



## **INTERPOL Tsunami Evaluation Working Group**

**The DVI Response to the South East Asian Tsunami between December 2004 and February 2006**



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## **Abbreviations**

<b>AM</b>	<b>Ante Mortem</b>
<b>CDR</b>	<b>Critical Decision Register</b>
<b>DVI</b>	<b>Disaster Victim Identification</b>
<b>DNA</b>	<b>Deoxyribonucleic acid</b>
<b>TTVI</b>	<b>Thai Tsunami Victim Identification</b>
<b>ISP</b>	<b>Internet Service Provider</b>
<b>IT</b>	<b>Information Technology</b>
<b>IMC</b>	<b>Information Management Centre</b>
<b>NGO</b>	<b>Non Government Organisation</b>
<b>PCR</b>	<b>Polymerase Chain Reaction</b>
<b>PM</b>	<b>Post Mortem</b>
<b>PTSD</b>	<b>Post Traumatic Stress Disorder</b>
<b>SOP</b>	<b>Standard Operating Procedure</b>
<b>STR</b>	<b>Short Tandem Repeats</b>
<b>TTVI</b>	<b>Thai Tsunami Victim identification</b>
<b>WHO</b>	<b>World Health Organisation</b>
<b>UN</b>	<b>United Nations</b>

## **Preface**

**It is estimated that over 250 million people are now affected annually by disasters world wide – three times the number recorded .during the 1970’s.**

**For whatever reason a disaster occurs, be it man made or natural, the increasing global expectation is that someone will be required to answer as to why it occurred, how it was dealt with and if, and where, blame can be apportioned. The capacity and capability of the media coverage across most of the globe now means that every decision made is put under immediate scrutiny by the watching world.**

**Such catastrophic events will demand a professional and ethical response by the authorities in charge and it is that response which will fall under the spotlight of scrutiny. The ability to provide rapid and professional solutions is only possible if considerable thought and pre planning has been applied to these situations, if resources have been identified and trained before the event, and if those contingency plans have been exercised to tease out the weaknesses and vulnerabilities. Real life experiences such as the events that form the subject of this report provide us with the greatest learning experiences and it is essential that we constantly scrutinise our strengths and weaknesses of past challenges.**

**The death and destruction left behind must be cleared away to allow a sense of normality to return for the majority of those affected, in a timely manner and to satisfy the expectation of the the public, the authorities and the media.**

**Government bodies and other organisations or agencies may be the principal stakeholders in this process, but the role of trained DVI**

**operatives is crucial to a successful conclusion. Human life is precious and an individual's right to dignity should extend to his/her chosen grave or resting place where possible and the beliefs of their family and loved ones should be respected.**

**It is for this reason that we should take the time to reflect upon the tragic events of the South East Asian Tsunami and upon the TTVI teams performance of dealing with this mass fatality incident to further develop our systems for dealing with the next disaster. It can no longer be dealt with on the basis of "if" this occurs but simply "when and where" the next disaster will take place. We have a duty to learn from past experience and to prepare for future incidents.**

**Much of the evidence available within this report originates specifically from the Thailand response and results from the unique situation of a country willing to accommodate an unprecedented number of international law enforcement and forensic responders, working in harmony for a common purpose.**

**Those involved in Thailand should be rightly proud for the achievement of a job well done, but there were lessons to be learnt and the intention of this report is to highlight those opportunities for the benefit of future operations and to make specific recommendations that will put the whole of the DVI community on a better footing to cope with future disasters.**

**The mere fact that Thailand has a strong focus within this report reflects the appreciation of the international community to Thailand for their open and co-operative response. The lessons of this operation and any identified areas for improvement are not reflections on Thailand and are intended to promote future international co-operation.**

**This report has been compiled with the co-operation of a number of respected DVI colleagues around the world and it is appropriate to pay particular thanks to Mr Torkjel Rygnestad (Norway), Mr Bertil Lindblom (Sweden), Mr Laurens Tinsel (Netherlands), Mr Hermann Metz (Australia) and to Prof Sue Black (CIFA) for proof reading the final draft. Thank you for your dedication.**

**Never before has such a DVI operation involved so many countries and for this reason we all share the successes of the mission and all shoulder the criticism where appropriate. On balance, this report also seeks to assist in the further development of international DVI policy and business process for the benefit of the global community.**

**Derek Forest OBE**

**United Kingdom**

**On behalf of the INTERPOL Tsunami Evaluation Group**

## **Mandate**

This review has been commissioned under a mandate established in accordance with resolution AGN/65/RES/13 of the ICPO-INTERPOL General Assembly meeting in Antalya from 23rd to 29th October 1996, at its 65th session: where it was agreed to study disasters that have occurred and take note of technical developments and experiences with a view to suggesting improvements in disaster victim identification (DVI) procedures and standards relating, *inter alia*, to reference material, technology, computerisation, education and training.

The INTERPOL Steering Group of the Standing Committee in accordance with the above resolution and in support of its strategic plan, agreed at its meeting in Ottawa between 1<sup>st</sup> and 3<sup>rd</sup> October 2007, that a working group should be established to evaluate and produce recommendations on the events and response to the Tsunami of 2004. The recommendations are intended for the benefit of future international development in the discipline of Disaster Victim Identification.

## **Evaluation Objectives**

**In any major incident requiring a significant response, it is important to evaluate objectively:**

- **The circumstances surrounding the event**
- **The consequences of the event**
- **The various phases and aspects of the response**
- **The issues, both positive and negative in achieving the desired and expected outcomes**
- **The examples of good practice**
- **The results of the response and the lessons learned**
- **The opportunities through recommendations for the benefit of future operations**

**The most important objective of this evaluation is to provide a detailed account of the challenges encountered from which lessons can be learnt and improvements in efficiency and effectiveness can be made.**



## **Scope**

The scope of this review specifically concentrates on the experiences and learning of responders and advisers to the Tsunami events within South East Asia. The period of the review extends from the initial incident on the 26<sup>th</sup> December 2004 through to the agreed withdrawal of international teams from Thailand on the 28 February 2006. Additionally, this review is not exclusive to the experiences of Thailand but will also encompass relevant learning from the experiences of other affected nations where available.

Specific to the evaluation focus on the unique situation of the DVI response within Thailand and the significant international collaboration in the response, this report takes account of:

- The different phases
- The command structure
- The infrastructure
- The resource implications
- The stakeholders and partners
- Communication issues
- Data collection challenges
- Data management and technology
- Quality control
- The identification sciences
- External and internal environments
- Outcomes

In addition, the review will comment on the later situation reports (SITREPs), where formal identification activity remains ongoing.

## **Methodology**

The majority of the evaluation is based on documented records produced during the course of the Thai Tsunami Victim Identification (TTVI) operation. It is no surprise and not unexpected that in excess of 80 Gigabytes of data were collected and stored during the operation in Thailand. This data related primarily to victim data but also includes other archival material including:

**Meeting minutes**

**Operational reports**

**Standard Operating Procedures**

**Executive minutes**

**Situation reports**

**Business plans**

**Commander's meeting**

**Scientific meetings**

**IT and technology**

Specific documents are not necessarily reproduced within the narrative of this report unless they are particularly relevant, but are available separately should further analysis be required of individual issues.

## **List of Recommendations**

### **Recommendation 1 (see Page 26)**

*It is recommended that Interpol encourages the appropriate global agencies responsible for the development of early warning systems to engage with national government and law enforcement bodies in vulnerable member states towards developing robust communication strategies during raised threats of earthquake and tsunami.*

### **Recommendation 2 (see Page 37)**

*It is recommended that INTERPOL member states examine those examples of good practice relating to call handling capacity and capability and ensure that they have in place, robust call handling systems and processes to enable large scale reporting of missing persons.*

### **Recommendation 3 (see Page 37)**

*It is recommended that INTERPOL member states develop systems, which ensure that when a missing person is reported to their authorities by concerned relatives or friends, they can be reassured that the report will be recorded and actioned.*

### **Recommendation 4 (see Page 37)**

*It is recommended that INTERPOL are proactive at the time of a disaster to offer assistance and co-ordination to host nations with managing media reporting and communicating with other international law enforcement agencies.*

### **Recommendation 5 (see Page 39)**

*It is recommended that INTERPOL member states review their national capacity and capability to respond to DVI incidents in line with the original INTERPOL resolution (1996) to ensure that they are resilient.*

**Recommendation 6 (see Page 39)**

*It is recommended that those INTERPOL member states that do not currently have a national DVI team should review that position given the clear benefits derived and evidenced from the Tsunami experience by those nations that did have such a team and were advanced trained in INTERPOL DVI procedures.*

**Recommendation 7 (see Page 39)**

*It is recommended that INTERPOL encourage all member states to develop their training requirements around internationally agreed minimum standards of competence.*

**Recommendation 8 (see Page 41)**

*It is recommended that INTERPOL member states recognise the advantages and benefits of mutual collaboration of effort when involved with disasters that include foreign nationals.*

**Recommendation 9 (see Page 41)**

*It is recommended that DVI Commanders in a country hosting a disaster encourage early engagement and dialogue with international colleagues of those countries with missing victims, in order to agree both ante mortem and forensic strategies.*

**Recommendation 10 (see Page 43)**

*It is recommended that the concept of the INTERPOL Crisis Management Support Group is considered as good practice and that the option to convene such a group for future disasters is recommended to INTERPOL.*

**Recommendation 11 (see Page 43)**

*It is recommended that INTERPOL openly encourage and lead on discussions with European Union members, United Nations, International*

*Red Cross and other vital Non Government Organisations (NGO's) in the development of joint strategies for disaster responses, which ensure that efforts are focused and targeted but not duplicated.*

**Recommendation 12 (see Page 43)**

*It is recommended that INTERPOL develop discussions with European Union members and the United Nations on how urgent funding opportunities can be developed, when required, to ensure that sufficient and appropriate logistics and resources are made available in a timely manner following disasters.*

**Recommendation 13 (see Page 45)**

*It is recommended that INTERPOL engage with affected nations at the earliest opportunity following a disaster to ensure that initial strategic assessments are carried out and that the affected nation has sufficient skills and experience to deliver direction to disaster management.*

**Recommendation 14 (see Page 45)**

*It is recommended that INTERPOL maintain a register of accredited international DVI Commanders as assessors who could be made available at short notice to less experienced nations to assist with initial strategic assessments and the development of strategic policy when disasters occur.*

**Recommendation 15 (see Page 45)**

*It is recommended that INTERPOL maintain a register of accredited international DVI Commanders as advisers when mature strategic assessments are required by nations with limited experience of disaster management.*

**Recommendation 16 (see Page 45)**

***It is recommended that the importance of initial response and tactics can have a lasting influence on the direction and control of a disaster incident and can significantly affect the overall outcomes of such a mission.***

**Recommendation 17 (see Page 46)**

***It is recommended that INTERPOL encourages the development, by member nations, of good practice relating to all new innovations and developments which deliver effective but secure communications and networking in disaster zones.***

**Recommendation 18 (see Page 46)**

***It is recommended that INTERPOL encourage worldwide Internet Service Providers (ISP) such as Yahoo, MSN and similar providers, to consider developing, and making available, a secure provision within their infrastructure for emergency disaster situations and those responsible for delivering essential aid.***

**Recommendation 19 (see Page 47)**

***It is recommended that for the future, co-ordination of logistics support is an essential requirement that INTERPOL can develop given their unique global position and their excellent communication networks. To achieve this INTERPOL must identify key individuals who can be seconded into their Crisis Support Centre immediately to manage these significant requirements.***

**Recommendation 20 (see Page 47)**

***It is recommended that INTERPOL should engage with the United Nations during the early phases of a disaster response to ensure that they are fully focused on the bigger situation surrounding logistical supplies.***

**Recommendation 21 (see Page 49)**

*It is recommended that the TTVI command structure for managing a multi-national DVI response should be identified as good practice.*

**Recommendation 22 (see Page 50)**

*It is recommended that the concept of the Information Management Centre (IMC) should be identified as good practice and promoted by INTERPOL to all member states with INTERPOL guidance around the operating procedures.*

**Recommendation 23 (see Page 58)**

*It is recommended that the TTVI Operational Protocol agreed between nations for the Tsunami mission should be recognised as good practice and developed for the future into a universally agreed protocol adaptable to all disaster situations and agreeable to all member states.*

**Recommendation 24 (see Page 58)**

*It is recommended that the maintenance of a Critical Decisions Register (CDR) should be highlighted as good practice and that INTERPOL should consider developing an international CDR for future missions that would be made available through the INTERPOL Web Site.*

**Recommendation 25 (see Page 59)**

*It is recommended that international guidance is developed surrounding the practical use of a CDR and how that can be incorporated into both the initial strategic assessment and the mature assessments of an ongoing mission.*

**Recommendation 26 (see Page 60)**

***It is recommended that the TTVI Mission and Values statements should be identified as good practice and encouraged by INTERPOL for universal adoption by member states for future DVI operations.***

**Recommendation 27 (see Page 62)**

***It is recommended that the social and economic impact that a DVI operation can have on a country or region should be recognised by all DVI Commanders and that operational strategies should be developed to minimise that impact during missions.***

**Recommendation 28 (see Page 63)**

***It is recommended that INTERPOL recognise the significant benefits derived from the DVI International System (Plass Data System) during the TTVI operation but examines the limitations of the system in recommending and developing future user requirements of enhanced systems.***

**Recommendation 29 (see Page 66)**

***It is recommended that, in general, the concept of using existing and agreed INTERPOL DVI procedures which promote universal understanding of business processes should be recognised as good practice.***

**Recommendation 30 (see Page 66)**

***It is recommended that INTERPOL countries should not abandon ethical and cultural drivers in DVI purely on the grounds that the excessive numbers make the operation logistically difficult.***

**Recommendation 31 (see Page 66)**

***It is recommended with some urgency, that INTERPOL should review and make recommendations on how alternative methods of identification may***



*be considered when the numbers of victims involved in the incident make the deployment of existing DVI procedures impractical (e.g. 50,000 + deceased).*

**Recommendation 32 (see Page 69)**

*It is recommended that in any future mission of a similar nature to the Asian Tsunami of 2004, the strategic infrastructure should recognise the vulnerability of information platforms and have in place daily data backup systems which store a complete copy of critical data in a readily retrievable format.*

