heavier suit and additional weight on the surface could cause the diver to feel constricted and could also be more constrictive in the water.

It appeared that the deceased had not correctlv disclosed her past medical conditions required in the medical statement;

The Doctor who issued her certificate was not the deceased General Practitioner.

The deceased had had recent diving experience and had wisely taken additional training, since completing her initial course and that it would seem that in this respect her training was suitable for the dive she undertook.

The points made in Sergeant Smith's summary have been carefully noted particularly that;

He stated that; The equipment used by the deceased is unlikely to have contributed to her death.

From autopsy and information from medical professional, it would seem she has had **two** major medical problem during the dive, probably during the ascent phase and that **either** would have been sufficient to have caused her death;

As she had not had a rapid ascent and had followed good diving practice, it is not clear why she suffered a cerebral arterial gas embolism and also it is not clear why she had a stomach rupture;

The advice of Dr Sames that the deceased should have had a thorough medical examination prior being declared fit to dive including an exercise FCG and that it appeared that she had not disclosed to the Doctor declaring her fit to dive, some of her previous medical history and that she not have been diving while taking some of the medication was found to have been in her possession.

Coroner's Findings into the death of Winifred Hazel ABSALOM.

After careful consideration of all the evidence into this unfortunate recreational diving misadventure it is found that the cause of the death of fifty three year old Winifred Hazel ABSALOM, of 15 Woolmer Drive, Willesborough, Ashford, Kent, United Kingdom whose date of birth was July 26, 1951 was primarily the result of a stomach rupture
while diving at the site of the Rainbow Warrior off the Cavalli Islands in Northland, New Zealand on February 10, 2005.

Such rupture is a documented rare complication of scuba diving.
The cause of the rupture was found to be the result of the pressure of gas in the peritoneal cavity which inflated her abdominal cavity causing an upward displacement of the diaphragm impairing her breathing leading to asphyxiation.

The pressure of gas possibly originated from swallowing air in short gasps and expanding on ascent could cause rupture of the stomach wall but the possibility of an inherent weakness in her stomach lining is not discounted.

Although there was no evidence of significant gastritis, focal localized weakening cannot be excluded.

The significance of the moderate atherosclerosis of her left coronary artery may have led to an episode of heart ischaemia and loss of consciousness contributing to her death as a secondary cause but that is not believed to have been the initiating or primary cause of it.

The comments of Dr Christopher Sames, Medical Officer of the Hyperbaric Unit at the Royal New Zealand Naval Unit at Devonport, Auckland, that people with a history of hypertension as was the case with the deceased, should have had a cardiology workup including exercise ECG prior to being declared fit to dive and those on the medication the deceased had been using and who suffer migraine headaches should not be diving are noted and are a warning.

Although there was no toxicological evidence of the presence of the anti-inflammatory medication, Voltaren which medication was found in her property and which she was believed to have been taking for pain from an ankle injury, the Court notes and records Dr Sames comment that if she had been taking it, or any other non-steroidal antiinflammatory medication that it could have affected the integrity of the stomach wall.

The Court is satisfied that normal dive procedures were in place and that the equipment being used conformed to professional requirement standards. The Court notes that care was made in taking her to the surface and although resuscitation was attempted it was unsuccessful.

The suggestions of Sergeant Smith that;
Regular medicals are needed to make sure that the diver is up to the task and that over long periods, they have not developed medical conditions that make them unfit to dive and the such medicals need to be completed either by the diver's own General Practitioner who is fully aware of their past and present medical condition or by a Specialist diving Doctor;

And that there should be more specific detailed standardized medical/screening questionaires for charter and training groups.
Such questionnaires should be written in consultation with industry groups, including medical groups and representatives from diver training organizations- Are commended as recommendations to be heeded by people associated with the dive industry and those intending to dive, especially those who have or have had medical problems or are in an relatively older age group.

The Court is aware and emphasizes that recreational diving continues to increase in popularity. New Zealand *offers* some excellent opportunities for the activity which attracts people from other countries as well as locally.
Attention to and due regard of the points Sergeant Smith has made can only add to safety and enjoyment while assisting in the avoidance of tragedies.

The Court commends recent discussions between interested parties including medical professionals, dive-training providers, Occupational Safety & Health, Police and other organisations involved in the industry about issues surrounding recreational dive medicals raised due to recreational diver deaths;
The Court supports the recommendation of Sergeant Bruce Robert Adams, Officer **in** Charge of Police National Dive Squad that recommendations and comments from this case be distributed to the eleven agencies which he has listed. The Court is most grateful to the Police National Dive Squad team for its input to this Inquest.
The Court notes that there has been no evidence of either neglect or fault by those employed by the Paihia Dive Compass Company.
The Court is grateful to all those who provided evidence, the special reports and suggestions for the Inquest and particularly thanks Senior Constable Wayne Mills, Officer-in-Charge at the Paihia Police Station in the Bay of Islands for his meticulous inquiries and assistance.

The Court extends sympathy to the family and friends of Miss Absalom in their sad loss.
C. H. Ayrton. Coroner.