**Recommendation 33 (see Page 70)**

*It is recommended that submitting countries should be encouraged to ensure that they have in place exact copies of all ante mortem data prior to submission to a foreign host nation. It is emphasised that this is not an issue of trust but addresses responsible security of information.*

**Recommendation 34 (see Page 71)**

*It is recommended that in any future multi-national response to a DVI incident, the funding arrangements should be a timely but prime responsibility of diplomatic agreement between nations at an early stage of the operation. Furthermore, participating nations should document that arrangement for the benefit of DVI Commanders.*

**Recommendation 35 (see Page 71)**

*It is recommended that an agreement should be reached between participating nations for the immediate deployment of a finance team responsible for the spend allocation and audit of international monetary contributions. This should not be a responsibility of DVI Commanders but should be managed by INTERPOL subject to agreement.*

**Recommendation 36 (see Page 72)**

*It is recommended that the finance team should put in place a process for approval of financial spend requests by DVI Commanders against a non bureaucratic operational budget allocation.*

**Recommendation 37 (see Page 72)**

*It is recommended that the finance team should be overseen by an approved audit process and the results of all audits should be shared with contributing nations.*

**Recommendation 38 (see Page 72)**

*It is recommended that in the event of a multi-national deployment to a country where a significant disaster has occurred, INTERPOL should consider being the lead legal entity for engaging and agreeing contracts which have financial implications.*

**Recommendation 39 (see Page 73)**

*It is recommended that all significant donations of equipment by foreign governments should include a caveat of what will happen to the equipment at the end of the operation and if the intention is to donate the equipment to a worthy cause, this should be documented.*

**Recommendation 40 (see Page 74)**

*It is recommended that the process of matching only post mortem forensic data to ante mortem forensic data should be recognised as good practice in delivering a fair and non discriminating identification strategy.*

**Recommendation 41 (see Page 74)**

*It is recommended that the early engagement with local faith and cultural leaders in any multi-national operation should be identified as good*

*practice and will significantly reduce local community hostility towards foreign DVI experts.*

**Recommendation 42 (see Page 75)**

*It is recommended that as a general rule for deployments and in order to maximise operational efficiency of staff deployments, duty rota's for 'in theatre' staff should not be less than 5 weeks duration depending on local conditions, risk assessment and the security situation.*

**Recommendation 43 (see Page 75)**

*It is recommended that generic INTERPOL guidelines be developed for the benefit of DVI teams in member states to cater for the welfare needs of staff, critical debriefing and the treatment of Post Traumatic Stress Disorders (PTSD).*

**Recommendation 44 (see Page 77)**

*It is recommended that early communication of ante mortem requirements to foreign nations should be a priority for DVI Commanders against an agreed forensic strategy.*

**Recommendation 45 (see Page 78)**

*It is recommended that the INTERPOL DVI Steering Committee should reinforce to DVI Standing Committee members that the use of visual identification methods in mass fatality incidents is considered unreliable and almost certainly will lead to the incorrect release of bodies.*

**Recommendation 46 (see Page 78)**

*It is recommended that identification strategies should always include primary identifiers of DNA, fingerprints, odontology or a unique physical/medical condition. The results from these scientific investigations*

*should meet with the satisfaction of the local legal authority for death certification.*

**Recommendation 47 (see Page 86)**

*It is recommended that the concept of the Information Management Centre (IMC) be identified as good practice for promotion through INTERPOL to international member states.*

**Recommendation 48 (see Page 86)**

*It is recommended that the TTVI Information Management Centre (IMC) staffing template be identified as good practice for future development of forensic data handling and matching centres.*

**Recommendation 49 (see Page 86)**

*It is recommended that the operational business model of the Information management Centre (IMC) be subjected to a separate INTERPOL development project to ensure that an international model of best practice is developed for the future.*

**Recommendation 50 (see Page 87)**

*It is recommended that all Standard Operating Procedures (SOP) and protocols of standard business process are universally developed and adopted into the INTERPOL DVI Manual.*

**Recommendation 51 (see Page 87)**

*It is recommended that INTERPOL develop minimum standards for data management and data exchange on an international basis for use in future disasters.*

**Recommendation 52 (see Page 93)**

*It is recommended that all international DVI operations include a security strategy for managing the deployment of multi-national staff at one location.*

**Recommendation 53 (see Page 94)**

*It is recommended that skills profiles are developed in agreement with INTERPOL which ensure that personnel deployed to future operations can evidence their qualifications and expertise against an agreed set criteria.*

**Recommendation 54 (see Page 96)**

*It is recommended that INTERPOL oversee the development of standard operating procedures and minimum data standards for the submission of quality ante mortem data by foreign countries.*

**Recommendation 55 (see Page 99)**

*It is recommended as good practice that the input of information onto Plass Data should be carried out by experts within the forensic disciplines to which the information appertains.*

**Recommendation 56 (see Page 100)**

*It is recommended that within future planning assumptions, it would be wise to engage and develop the established worldwide technical capabilities of the INTERPOL I-24/7 network infrastructure to provide a robust platform for managing the computerised systems, improved international communication and enhanced data transfer of records between countries.*

**Recommendation 57 (see Page 111)**

*It is recommended that personnel dispatched to recover AM data only accept original dental records, including but not limited to original dental*

*radiographs. All of the dental patient information is valuable and one cannot predict the specific aspect of an AM record that will be the most valuable so all records from all generalist and specialist dentists should be acquired.*

**Recommendation 58 (see Page 112)**

*It is recommended that copies of all documents submitted, should be undertaken in the originating country and the copies should be retained there.*

**Recommendation 59 (see Page 113)**

*It is recommended that where AM dental record transcription is provided remotely in the home country it is vital that it is undertaken by a suitably qualified forensic dentist*

**Recommendation 60 (see Page 113)**

*It is recommended that a quality control procedure is carried out by a second forensic dentist to ensure the accuracy and integrity of the information being provided.*

**Recommendation 61 (see Page 116)**

*It is recommended to use digital techniques as a tool for the future. The various DVI related data should all be digitally recorded, i.e. dental information, fingerprints, medical findings, property and forensic police evidence. The quality will increase and it will be easier to enter the information in DVI System Intl.*

**Recommendation 62 (see Page 116)**

*It is recommended that the use of digital techniques should also be included in manuals describing the various forensic police and scientific*

*methods of tracing evidence. Digital information is also easy to transfer between working stations.*

**Recommendation 63 (see Page 116)**

*It is recommended that in DVI operations it is not necessary or culturally acceptable that both jaws (mandible and maxilla) are extracted and removed from the body. Evidence from the TTVI operation showed that in the few cases where this had been done, the jaws could not be retrieved for re-examination and considerable delay occurred.*

**Recommendation 64 (see Page 119)**

*It is recommended that consideration be given to deploying the Plass Data System within the mortuary facilities for quality control of recorded information within the system against the physical victim examination.*

**Recommendation 65 (see Page 121)**

*It is recommended that the fingerprint experts should have a professional fingerprint manager to coordinate the work and to establish a fingerprint expert group.*

**Recommendation 66 (see Page 130)**

*It is recommended and important that persons with appropriate experience and skills of DNA analysis within laboratory work and DVI take part in the initial assessment of the disaster scene and be involved in the decisions taken after such an assessment.*

**Recommendation 67 (see Page 134)**

*It is recommended that INTERPOL, in collaboration with the member states, decides on a format for the labelling of post mortem samples.*

**Recommendation 68 (see Page 136)**

***It is recommended that INTERPOL makes an inventory of accredited laboratories prepared and skilled to perform DNA analyses of post mortem samples and deliver results according to the requirements stated.***

**Recommendation 69 (see Page 138)**

***It is recommended that INTERPOL initiate a development of the DVI System to also include facilities for kinship analysis of post mortem and ante mortem DNA results of profiles from at least close family members***



### The Geographic Event

At 00:58 GMT (07.59 am) local time on 26<sup>th</sup> December 2004, the Eurasian and Australian tectonic plates collided deep under the Indian Ocean, 240 kilometres (150 miles) off the coast of Sumatra. Deep on the ocean floor lies a 1,200km (745 mile) trench called the Andaman-Sumatran subduction zone. The collision vertically jolted the sea bed along the trench by several meters displacing hundreds of cubic kilometres of water. This volume then moved away from the epicentre as a series of waves travelling in excess of 800km/h (500mph). This speed reduced in shallower water but the size of the waves increased proportionally.

This shift in the earth's core measured 9.3 on the Richter scale, amounting to the largest earthquake the world has seen in 40 years. To put this in perspective, the effect was equal in magnitude to 23,000 atomic bombs the size of that witnessed in Hiroshima, Japan in 1945.

Within just 30 minutes the effects were witnessed along the closest coast lines of Indonesia and nearby islands, but over the next seven hours it transmitted its destructive powers to the detriment of thirteen nations as far away as Africa.

Scientists at the Pacific Tsunami Warning Centre, relying on seismic data alone and working thousands of miles away on the island of Hawaii had detected evidence of the earthquake but initially had no idea that it had given rise to an ocean-wide Tsunami.

It was a full 50 minutes after the initial earthquake that they first picked up the tremors and then issued a warning of a possible local tsunami. Thirty minutes after the shaking had subsided, the first wave, travelling eastwards, crashed into Sumatra.

It is recognised that the ability to predict a resulting Tsunami in these circumstances is extremely difficult but likewise it is known that such outcomes are both possible and indeed likely, albeit the resulting consequences are unpredictable.

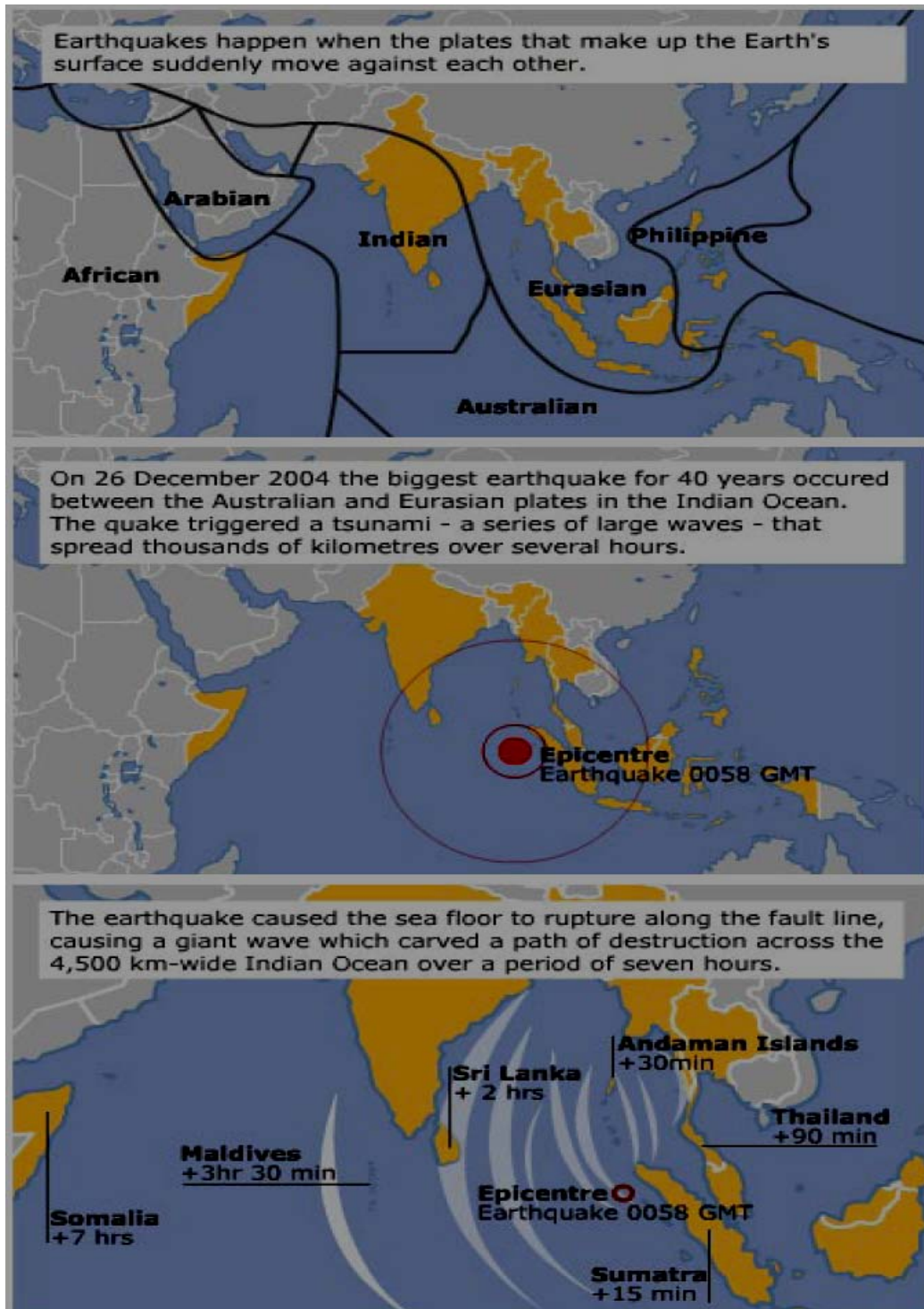
Past experiences have demonstrated that the most effective methods to reduce the impact on loss of life are to establish Tsunami Warning Systems across vulnerable geographic regions. These must be effective, efficient and able to communicate real time messages to vast numbers of local communities. The ability to embrace technology in assisting with this challenge improve with time, but the governments and authorities of those vulnerable nations must work together to develop the most advanced communication networks to ensure any potential loss of life resulting from future events is minimised.

This is a challenge for the combined efforts of the scientists and those experts in the development of technologies to work together on a global basis to deliver effective systems for the future. Many countries now embrace such warning systems but evidence still exists that the effectiveness of the communication methods to the endangered communities needs to be more robust.

### **Recommendation 1**

***It is recommended that Interpol encourages the appropriate global agencies responsible for the development of early warning systems to engage with national government and law enforcement bodies in vulnerable member states towards developing robust communication strategies during raised threats of earthquake and tsunami.***

Likewise, the pre planning of how to activate mass evacuation strategies from vulnerable areas is a challenge through which nations should support each other to achieve the most effective and safe timely solutions



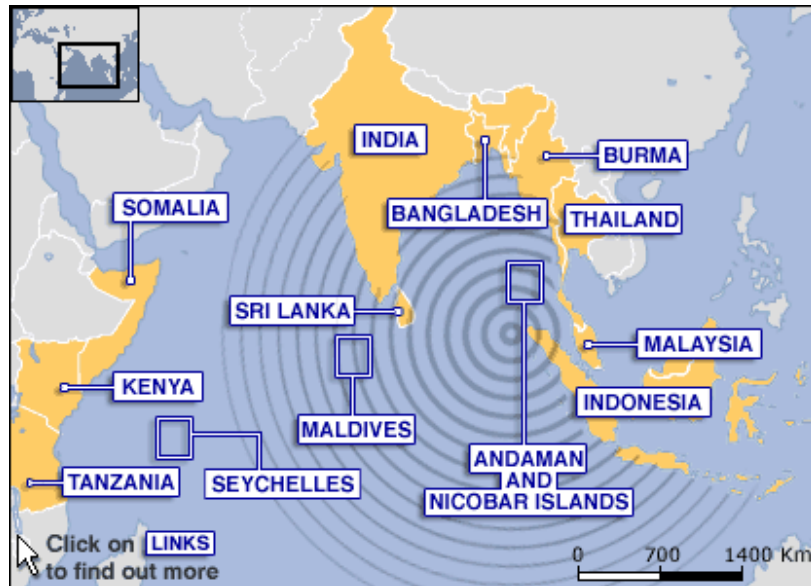
*Geographic representation of earthquake and the subsequent tsunami.*

### **Regional Impact of Tsunami**

It is estimated that the loss of life across the 13 nations impacted by the tsunami was circa 280,000, one of the largest incidents involving loss of life from a natural disaster in living memory.

### **Estimated death tolls by nation**

<b>Indonesia</b>	<b>160,000 dead or missing</b>
<b>Sri Lanka</b>	<b>35,000 dead or missing</b>
<b>Indian mainland</b>	<b>8,850 dead</b>
<b>India's Andaman and Nicobar islands</b>	<b>7,450 dead or missing</b>
<b>Thailand</b>	<b>8,195 dead or missing</b>
<b>Maldives</b>	<b>81 dead</b>
<b>Malaysia</b>	<b>68 dead</b>
<b>Burma</b>	<b>61 dead (official total)</b>
<b>Bangladesh</b>	<b>2 dead</b>
<b>Somalia</b>	<b>200 dead</b>
<b>Kenya</b>	<b>1 dead</b>
<b>Tanzania</b>	<b>10 dead</b>
<b>Seychelles</b>	<b>1 dead</b>



### ***Countries affected by the tsunami***

#### **Indonesia**

Indonesia sustained the heaviest casualties with approximately 160,000 human fatalities and considerable physical damage to infrastructure causing 500,000 people to be dispossessed.

It is estimated that 160 organisations and UN agencies were involved in the provision of aid including food, medical assistance, shelter and schooling. Foreign defence forces were initially used to assist with relief efforts.

No DVI operation was conducted.

#### **Sri Lanka**

In excess of 31,000 people lost their lives as the Southern and Eastern coast lines of Sri Lanka were impacted by the tsunami. Over 100,000 homes were destroyed which resulted in more than half a million people being

without adequate accommodation. An international labour organisation estimated that 400,000 people lost their jobs as a consequence of industry, small business and agricultural destruction.

A limited DVI operation was conducted in Sri Lanka.

### India

The South East coast of India was the primary impact zone for that nation, where the waves penetrated up to three kilometres inland. Eight thousand eight hundred and fifty (8,850) people died and over 150,000 homes were damaged or destroyed.

No DVI operation was conducted.

### Andaman and Nicobar islands

These remote islands were devastated with approximately 7,450 fatalities or missing persons recorded.

No DVI operation occurred.

### Maldives

Of the 199 inhabited islands constituting the Republic of Maldives, 20 were totally destroyed and there were 81 fatalities.

DVI operation was conducted by South African authorities.

## **Malaysia**

Sixty-eight (68) fatalities were recorded in Malaysia. The coast line section was spared from major devastation as it was sheltered from the main path of the waves by Sumatra.

The victims were generally swept from the beaches around the resort island of Penang.

## **Myanmar (Burma)**

The death toll has officially been set at 61. The worst affected area was the Irrawaddy Delta which is mainly inhabited by subsistence farmers and fishermen. Other Myanmar workers living and working in Thailand are also known to have been amongst the dead and in fact far more Myanmar nationals were identified in Thailand than were actually reported missing, as a result of proactive identification within the TTVI by using the Thai immigration database and searching it against Post Mortem fingerprints.

No DVI operation occurred.

## **Somalia**

This was the worst hit African nation. Approximately 200 Somalis are believed to have died. Over 1,180 homes were destroyed along with the surrounding infrastructure. It is believed that approximately 30,000 people had been displaced.

The United Nations called for \$13m in aid to assist victims. Aid agencies supplied initial ground support assisted by the German military.

## **Thailand**

**Although other nations were affected more by the Tsunami, Thailand had a more unique disaster toll. Of the 5,395 fatalities in Thailand, approximately 2,400 were foreign nationals from 36 different nations.**

**Purely from a DVI perspective, the emerging circumstances over the following months were destined to test the global theories and practises of DVI management and identification procedures to limits not previously encountered. Without doubt, these unique circumstances offer the most valuable learning mechanism for future strategic and policy development.**

**The disaster occurred during the Christian Christmas festival period when many families from all over the world had descended for the vacation period on Thailand's popular coastal resorts.**

**The West coast of Thailand and surrounding islands were severely hit by the ensuing waves. Within 90 minutes of the original earthquake, the outlying islands and 380 kilometres of coastline were struck by the tsunami. The waves varied between ten and thirty metres in height.**

**The waves moved across islands and along the coastline, moving inland destroying buildings, infrastructure and vegetation.**

**Many of the survivors were separated from family and friends who were still missing but also without food shelter or clothing. Much of the coastal infrastructure had been lost to the sea.**





***Top - A Thai navy boat that was guarding the king's grandson, Khun Poom Jenson, was washed 1.5kilometres inland from Khao Lak beach by the Tsunami.***

***Below – The boat remains in situ to this day as a permanent memorial and mark of respect to those who lost their lives.***



*Then and now, almost all of the main tourist sites in Thailand have been cleared and many rebuilt. The top photo, taken on New Year's Eve 2004, shows the devastation to the resort at Takua Pa on the island of Phi Phi*



*Two days after the tsunami hit, wreckage littered the length of Tewewong Road just off Patong beach in Phuket, Thailand. Today the street is largely back to normal.*

### **Initial Thai Response**

Initially, Thailand did not seek disaster relief aid following the tsunami. However, the Thai authorities quickly became overwhelmed by the devastation and heavy death tolls, including a large number of foreign victims. They recognised that the need to identify the victims would be driven from both internal and external pressures including foreign political pressure due to the large number of deceased nationals from overseas. They therefore accepted international offers for technical assistance with the recovery and identification process of the deceased.

The events in the whole of South East Asia were being transmitted world wide in real time by the world's media. Amateur footage taken by survivors of the waves hitting land only added to the drama and reality of the disaster as it unfolded. With this added pressure and a large number of international victims, Thailand's efforts and reactions came under closer scrutiny than others. The vivid images and growing death tolls understandably shocked the watching world.

It also had the effect of initiating frantic international enquires by friends and relatives of those believed to be visiting or holidaying in this particular region.

To demonstrate the impact of how such an event can manifest global implications for both the affected nations and those nations far more remote to the scene itself, it is helpful to quote the situation and reaction to these events within the United Kingdom as one example. As the news was transmitted in real time around the world, the Foreign and Commonwealth Office issued emergency numbers through the media for concerned relatives to contact if they thought that they may have relatives involved abroad. Almost immediately this facility was overwhelmed by the volume of

calls received and the Metropolitan Police in London was requested to open their dedicated Casualty Bureau facility which quickly required assistance from other UK police forces to accommodate the unprecedented demand.

To quantify the effect that such an incident has in these circumstances, the final death toll for the UK was 147, however by the end of the first day some 38,000 calls had been received and 22,000 people from the UK had been reported missing. In reality the actual number of UK citizen's known to have been in the region at the time of the tsunami was around 100,000. Likewise it is believed that around 20,000 Swedish nationals were in the region at that particular time. This situation was replicated across Europe where the majority of foreign victims in Thailand were subsequently found to be from Sweden, ultimately suffering loss of 543 nationals and Germany reported similar levels of loss.

#### **Recommendation 2**

*It is recommended that INTERPOL member states examine those examples of good practice relating to call handling capacity and capability and ensure that they have in place, robust call handling systems and processes to enable large scale reporting of missing persons.*

#### **Recommendation 3**

*It is recommended that INTERPOL member states develop systems, which ensure that when a missing person is reported to their authorities by concerned relatives or friends, they can be reassured that the report will be recorded and actioned.*

#### **Recommendation 4**

*It is recommended that INTERPOL are proactive at the time of a disaster to offer assistance and co-ordination to host nations with managing media*

***reporting and communicating with other international law enforcement agencies.***

This unprecedented demand for assistance and answers from the public affected many nations in a similar manner. The demand was continually fuelled by the detailed media coverage and lack of direct communication links to the region.

This placed significant pressure on governments to react in an unprecedented manner. All agreed to send resources immediately from both the political and diplomatic quarters to assist stranded and injured nationals. Specially trained law enforcement agencies, resources and forensic experts were also required to assist in the recovery and identification of the dead.

Specifically worthy of note was the ability of certain countries to deploy existing trained and available DVI Teams consisting of both police and forensic specialists. The ability of these countries echoed the recommendations of the original INTERPOL resolution of 1996 that countries should prepare for such events and develop their capacity and capability, resources and equipment to provide such a response.

Likewise, the co-ordination of international law enforcement and DVI communications by INTERPOL showed how at a time of catastrophe, the international community can pull together and react positively. There should be no assumption that everything worked perfectly, because in reality this was a situation that demanded strong leadership and strategic direction.

There should be early recognition of good practice. The Australian DVI teams were to be congratulated for their speedy initial response and their

obvious heavy investment in DVI training. Acknowledging that they had learned many lessons from their experiences in Bali in 2002 and the Australian Embassy Bombings in Jakarta in 2004, the important fact is that they continued to build their expertise, capacity and capability and they learned from previous experience. There is no doubt that much of the initial strategic decision making by Australia and its DVI Commanders in the early few days after the tsunami were robust, well reasoned and importantly, stood the test of time throughout the life of the mission.

The particularly important decisions which will be vital to any DVI operation for the future, surrounded the requirements for the DVI infrastructure particularly in Thailand. These had been carefully thought through in quick time with the assistance of the experienced Nordic Countries who again demonstrated much good practice during this mission.

**Recommendation 5**

*It is recommended that INTERPOL member states review their national capacity and capability to respond to DVI incidents in line with the original INTERPOL resolution (1996) to ensure that they are resilient.*

**Recommendation 6**

*It is recommended that those INTERPOL member states that do not currently have a national DVI Team should review that position given the clear benefits derived and evidenced from the tsunami experience by those nations that did have such a team and were advanced trained in INTERPOL DVI procedures.*

**Recommendation 7**

*It is recommended that INTERPOL encourage all member states to develop their training requirements around internationally agreed minimum standards of competence.*

In Thailand the scale of the international DVI response was unprecedented and will possibly never be repeated again given the way in which events developed over subsequent months.

Diplomatically, and with full Thai assistance, all responding nations quickly negotiated their way into Thailand offering their assistance to a country that was struggling to cope with the enormity of the disaster. The Thai authorities were quickly convinced by the international delegation that trained DVI staff from the 31 nations would be essential to the success of what was going to become a large scale DVI operation.



*The desperate hopes of families seeking their loved ones*

As in all disaster events involving multi-national victims, it is highly unlikely that the country enduring the disaster (i.e. the host country) will



ever manage the subsequent response in total isolation. The recognition that one of the most crucial elements to a speedy and successful identification process can only be achieved with the cooperation of foreign assistance to secure, process and provide, quality AM data relating to the missing. Without such quality assured information much of the good work undertaken at or near to the scene itself to secure quality PM data will be in vain.

**Recommendation 8**

*It is recommended that INTERPOL member states recognise the advantages and benefits of mutual collaboration of effort when involved with disasters that include foreign nationals.*

**Recommendation 9**

*It is recommended that DVI Commanders in a country hosting a disaster, encourage early engagement and dialogue with international colleagues of those countries with missing victims, in order to agree both ante mortem and forensic strategies.*

The speed and completeness of the recovery operation has a vital effect on the rebuilding process especially for an economy that is heavily focussed on the tourist industry. If victims were not quickly and correctly identified and returned to loved ones this could have a devastating and long lasting effect on confidence which relies heavily on tourist trade as an essential component to re build the economy.

## The International Response

### INTERPOL General Secretariat, Lyon, France.

Within 24hrs of the disaster occurring, INTERPOL 24-hour Command and Co-ordination Centre in Lyon, France was aware of the disaster and had contacted the affected countries to offer any support required. At the same time it informed its network of national DVI teams of the situation and offered its co-ordination services, part of the INTERPOL protocol established for such events. This was to become their largest Incident Response Team operation to date. Their logistical and communications support would be vital to the success or failure of the operations.

By 31<sup>st</sup> December 2004, Secretary General Ronald K Noble had personally travelled to Thailand to make a first hand assessment of the additional support that would be required. On 5th January 2005 the Secretary General convened a meeting in Lyon, France for senior police officials of the nations affected and also those providing a DVI response. The group discussed operational and strategic law enforcement issues arising from the disaster and the co-ordination of the international police response. General Nopadol Somboonsub of the Royal Thai police attended to provide a detailed briefing of the operation to date.

The meeting also endorsed the proposal of the Secretary General to create a Crisis Management Support Group immediately, consisting of INTERPOL staff and officials from member countries, to assist in the co-ordination and support of international DVI efforts in Asia. This unusual step had been taken as a response to the scale of requests for assistance being received at INTERPOL which threatened to overwhelm the organisation's resources.

The unit was quickly established and staffed by the Metropolitan Police Service, London and the UK Foreign and Commonwealth Office, and

worked in support of INTERPOL's Command and Co-ordination Centre (CCC). The Crisis Management Support Group ensured a focused and effective approach whilst at the same time easing the CCC's workload by handling the majority of Tsunami related enquiries.

**Recommendation 10**

*It is recommended that the concept of the INTERPOL Crisis Management Support Group is considered as good practice and that the option to convene such a group for future disasters is recommended to INTERPOL.*

In mid January 2005, Secretary General Noble also met with European Justice Ministers and Home Affairs Ministers in Luxembourg to seek extraordinary support for the organisation's ongoing efforts to provide DVI teams with all necessary logistics, co-ordination and communications assistance in response to the Tsunami disaster.

**Recommendation 11**

*It is recommended that INTERPOL openly encourage and lead on discussions with European Union members, United Nations, International Red Cross and other vital Non Government Organisations (NGO's) in the development of joint strategies for disaster responses, which ensure that efforts are focused and targeted but not duplicated.*

**Recommendation 12**

*It is recommended that INTERPOL develop discussions with European Union members and the United Nations on how urgent funding opportunities can be developed, when required, to ensure that sufficient and appropriate logistics and resources are made available in a timely manner following disasters.*

## **DVI Operation**

The early arrival of the Australian DVI Team with recent experience of response to mass victim disaster scenes including Bali in 2002, assisted greatly in the initial strategic assessment process. With hindsight, the importance of this strategic assessment will prove vital to any similar operation for the future as without doubt it shapes the scale of the necessary response and the requirements around infrastructure, equipment and resources from the outset.

The decisions taken at this early point in time, in the immediacy of the disaster event, must stand the test of time throughout the duration of the mission. In the event of poor initial assessments or indeed questionable decision making clearly leave a real prospect of the mission being overwhelmed due to a lack of resources or infrastructure. Conversely, over reaction can be extremely costly in financial terms.

The Australian experience immediately assisted in placing some structure around the requirements of the long mission ahead. Their strategic assessment informed the operations already underway and recognised the requirement of a significant infrastructure to deliver a sustainable operation around the victim identification process.

This assistance proved invaluable, within days of requests being made, support from law enforcement and forensic specialists around the world was arriving in Thailand. This created new problems around the logistics of housing and accommodating increasing numbers of staff within the DVI process.

Each responding national team was received and supported by its own Embassy or Consulate in finding accommodation and team headquarters.

Hotels at this time were understandably emptying quickly as surviving holiday makers chose to cut short their holiday breaks and head home early. This proved to be advantageous to the DVI teams who needed large numbers of rooms and additional hotel accommodation to set up operations centres and also served to bolster the economic situation for the hotel industry.

**Recommendation 13**

*It is recommended that INTERPOL engage with affected nations at the earliest opportunity following a disaster to ensure that initial strategic assessments are carried out and that the affected nation has sufficient skills and experience to deliver direction to disaster management.*

**Recommendation 14**

*It is recommended that INTERPOL maintain a register of accredited international DVI Commanders as assessors who could be made available at short notice to less experienced nations to assist with initial strategic assessments and the development of strategic policy when disasters occur.*

**Recommendation 15**

*It is recommended that INTERPOL maintain a register of accredited international DVI Commanders as advisers when mature strategic assessments are required by nations with limited experience of disaster management.*

**Recommendation 16**

*It is recommended that the importance of initial response and tactics can have a lasting influence on the direction and control of a disaster incident and can significantly affect the overall outcomes of such a mission.*

Co-operation from many of the world's airlines must be acknowledged and was readily made available for moving large amounts of equipment and kit from around the world and into the affected areas of operation. An early challenge with many of these operational command centres located within local hotels was establishing secure communications back home to their respective police administrations.

Typical adaption of readily available internet connections such as Yahoo and MSN were able to provide quick solutions in terms of communication links but were obviously questionable over their security status. This again gives DVI teams across the international community some basis for additional work in the future to develop better and more readily available robust and secure communication systems.

**Recommendation 17**

*It is recommended that INTERPOL encourages the development by member nations of good practice relating to all new innovations and developments which deliver effective but secure communications and networking in disaster zones.*

**Recommendation 18**

*It is recommended that INTERPOL encourage worldwide Internet Service Providers (ISP) such as Yahoo, MSN and similar providers, to consider developing, and making available, a secure provision within their infrastructure for emergency disaster situations and those responsible for delivering essential aid.*

Many countries were impressive in their ability to source significant amounts of essential equipment in short time periods and to mobilise that equipment to the affected areas. Again the establishment of early Command and Control structures for the future would allow the provision

of this resource to be co-ordinated and would ensure that necessary logistics requirements are delivered to the correct destination and the areas of greatest need.

**Recommendation 19**

*It is recommended that, for the future, co-ordination of logistics support is an essential requirement that INTERPOL can develop given their unique global position and their excellent communication networks. To achieve this INTERPOL must identify key individuals who can be seconded into their Crisis Support Centre immediately to manage these significant requirements.*

The bigger picture of co-ordination requirements however is not something that can be achieved in isolation without a larger multi agency approach. For example, transporting significant volumes of essential equipment into areas of devastation is one challenge, but the reliance on the area to receive it, store it and distribute it is a vast logistical operation involving strategic planning and the availability of appropriate buildings, storage, staffing and a distribution strategy.

Availability of critical infrastructures such as airports have to be a priority in the early stages of any response and the ability to maintain those facilities needs to be the first consideration. This includes the movement of essential fuel supplies to enable arriving aircraft to refuel and take off again – a problem that was recently identified following the Haiti disaster..

**Recommendation 20**

*It is recommended that INTERPOL should engage with the United Nations during the early phases of a disaster response to ensure that they are fully focused on the bigger situation surrounding logistical supplies.*

A recognised weakness at the start of the Thailand DVI process was the degree of co-ordination and collaboration both within and between the DVI responses from each nation. For the first few days, national DVI teams started working in isolation looking for their own deceased nationals. Probably born out of a desire to achieve results, it caused confusion and a significant duplication of effort. This was a clear example of the necessity to establish a robust Command and Control structure as quickly as possible.

Those Command and Control structures should always be headed by an appropriate senior Commander from the host country and established in accordance with due regard to the legal framework that exists within that country. There is a heavy requirement for that senior Commander to draw on past experience and advice from experts in the field and they can be provided with consent from the international community.

Particularly when international law enforcement officers collaborate in these circumstances, they will always be mindful that in general they have no legal powers within the host country and will be guests of the host authorities. This is an essential part of establishing a harmonious working relationship and defining the initial 'rules of engagement' for any foreign assistance provided.

From 28th December 2004, foreign DVI specialist teams began to arrive in Thailand to offer assistance to the Thai government with the identification of victims of the Indian Ocean Tsunami that struck on 26th December 2004.

Field operations were initially conducted in four temporary mortuaries established in Phang Nga, Krabi and Phuket provinces. During this early period, two different systems of DVI operations had commenced - those conducted by Thai DVI teams and those by international DVI teams.



By the 30th December 2004 as a command structure was evolving, duplication of effort was recognised by all responders. A meeting of all international DVI teams was called at Phuket Police Station, chaired by Dr Chumsak, Director General of the Central Institute of Forensic Science under the Ministry of Justice.

Out of that meeting was born the TTVI (Thai Tsunami Victim Identification), headed by General Nopadol Somboonsub from the Royal Thai Police as overall DVI Commander. The TTVI was formed in an effort to integrate the conflicting approaches into a single unified process, which was designed to meet the INTERPOL DVI Guidelines for mass fatality incidents.

An underpinning Joint Chief of Staff Command Structure was established represented by Colonel Ponprasert Ganjanarintr of the Royal Thai Police and Federal Agent Karl Kent representing the international community. The operation now had a structure and starting point to evolve that was accepted by and transparent to all.

**Recommendation 21**

***It is recommended that the TTVI Command structure for managing a multi-national DVI response should be identified as good practice.***

An international DVI coordination centre was initially established at the Royal Thai Police Headquarters in Phuket, to co-ordinate the activities of all international DVI teams in Thailand but was later transferred to the Telecommunications Organisation of Thailand (TOT) building and became known as the Information Management Centre (IMC).

This centre again operated under the overall command of Police General Nopadol of the Royal Thai Police. This centre was deemed to be the primary location for the collation of all AM data including that collected in Thailand and by the international community.

**Recommendation 22**

***It is recommended that the concept of the Information Management Centre (IMC) should be identified as good practice and promoted by INTERPOL to all member states with INTERPOL guidance around the operating procedures.***

The four main areas of the DVI Operation were:

1. Command and Administration - TOT Building, Phuket
2. Field Operations: Mai Khao Cemetery, Phuket (Sites 1C and 2)
3. TTVI Information Management Centre -: TOT Building, Phuket
4. Property Operations - Talang Police Station, Phuket.

On 7<sup>th</sup> January 2005, a strict protocol for DVI operations was established and agreed by an International DVI Committee representing over 400 DVI specialists from over 30 countries. This protocol established some important ground rules around the transparency and the ethical approach that was to be taken by all those involved in the operation. The first principle being that every victim would be treated equally without prejudice and the second principle being that the INTERPOL DVI process would be the agreed method to deliver the identity of all victims. This ensured the integrity of the process and sought to inspire confidence. Fingerprints, DNA and Odontology were also agreed as the primary identifiers. These protocols still hold good today and should form the basis of any future international operation.

**This initial protocol defined the backbone of the international agreements for mutual understanding and co-operation. Essentially it outlined:**

- 1. Every deceased person will be treated equitably to ensure there is no discrimination based upon race or ethnicity.**
- 2. It is agreed that all DVI operations conducted in Thailand will observe the International INTERPOL DVI Guidelines.**
- 3. It is agreed that there will be complete co-operation between the Thai authorities and the International Community.**
- 4. It is agreed that International DVI teams will be allowed to re-examine deceased persons if deemed necessary. This re-examination is to be conducted only once and in the company of a Thai Doctor.**
- 5. A joint command structure has been endorsed by Police General Nopadol Somboonsub, Deputy Commissioner General, Royal Thai Police. This is the agreed command structure for all DVI operations in Thailand.**
- 6. It is agreed that the DVI Commander is General Nopadol Somboonsub.**
- 7. It is agreed that Joint Chiefs of Staff representing Thailand and the International Community will report directly to General Nopadol on all aspects of DVI operations.**
- 8. It is agreed that a Thai Tsunami Victim Identification Executive Committee (TTVIEC), established at the Telecommunications**

**Organisation of Thailand (TOT) in Phuket, will co-ordinate all DVI Operations in Thailand.**

**9. The composition of the Thai Tsunami Victim Identification Executive Committee will include:**

- a. Chair of the International DVI Committee, Thailand**
- b. Joint Chiefs of Staff (2)**
- c. Deputy Joint Chief of Staff**
- d. DVI Commander Site 1 (Wat Yan Yao)**
- e. DVI Commander Site 3 (Krabi)**
- f. Secretariat**
- g. Police Liaison Officer representative**
- h. IMC Commander Thai Tsunami Victim Identification – Information Management Centre (TTVI-IMC)**
- i. A maximum of 4 other members as identified by the International DVI Committee, to ensure appropriate International representation on this Committee.**

**10. It is agreed that the Thai Tsunami Victim Identification Committee will comprise all DVI Commanders and Police Liaison Officer Representatives from those nations engaged in DVI operations in Thailand.**

**11. It is agreed that the DVI Commanders will report on progress and critical issues to the Executive Committee on a daily basis.**

**12. It is agreed that a single Thai Tsunami Victim Identification Information Management Centre (TTVI-IMC) will be established to manage Ante Mortem and Post Mortem data and reconciliation processes.**

**13. It is agreed that the operations of the TTVI-IMC will be controlled by detailed protocols.**

**14. It is agreed that the DVI International System software programme from Plass Data Software A/S, Denmark will be implemented at the TTVI-IMC to store and compare all Ante Mortem and Post Mortem data.**

**15. It is agreed that it would be optimal for Thai DVI and forensic specialists to operate within the TTVI-IMC. This would facilitate the transfer of Ante Mortem and Post Mortem data into the Plass Data system. This data was obtained by Thai DVI teams in response to the disaster.**

**16. It is agreed that INTERPOL will provide communications, identification systems and logistic support to the TTVI-IMC for the duration of operations.**

**17. Four mortuary sites of operation by the International DVI Team Operations established at:**

- a. Site 1a: Wat Yang Yao (Phang Nga Province)**
- b. Site 1b: Bang Muang (Phang Nga Province)**
- c. Site 2: Tha Chat Chai (Phuket Province)**
- d. Site 3: Krabi (Wattham Province)**

**18. It is agreed that a standardised body numbering system will be applied to all sites of operation to ensure the allocation of individual body reference numbers: These numbers consist of:**

**Country Code # - Location Code # - Body number**

**Example: 61 – 1 – 12345**

**Note: Any deviation from this system must be authorised by the Executive Committee.**

**19. It is agreed that collection of DVI Post Mortem samples will consist of:**

- a. Fingerprints where possible**
- b. Dentition**
- c. Bone fragments (if necessary)**
- d. Two intact healthy teeth (molars)(Molars)**
- e. Physical Description**
- f. Property**
- g. Medical Data**

**20. It is agreed that chain of custody documentation must be created from all evidence processed or samples created by all parties involved in the DVI process.**

**21. It is agreed that complete openness and availability of all chain of custody documentation will be observed for all evidence processed/created by all parties involved in the DVI process.**

**22. It is agreed that DNA profiling of both Ante Mortem and Post Mortem DNA samples will meet the standards set out in the INTERPOL Guidelines for the use of DNA in a Multi Casualty Incident.**

**23. It is agreed that China will provide a single, accredited DNA laboratory to undertake the analysis of Post Mortem samples obtained in Thailand.**

- 24. It is acknowledged that Thai government laboratories have already conducted DNA profiling of a significant number of PM samples. Wherever possible this data will be used to effect identification through the TTVI–IMC reconciliation processes.**
- 25. It is also agreed that until the Chinese DNA profiling facilities are fully operational, the Thai government authorities have kindly offered PM sample DNA profiling capability for priority cases. This service will be provided on a limited basis and only upon official request from the victim’s respective Embassy.**
- 26. It is agreed that DNA profiling of Ante Mortem samples will be completed within the country of collection.**
- 27. It is agreed that if a country is unable to conduct the analysis of the Ante Mortem samples the Chinese government will provide this analytical service.**
- 28. It is agreed that Identifiler™ PCR system or equivalent, with 15 loci and one xy chromosome marker, is the most appropriate for DNA profiling of all Post Mortem samples.**
- 29. Should it prove necessary to transport Post Mortem samples outside Thailand to a single DNA laboratory, it is agreed that Kenyon International will provide the transportation service.**
- 30. It is agreed that demographic data should be assessed by scientific methods as recommended by the TTVI – Scientific Advisory Sub-Committee.**

- 31. It is agreed that all scientific and medical procedures and associated analyses should be conducted in accordance with recommendations by the TTVI - Scientific Advisory Sub-Committee.**
- 32. It is agreed that an identification can only be established and deceased released in accordance with the laws of Thailand and when the following requirements have been satisfied:**
- a. An official death certificate identification document signed by a medical Doctor from Thailand.**
  - b. Where possible this death certificate should be co - signed by a DVI Commander or delegate from the International DVI team.**
  - c. All identification documentation must be presented to a Thai Government TTVI Identification Board by the nominated TTVI-IMC Reconciliation representatives.**
  - d. The identification documentation must be accompanied by a covering request from the relevant Embassy requesting the release of the identified deceased.**
  - e. Identification will be based upon a positive comparative analyses (match) of at least one of the following primary identifiers:**
    - i. Fingerprints or**
    - ii. DNA or**
    - iii. Dental.**
  - f. Where possible, secondary evidence to support identification should also be presented. This may include facial recognition,**



**property, jewellery, documents, tattoos or evidence of medical procedures.**

**g. If the TTVI Identification Board is satisfied of the identification, the body will be released for the purposes of repatriation.**

**h. All original documentation that supports the identification of the deceased will remain the property of the Thai Government.**

**i. Copies of all identification records will be provided to the respective International DVI team representative for their records.**

**33. It is agreed that in the interests of public health and on completion of post mortem examinations, a single commercial company will prepare the deceased for release to next of kin.**

**34. It is agreed that when a victim is identified to the satisfaction of the Thai Identification Board, the Thai Government will notify the respective Embassy. That Embassy will then undertake to advise the Thai Government as soon as next of kin has been informed.**

**35. It is agreed that a number of commercial companies can provide repatriation services to all countries who seek this service. The deceased are to be prepared in accordance with requirements of individual nations.**

**The basic principle of the aforementioned protocol not only served to successfully underpin the entire TTVI Operation over the lengthy period of the mission, but has also been tested to limits not previously experienced in an international environment. The protocol encapsulated both the major**

concerns of all nations represented and delivered some basic, but acceptable, solutions to the significant faith and cultural challenges that such a multi-national event highlights. It is therefore realistic to believe that the basis of this protocol could be adapted and made available through the mechanism of INTERPOL for future disasters and should be highlighted as a model of good practice.

**Recommendation 23**

*It is recommended that the TTVI Operational Protocol agreed between nations for the Tsunami mission should be recognised as good practice and developed for the future into a universally agreed protocol adaptable to all disaster situations and agreeable to all member states.*

Over a relatively short period of time, critical decisions were taken on how the DVI response would be developed. For transparency and record purposes, an item of good practice was the early creation of a 'Critical Decisions Register' which was maintained by the Joint Chiefs of Staff.

This register was maintained throughout the 14 months of the operation and provided an auditable record of when, where, by whom and why certain strategic decisions were made. These recorded decisions covered all aspects of the operation and were reflections of the debated discussions that had taken place and been approved within the daily 'Executive Committee' meetings which were established as part of the decision making and communication strategy.

**Recommendation 24**

*It is recommended that the maintenance of a Critical Decisions Register (CDR) should be highlighted as good practice and that INTERPOL should consider developing an international CDR for future missions that would be made available through the INTERPOL Web Site.*

### **Recommendation 25**

*It is recommended that international guidance is developed surrounding the practical use of a CDR and how that can be incorporated into both the initial strategic assessment and the mature assessments of an ongoing mission.*

Having established a robust protocol of joint understanding between the Thai Authorities and the international community engaged in providing support to the operation, in essence the following strategic mission statement and supporting values were developed, defined and agreed:

### **MISSION AND VALUES**

#### **TTVI MISSION**

To identify the victims of the Thai Tsunami and release these identified deceased for repatriation to their families, in accordance with Thai law, the INTERPOL DVI Guidelines and TTVI Protocols.

#### **TTVI VALUES**

##### **Commitment**

Members engaged in TTVI operations will be characterised through their dedication, application, perseverance and a belief in their personal capacity to achieve and add value to the operation.

##### **Equity**

Every deceased person will be treated equitably to ensure there is no discrimination based upon age, race or ethnicity.

### **Transparency**

Complete openness and availability of all information and documentation generated through the TTVI operation will be maintained to all persons with a genuine right to such information.

### **Spirit of Cooperation**

There will be complete co-operation between the Thai authorities and the international community and between individual countries within the international community to achieve operational objectives.

### **Accountability**

All members of TTVI operations accept responsibility for the consequences of their efforts and any associated outcomes.

### **Integrity**

All members of TTVI operations will display complete honesty and forthrightness in all their actions whilst engaged in the operation.

### **Recommendation 26**

*It is recommended that the TTVI Mission and Values statements should be identified as good practice and encouraged by INTERPOL for universal adoption by member states for future DVI operations.*

## **STAKEHOLDERS AND PARTNERS**

During the life cycle of the operation, and as the complexity of the operation unfolded, the recognition of the high level key stakeholders and partners became more apparent. These were:

### **Stakeholders**

- Families of the victims
- All nations which have incurred human losses

- **Thai provincial governments**
- **Thai and foreign government departments**
- **Thai and foreign law enforcement agencies**
- **Thai and international health agencies**
- **Funding nations**
- **INTERPOL**
- **National DVI teams**

### **Partners**

- **Telecommunications Organisation of Thailand (TOT)**
- **Normeca**
- **CRIMTRAC**
- **Plass Data**
- **The Bode Technology Group, Inc.**
- **International Commission of Missing Persons (ICMP)**
- **Beijing Genomics Institute (BGI)**
- **UK Forensic Alliance**
- **National Board of Forensic Medicine, Department of Forensic Genetics, Sweden**
- **Other international forensic laboratories**
- **Barcode Data Systems, Pty Ltd**
- **Participating foreign government agencies (law enforcement agencies)**
- **Private practitioners**
- **Other international aid agencies**

**The above list is not exhaustive as would be expected in such a complex set of circumstances and additionally there were many other agencies and Non Government Organisations (NGO's) performing essential work alongside the victim identification process helping to support the survivors and refugee's in their various stages of recovery, from the rescue phases**

through to the recovery phases of returning to normality. Without doubt the notion of normality will take decades to finally achieve and probably take two or three generations to minimise the impact of such a catastrophic event.

The relevance of the essential recovery work particularly in the early months after the event can be affected and impacted upon by the disaster victim identification process itself and should be recognised in terms of potential social and economic impact on an area or region dependant on a vibrant tourist industry.

The wider public image that ongoing victim identification work can have on the reputation of an area is to be recognised in how the operation is managed and publicised. Where possible, the mission should be as low key as the wider media coverage will allow but essentially must be efficient and undertaken as swiftly as circumstances will allow, without impacting on the integrity of the process itself.

**Recommendation 27**

***It is recommended that the social and economic impact that a DVI operation can have on a country or region should be recognised by all DVI Commanders and that operational strategies should be developed to minimise that impact during missions.***

Given the number of perceived victims and the considerable amount of documentation that would be generated, an agreed technology support system was required. The DVI International System from Plass Data was available and thus adopted. This system was utilised to record all Ante Mortem and Post Mortem data. It served its purpose well but due to the high demand placed on the system by the size of the incident, many

deficiencies were identified. No doubt this will inform the user requirement of future enhancements.

### **Recommendation 28**

*It is recommended that INTERPOL recognise the significant benefits derived from the DVI International System (Plass Data System) during the TTVI Operation but examines the limitations of the system in recommending and developing future user requirements of enhanced systems.*

## **ROLES**

Within the mission, the strategic roles played by key contributing stakeholders underpinning the infrastructure of the operation were essentially defined as follows:

### **INTERPOL**

- Management of all Missing Persons information, interaction with Liaison Officer Network, provision of secretariat support to Executive Committee and co-ordination of provision of staff for the IMC. Chair of the Executive Committee and provider of logistical support.

### **TOT (Telephone of Thailand)**

- Provision of building accommodation and facilities for IMC.

### **Normeca (Norway)**

- Provision of portable mortuary facility at Tha Chat Chai. Logistical support, including consumables and mortuary equipment at that site until all activities have been terminated.
- Provision of portable office facilities at the IMC.

### Acknowledgement

*It is requested that all participating nations recognise the professionalism and contribution of Normeca to the success of the TTVI Operation.*

### CRIMTRAC (Australia)

- Provision of an automated fingerprint identification system

### Acknowledgement

*It is requested that all participating nations recognise the professionalism and contribution of CRIMTRAC to the success of the TTVI Operation.*

### Plass Data (Denmark)

- Provision of DVI International System software program to manage all AM and PM data.

### Beijing Genomic Institute (China)

- DNA profiling of more than 800 post mortem samples.

### UK Forensic Alliance (UK)

- DNA profiling of samples from 200 deceased

### National Board of Forensic Medicine, Department of Forensic Genetics, Sweden

- DNA profiling of samples from 600 deceased

### Barcode Data Systems, Pty Ltd

- Commercial offer to provide DNA sample bar-coding system, purchased by Australian Government.

### Other international forensic laboratories

- Quality control DNA profiling of ante mortem and post mortem samples



### **Private Practitioners**

- **Provision of additional forensic specialist support**

### **International Commission of Missing Persons (ICMP - Bosnia)**

**ICMP entered into an agreement with the Royal Thai Police to undertake the DNA analyses of all remaining PM DNA samples (approx: 1500).**

### **The Bode Technology Group, Inc. (USA)**

**Provision of expert forensic advice to the TTVI Executive Committee, preparation of scientific protocols and methods. Support of key initiatives, including DNA sample bar coding.**

### **Acknowledgement**

*It is requested that all participating nations recognise the professionalism and contribution of all forensic providers both in Thailand and around the world to the success of the TTVI Operation.*

### **Acknowledgement**

*It is requested that all participating nations recognise the professionalism and contribution of all the Forensic experts deployed in Thailand in the disciplines of Fingerprints, Odontology, DNA, Anthropology and Forensic Pathology to the success of the TTVI Operation.*

**At the same meeting on 30 December 2004, an international command structure was established. This was based exclusively on the trust and mutual respect of nominated individuals. This structure was essential to cement the delivery of a cohesive, professional solution to the challenges that lay ahead.**

The structure worked remarkably well from start to finish and demonstrated the ability of international law enforcement agencies and forensic specialists to work together for a common goal.

TTVI agreed to adopt the INTERPOL DVI procedures as the standard business process. The operation tested those procedures to their limits given the size and difficult circumstances of the operation and number of victims to be identified.

**Recommendation 29**

*It is recommended that in general the concept of using existing and agreed INTERPOL DVI procedures which promotes universal understanding of business processes should be recognised as good practice.*

**Recommendation 30**

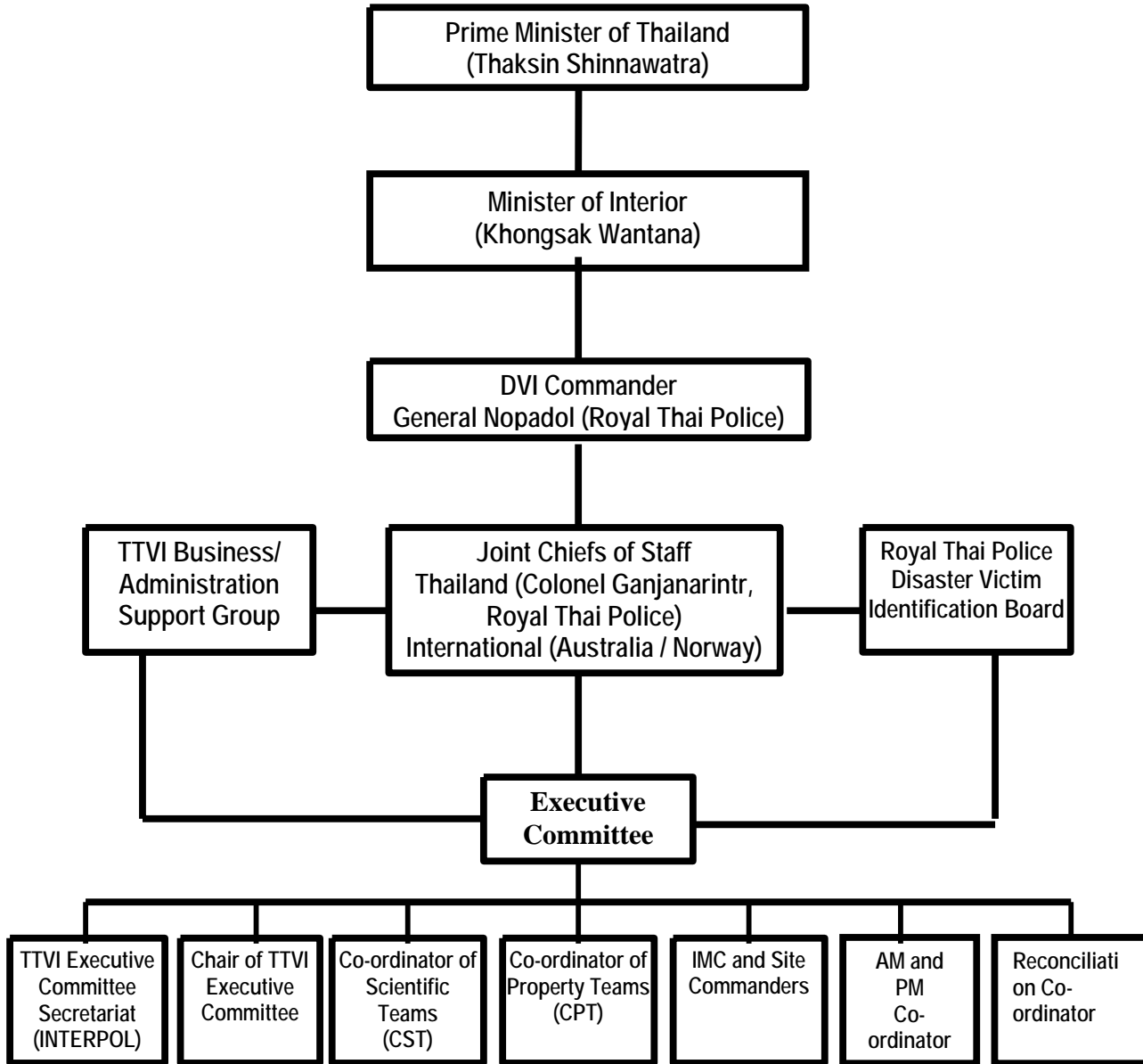
*It is recommended that INTERPOL countries should not abandon ethical and cultural drivers in DVI purely on the grounds that the excessive numbers make the operation logistically difficult.*

**Recommendation 31**

*It is recommended that, with some urgency, that INTERPOL should review and make recommendations on how alternative methods of identification may be considered when the numbers of victims involved in the incident make the deployment of existing DVI procedures impractical (e.g. 50,000 + deceased).*

The multi-national team was to remain in Thailand for a total of 14 months. At the time of their departure on the 28th February 2006, 508 victims remained unidentified from a total body count of 5,384.

## NATIONAL COMMAND STRUCTURE



**TTVI Executive Committee Members**  
 Representatives from all participating countries  
 currently directly involved in the TTVI DVI operation (at  
 12 September 2005 – 17 countries)  
 Police Liaison (on rotation)  
 Joint Chiefs of Staff and IMC Commander  
 Diplomatic liaison officer/advisor  
 Financial advisor (IRL)

**From the outset of operations, funding and accommodation issues were problematic. No formal funding stream for this sort of operation existed and the generous donations of nations such as Australia and Norway were crucial to the initial progress and must be recognised.**

**The hot and humid conditions caused logistical problems around storage and working environments and there was also significant health and safety issues for staff working long hours in difficult conditions and subject to extreme heat particularly those working in personal protective equipment.**

**In total 2,000 personnel from 31 nations were involved in the victim identification process in Thailand and Sri Lanka.**



***Images from site 2 funded by the Norwegian Government***



***Images of the Normeca Temporary Mortuary solution from site 2 funded by the Norwegian Government***

Working from previous experience, Australia took an early decision to fund a commercial responder (Kenyon's International), this proved to be a sound strategic move given their extensive experience in disaster management. Their logistical support proved invaluable in the early months and they were able to facilitate the technical delivery of computer systems and network support, albeit a somewhat crude and basic platform.

A specific issue for concern with hindsight was the lack of offsite data backup systems which could have left the entire operation vulnerable should any further event, such as a fire, have destroyed the main operations centre.

**Recommendation 32**

***It is recommended that in any future mission of a similar nature to the Asian Tsunami of 2004, the strategic infrastructure should recognise the vulnerability of information platforms and have in place daily data back up***

*systems which stores a complete copy of critical data in a readily retrievable format.*

It is certainly viewed as a potential role of INTERPOL to ensure that these elements of initial setup are considered by host nations.

Likewise, in terms of hard data in the form of paper derived records and especially data that was collated for the purposes of Ante Mortem records, it should be remembered that in many cases this information cannot always be replaced if destroyed or lost.

**Recommendation 33**

*It is recommended that submitting countries should be encouraged to ensure that they have in place exact copies of all ante mortem data prior to submission to a foreign host nation. It is emphasised that this is not an issue of trust but addresses responsible security of information.*

The early financial arrangements of *ad-hoc* funding were not sustainable and relied heavily on the good will of multi government support through local embassies. There was no structure to the early funding arrangements and little audit control of what and how money was being spent other than through the Executive Committee. Eventually the financial position developed into the establishment of an international fund to maintain the operational commitments of all nations involved.

As the operation progressed, the TTVI command team became responsible for a multi million US dollars budget made up of the internationally donated funds. This budget although sufficient, still relied on the generosity of individual nations to provide and fund the resources required. There were no rules or agreements supporting these donations and some countries

were more proactive in recognising the urgency and importance of the structure than others who reluctantly volunteered to invest in the process.

It was also evident that as donations were made, country after country attempted to gain political and media advantage by offering larger amounts than the previous donor. Whilst this served to enhance the essential funds required, it was not a model of good sustainable practice for future missions centred on international co-operation and is worthy of wider debate through political forums on how contingencies for such events could be managed more effectively for the future.

For the future, dialogue should take place between the European Union and the United Nations to establish a trigger mechanism for international funding of disaster responses and a contribution formula agreeable to all participants.

The early introduction of qualified and experienced finance officers is also viewed as an essential requirement to relieve the pressure on DVI Commanders who should be focused specifically on the task in hand of identifying the deceased.

**Recommendation 34**

*It is recommended that in any future multi-national response to a DVI incident, the funding arrangements should be a timely but prime responsibility of diplomatic agreement between nations at an early stage of the operation. Furthermore, participating nations should document that arrangement for the benefit of the DVI Commanders.*

**Recommendation 35**

*It is recommended that an agreement should be reached between participating nations for the immediate deployment of a finance team*

*responsible for the spend allocation and audit of international monetary contributions. This should not be a responsibility of DVI Commanders but should be managed by INTERPOL subject to agreement.*

**Recommendation 36**

*It is recommended that the finance team should put in place a process for approval of financial spend requests by DVI Commanders against a non bureaucratic operational budget allocation.*

**Recommendation 37**

*It is recommended that the finance team should be overseen by an approved audit process and the results of all audits should be shared with contributing nations.*

The budgetary management rightly raised other issues over the legal identity of the TTVI and the accountability of its Command Team members to administer the operational spends. Long term, this becomes more difficult due to the continual staff rotations of those deployed. It highlights for the future a clear requirement for an international identity probably under the central command of INTERPOL in partnership with any host nation of a future disaster. It is imperative that early dialogue is secured between the DVI command structure and diplomatic representatives in theatre, to ensure that sustainable financial planning is established.

**Recommendation 38**

*It is recommended that in the event of a multi-national deployment to a country where a significant disaster has occurred, INTERPOL should consider being the lead legal entity for engaging and agreeing contracts which have financial implications.*



The infrastructure developed as needs dictated, with equipment being supplied or funded by donations from participating governments. As previously stated both Australia and Norway were commendable in their substantial investment and financial support. Norway invested in the purpose built mortuary site in Phuket, which once fully established by Normeca, was performing 120 post mortems examinations per day at the height of the mission.

**Recommendation 39**

***It is recommended that all significant donations of equipment by foreign governments should include a caveat of what will happen to the equipment at the end of the operation and if the intention is to donate the equipment to a worthy cause, this should be documented.***

A significant challenge faced by the operation was the development of internal business processes that provided the necessary operational transparency to stakeholders at all levels, from individual and collective governments to those of the victims' families. The processes required consideration of the cultural issues of a multi faith incident, with differing religious requirements and attitudes to death.

These factors and others required careful consideration in order to manage expectations to prioritise individuals for identification. This was unambiguously stated in the TTVI business plan that “every deceased person will be treated equitably to ensure there is no discrimination based upon age, race or ethnicity”. This operational “value” was agreed and on the whole adhered to by all members involved in the DVI operations.

Evidence of adherence was that the Royal Thai Police (RTP) were under pressure to find and fast track the search for the King's grandson, Prince Bhumi Jensen, Khun Poom (son of Princess Ubol Tatana) who at the time

of the Tsunami had been jet-skiing off the beach at Khao Lak. It was later confirmed that the prince was a victim of the tsunami.

Despite this obvious pressure on senior RTP personnel it was agreed by all concerned that all identifications would be achieved by matching Post Mortem data to Ante Mortem data and on no account would any searching be conducted in reverse. This demonstrated fairness and gained unanimous support from all countries including Thailand.

**Recommendation 40**

*It is recommended that the process of matching only comparison of post mortem forensic data to ante mortem forensic data should be recognised as good practice in delivering a fair and non discriminating identification strategy.*

A vital component to the strategy was the engagement with various religious groups in Thailand, in particular Buddhist Monks, who were pivotal in reassuring local communities that international teams were committed to identifying all victims and would not cease operations once they had recovered their own victims.

**Recommendation 41**

*It is recommended that the early engagement with local faith and cultural leaders in any multi-national operation should be identified as good practice and will significantly reduce local community hostility towards foreign DVI experts.*

This placed pressure on some of the international participants and their respective governments, who after accounting for all of their own missing victims, felt morally obliged to remain with the mission until the agreed departure date of February 2006. This obviously had significant financial

implications in terms of their police and scientific staff deployed who continued to be replaced on three, four or five week rotations.

**Recommendation 42**

*It is recommended that as a general rule for deployments and in order to maximise operational efficiency of staff deployments, duty rotas for 'in theatre' staff should not be less than 5 weeks duration depending on local conditions, risk assessment and the security situation.*

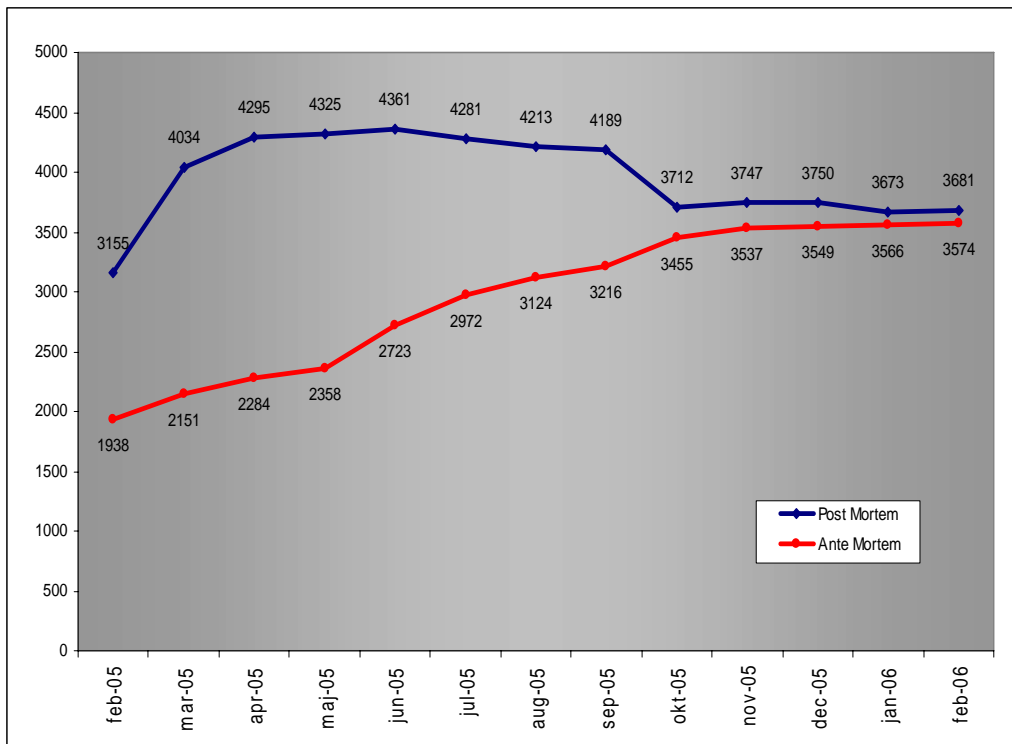
**Recommendation 43**

*It is recommended that generic INTERPOL guidelines be developed for the benefit of DVI Teams in member states to cater for the welfare needs of staff, critical debriefing and the treatment of Post Traumatic Stress Disorders (PTSD).*

All information that was sent to the TTVI centre and collected from the mortuary sites was stored in the DVI System International (Plass Data, Denmark). The number of AM and PM files in the DVI System International during the TTVI operation is illustrated in the following chart.

The final numbers 3,574 AM files and 3,681 PM files are eliminated from duplicate files. This is seen from the declining numbers of PM files from the maximum number in June 2005.

The elimination of duplicate files does not include files of unidentified body parts. According to the official number of missing persons in Thailand and the final number of PM files in the DVI System International 1,714 bodies should have been released before the TTVI operation started. Most of those were identified according to visual and physical identification.

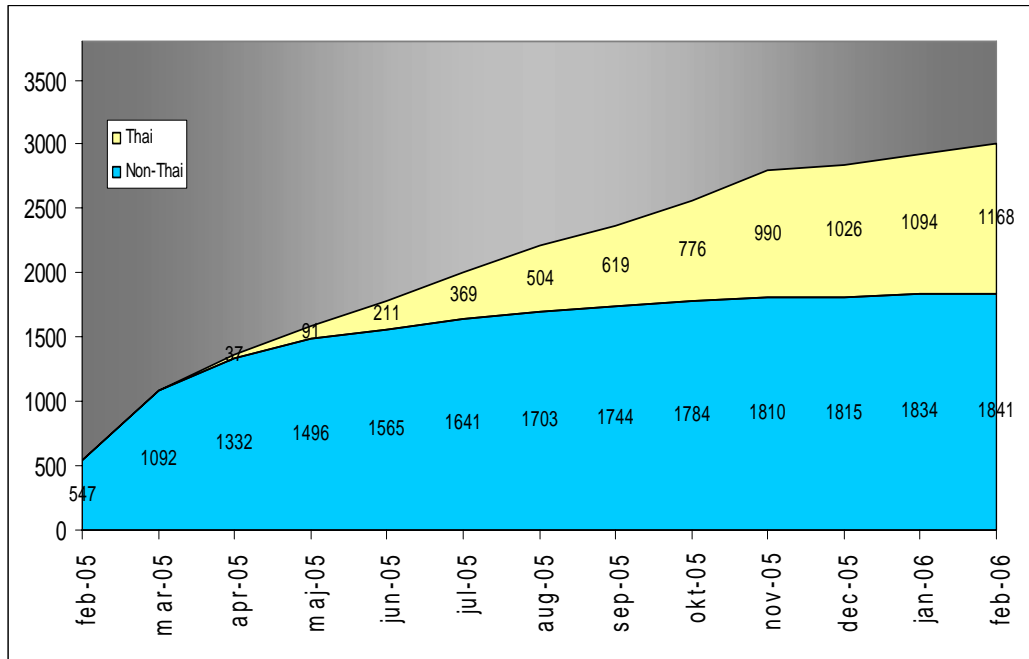


***Number of PM and AM files registered in DVI System International. The decreasing PM numbers reflects the elimination of duplicate files.***

In January and February of 2005, the number of identified bodies increased rapidly. The number of identified Non Thai and Thai bodies are shown in table 14.14. Most of the early identified bodies were foreign tourists spending their holidays around the Christmas festivities in Thailand. A rapid response with AM information from the countries in the North West of Europe made this rapid identification possible. The number of identified Thai bodies increased when more Thai AM information was collected. Lack of AM information from missing persons in Thailand and other countries was an initial problem for the operation.

**Recommendation 44**

***It is recommended that early communication of ante mortem requirements to foreign nations should be a priority for DVI Commanders against an agreed forensic strategy.***



***The number of Non Thai and Thai bodies identified in the TTVI operation from February -05 to February -06. The numbers for February and March do not separate Non Thai and Thai bodies.***

All bodies were identified by primary and supported by secondary methods of identification according to the INTERPOL guidelines, which were endorsed for the TTVI operation. The primary methods included dental analysis, fingerprint analysis and DNA analysis. Personal descriptions and medical findings as well as evidence and clothing were categorised as secondary methods.

In this evaluation these methods are addressed as physical information. Visual identification was not accepted as a method for confirmation of identity. Victims were identified with a single identification method like

dental and fingerprint analysis or with a combination of methods. Most of the identifications based on DNA analysis were performed in combination with physical information including gender, age or other descriptions of the deceased.

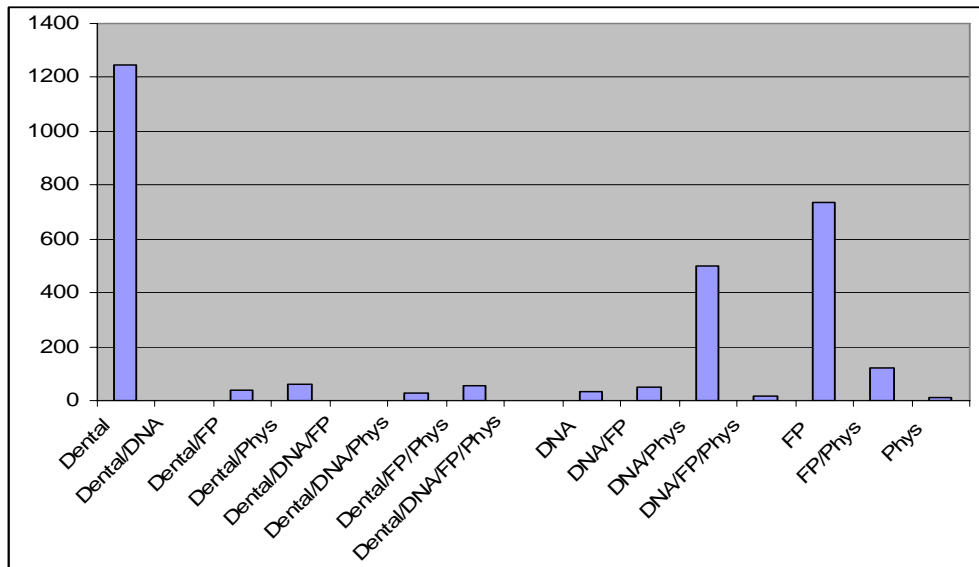
**Recommendation 45**

*It is recommended that the INTERPOL DVI Steering Committee should reinforce to DVI Standing Committee Members that the use of visual identification methods in mass fatality incidents is considered unreliable and will almost certainly lead to the incorrect release of victims.*

**Recommendation 46**

*It is recommended that identification strategies should always include primary identifiers of DNA, Fingerprints, Odontology or unique medical condition. The results from these scientific investigations should meet with the satisfaction of the local legal authority for death certification.*

The following chart provides detail of the number of identifications achieved through a single method approach e.g. fingerprints and also via a combination of different methods e.g. fingerprints and DNA. A significant number of bodies (1,248 or 43%) were identified by dental analysis alone. Fingerprint analysis and DNA analysis in combination with physical information were also common methods for identification. Thirty per cent (880 bodies) of all identified bodies were identified via a combination of different methods.

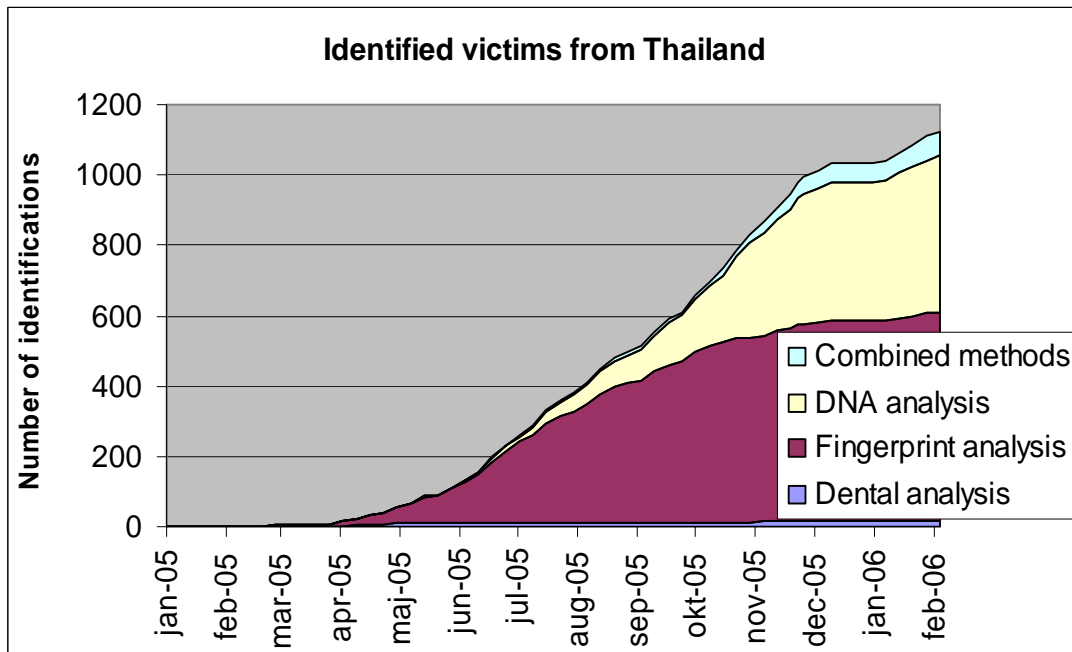
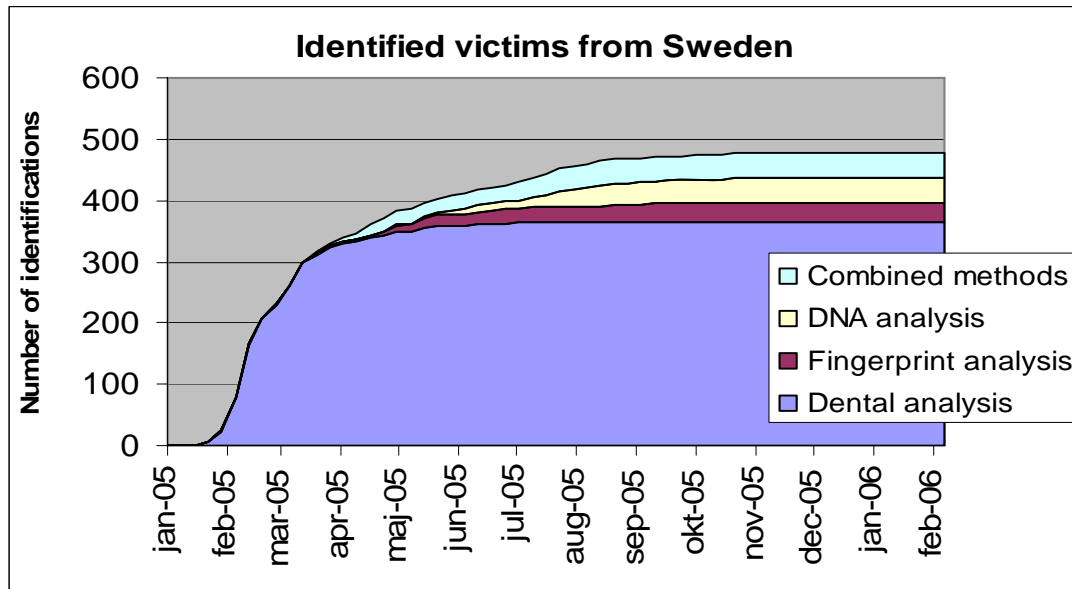


***Number of identified bodies identified with different identifiers or combination of identifiers. The combined classes do not include any order of how the methods were added. Data analysed up to 19<sup>th</sup> January 2006.***

The deceased were identified by different methods according to the AM information available. Dental AM information was sent from most of the northwest European countries early in the process. Therefore a great number of Europeans were identified by dental analysis during the first months of the operation. This can be seen from the table below showing victims from Sweden, for example, identified by different methods. Similar identification profiles were found for most of the European countries.

The Thai bodies were identified later in the process due to an initial lack of AM information. In April 2005 there were 417 Thai AM files in the DVI system compared to 1,867 Non Thai AM files. The effect of this can be seen below showing the number of Thai victims identified by different methods. It is obvious from the figure that dental analysis is not an efficient method for identification due to a low input of dental AM information. The late

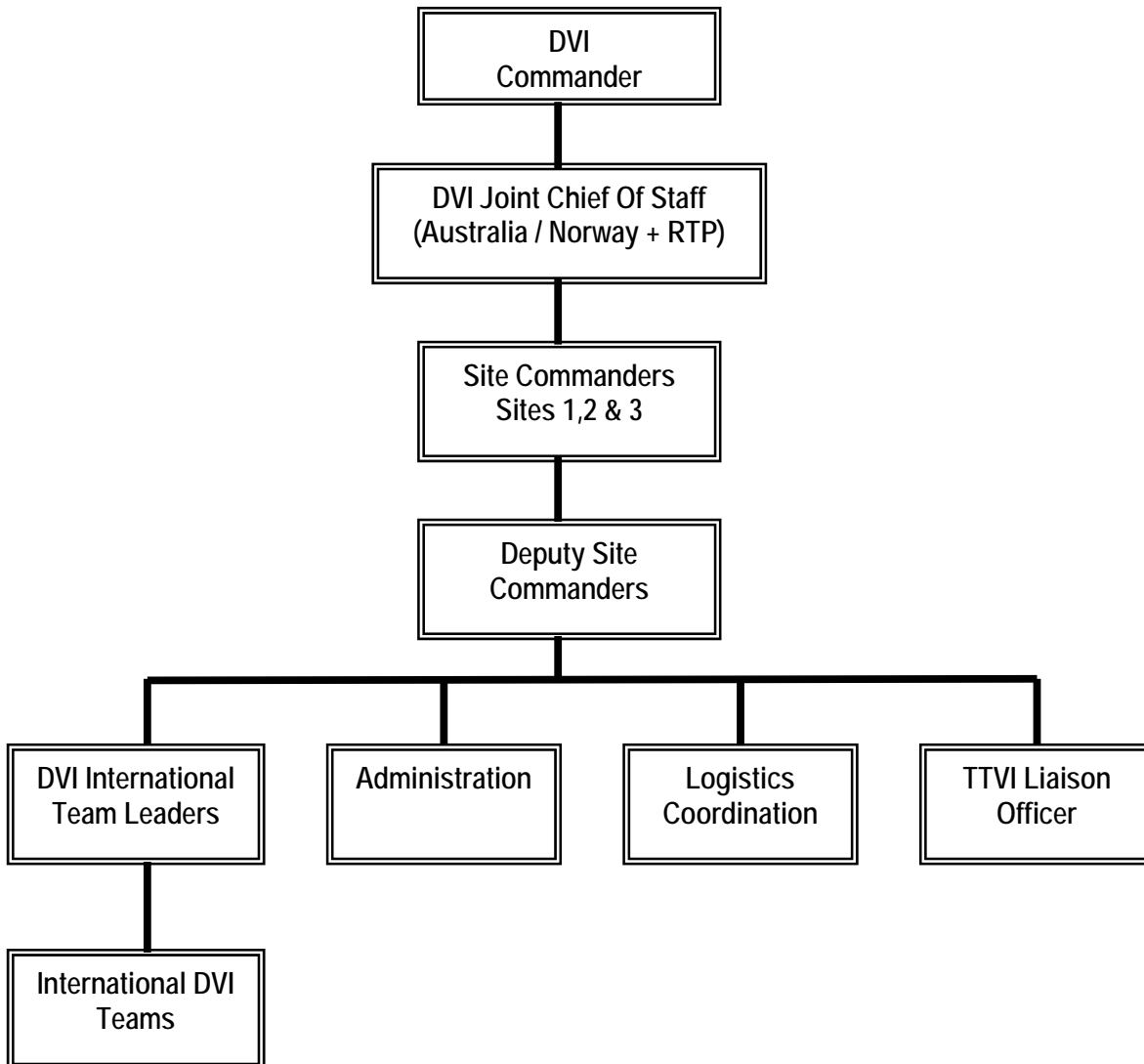
increase of fingerprint and DNA identifications also indicate initial problems with these methods.



**Identified victims from Sweden and Thailand identified by different methods or combination of methods.**



## FIELD OPERATION STRUCTURE



### Field Operation Roles

#### Site Commander

The site commanders held overall authority for all activities conducted at the mortuary sites. This included ensuring all work was conducted within the agreed protocols. They maintained close liaison with IMC Commander

and were responsible for reporting to the Executive Committee on daily activities at the site, including statistics of capacity of the site. They were also responsible for monitoring and maintaining resource levels; including staff rosters for the site.

### **Deputy Site Commander**

The Deputy Site Commander undertook the duties and responsibilities of the Site Commander in their absence. The Deputy Site Commander was responsible for briefing the International DVI Commanders on a daily basis, overseeing the body release process, ensuring health and safety for the workers was maintained and adhered to, and monitoring of resources including DVI team rosters. The Deputy worked closely with the Site Commander, TTVI Liaison Officer and IMC quality assurance team. The body release process included checking the identification paperwork with the deceased, signing the necessary release papers with the Embassy Representatives or family members prior to releasing the body.

### **Administration**

The administration on site was responsible for maintaining accurate records, providing administrative support to the Site Commanders and to the staff working on the site.

### **Logistics Coordination**

This position was responsible for fielding resource requests from the Deputy Site Commanders, facilitating the acquisition and distribution of resources as required.

### **TTVI Liaison Officer**

This position provided a single point of contact for DVI members at the site for queries relating to the IMC. They provided critical liaison between the Site Commander, Deputy Site Commanders, Property Investigation Team, IMC Commander and Fingerprint and Dentistry Team Leaders.

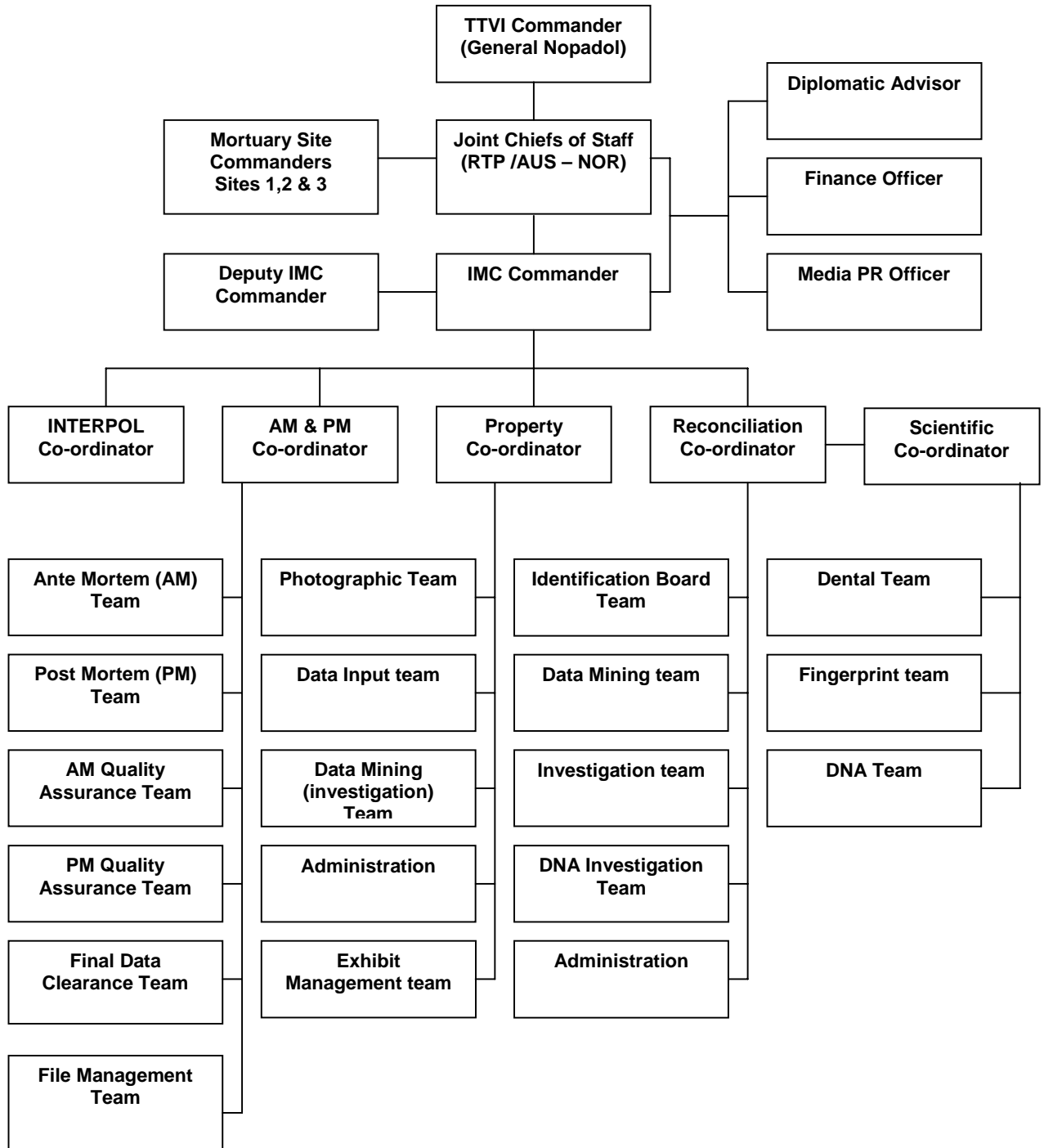
### **International DVI Team Leaders**

These members commanded each of the International DVI Teams and conveyed all issues and considerations to their DVI teams working at the sites and IMC.

### **International DVI Teams**

The International DVI Teams conducted work within all areas of the DVI process, including the sites and IMC.

## TTVI COMMAND STRUCTURE



**Given that thousands of people from many countries lost their lives due to the tsunami, and in recognising that gathering the necessary data from around the world would be a difficult and time consuming process, all information gathered by national authorities concerning victim details was sent to the Thai Tsunami Victim Identification Information Management Centre (TTVI-IMC) in Phuket where it was entered into a parallel database that enabled the matching against the available post mortem information. The task facing the DVI teams in Thailand was to deliver rapid, dignified and accurate identifications of victims so that they could be returned to their loved ones at the earliest opportunity.**

**On average, around 100 staff from more than 20 countries was working in the TTVI-IMC at any point in time. The unit included forensic specialists in a number of areas, including Odontology, Fingerprints and DNA. The centre was organised into various sections to process both ante and post mortem information which was then entered into a specially created database to assist with the identification of all victims of the Thai Tsunami.**

**This co-ordinated effort by the international community significantly speeded up the victim recovery and identification process, enabling victims' families to begin the healing process and societies to rebuild. However the scale of this disaster meant that the Thai authorities, supported by Disaster Victim Identification teams from more than 30 countries, faced a lengthy process in retrieving, analysing and matching data in order to achieve this goal.**

**Police in countries which received reports of missing persons could download the INTERPOL missing person report forms from the INTERPOL public website and once completed, these were then sent electronically to**

the International Missing Person's unit at the TTVI Information Management Centre in Phuket. Each country which had reports of missing persons thought to be a victim were asked to send as much detail as possible – physical description, dental records and X-rays, photographs, fingerprints, DNA and medical history.

DVI teams from around the world were working in Phuket to assist the Thai authorities to identify the victims. The teams used the established and universally accepted INTERPOL DVI protocols to ensure a co-ordinated collection of post mortem evidence. Dental X-rays and photographs were sent to the dental post mortem section in the TTVI – IMC where they were verified and entered by forensic dentists into the Plass Data System. Fingerprint information was sent to the AFIS section where it is also checked, quality controlled and inputted into the system.

**Recommendation 47**

*It is recommended that the concept of the Information Management Centre (IMC) be identified as good practice for promotion through INTERPOL to international member states.*

**Recommendation 48**

*It is recommended that the TTVI Information Management Centre (IMC) staffing template be identified as good practice for future development of forensic data handling and matching centres.*

**Recommendation 49**

*It is recommended that the operational business model of the Information Management Centre (IMC) be subjected to a separate INTERPOL*

*development project to ensure that an international model of best practice is developed for the future.*

**Recommendation 50**

*It is recommended that all Standard Operating Procedures (SOP) and protocols of standard business process are universally developed and adopted into the INTERPOL DVI Manual.*

**Recommendation 51**

*It is recommended that INTERPOL develop minimum standards for data management and data exchange on an international basis for use in future disasters.*

Once a potential match had been made, both the AM and PM information on that individual was sent to the reconciliation team where the potential match was verified. If the reconciliation team believed the match was positive, the file was then developed into a comprehensive identification file of all available supporting evidence and then sent to the Identification Board. This was the equivalent of a Coroner's court which operates in many countries. The Identification Board were then able to give official approval to any victim identification and also authorised the body to be released for repatriation when appropriate.

These procedures adopted within the TTVI – IMC were developed to provide the DVI team members working within the centre with a clear understanding of the protocols and procedures that had been adopted and agreed by both the Royal Thai Police and the collaborating international teams. These procedures were based on the principles of the INTERPOL

**Disaster Victim Identification Guidelines and related specifically to the DVI response to the Tsunami in Thailand.**

**The IMC fulfilled three distinct functions, Ante Mortem and Post Mortem information processing, DVI specialist support and reconciliation processing. The Ante Mortem and Post Mortem Co-ordinator was responsible for the IMC office located on the 3<sup>rd</sup> floor of the TOT building in Phuket. The Reconciliation Co-ordinator was responsible for the reconciliation section of the operation located on the 2<sup>nd</sup> floor of the TOT building. In addition each specialist area was managed by a team leader who was specifically responsible for the efficient management of their specialist group.**

#### **IMC DVI COMMANDER**

**The management of the TTVI – IMC part of the operation was the responsibility of the IMC Commander who was responsible for the overall command and control of the Information Management Centre. The IMC DVI Commander was also responsible for certain daily commitments, including:-**

- At 9.00 am an Executive Committee meeting at the TOT was convened to provide an overview of IMC activities to be provided to representatives.**
- At approximately 10.00 am, the Identification Board process was carried out. The attendance by the IMC DVI Commander was not usually required, as the authorisation for the identification to be presented to the Identification Board was provided by the Chair who was a senior official of the Royal Thai Police.**



- At 12 noon a meeting with the AM / PM Co-ordinator and Reconciliation Co-ordinator was convened to discuss operational progress and any other issues requiring dynamic resolution.
- At 3.00 pm a Liaison Officer Meeting (LOM) was convened in the main board room of the TOT. Initially the IMC DVI Commander attended these meetings to provide feedback to the relevant international country representatives. This function was later devolved to the Co-ordinators. However the IMC DVI Commander would always attend if there were significant messages and information that needed to be circulated.
- At programmed times, tours of the IMC were conducted for Government officials and visiting dignitaries.
- At programmed times, interviews with media representatives were conducted.
- Once a week an International DVI Commander's meeting was convened in the TOT board room. This important meeting provided a forum to discuss many of the critical issues that were arising on a weekly basis and the actions arising were documented to ensure that positive resolutions were progressed.

The IMC DVI Commander was also responsible for:-

- Ensuring strict compliance with the principle that each victim was to be treated equally in terms of the identification process, regardless of any external pressures being exerted.
- Ensuring that transparency of the IMC DVI process was maintained.
- Ensuring that the IMC – DVI Commander did not task or arrange activities that impacted on the operational management of personnel and resources at mortuary sites without closely consulting with the respective DVI Site Commanders.
- Ensuring that the INTERPOL Protocols for Disaster Victim Identification were followed.

- Ensuring that all IMC functions and activities complied with the International DVI Committee Agreement for the response to the Tsunami Disaster on 26/12/04.
- Ensuring that all Standing Operating Procedures for the Antemortem / Post Mortem Centre and Reconciliation Centre were followed.
- Ensuring that a representative and even distribution of nationalities were deployed within the IMC.
- Ensuring that key positions within the IMC management structure were evenly represented across nations.
- Ensuring that personnel within the IMC complied with recognised reporting channels in that they reported to their direct Co-ordinator or Team Leader for advice and guidance.
- Ensuring that all data channelled through the IMC complied with the agreed work flow chart.
- Ensuring that specialist teams at the IMC were staffed with appropriate numbers and skill sets. NB: the initial staffing and rostering arrangements were *ad-hoc*. However, a plan was later developed so that INTERPOL could have a more active role in managing the diverse human resource response.
- Ensuring that the actions of targeted requests were undertaken. Although the initial template indicated that the authority for the targeted investigation is provided by the IMC Commander, this was later devolved to the Co-ordinators to increase efficiency and productivity.

The IMC Commander also authorised all identifications before they were presented to the Identification Board as part of the final quality control process. The signature of the IMC Commander was an acknowledgement that the DVI process complied with DVI protocols only and it was not an acknowledgement that the identification was accepted. Authorisation

could only be provided by the Senior Thai officials in their capacity as Chair of the Identification Commission.

It was a responsibility of the IMC Commander to collate all request forms from the IMC Co-ordinators that related to the re-examination of bodies. These request forms were recorded and copied. The originals were handed to mortuary site Commanders at sites 1, 2 and 3

The IMC Commander was provided with the daily statistics from Plass Data for the number of AM and PM documents that had been entered into the system. From the Reconciliation Centre, they obtained the number of identifications that have been approved, on a daily basis, by the Identification Board. These sources were known to be accurate and therefore a decision was made to only report on activities that were known to be correct as this was felt to be critical to the communication and media strategies.

The Missing Persons list was not considered to be an accurate reflection of the actual number of missing persons as this was a fluctuating statistic for much of the operation given that many people initially reported as missing were later found to be safe and well or not actually involved in the incident at all.

Likewise, the flow of information from some countries concerning the notification of people missing was slow and as such missing people were being reported to the IMC on some occasion's months after the initial event. Consequently, it was decided that until these particular statistics could be relied upon, they should not be reported.

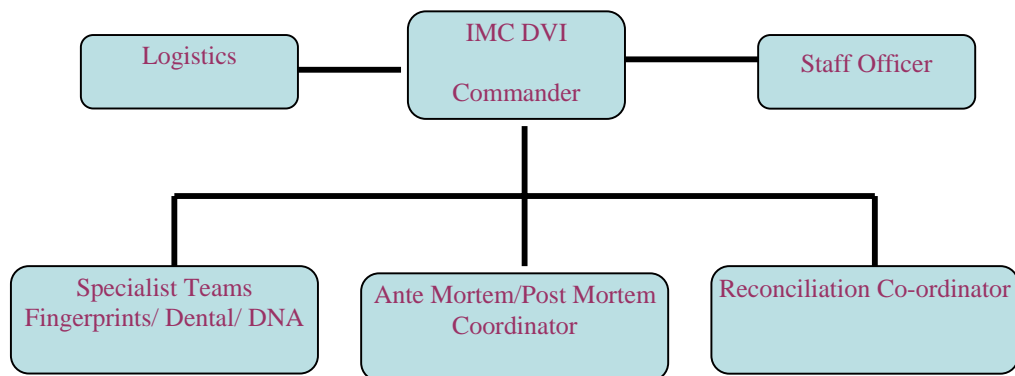
The IMC prepared a situation report on a daily basis and ensured that copies were made available to the members of the Executive Committee

each morning at 9.00 am. The statistics obtained from Plass Data and the Reconciliation Centre was also included in that report.

The IMC ensured that an updated inventory was maintained by Kenyon International. This inventory was required to contain all items purchased under the Australian / Kenyon agreement and also included all resources on loan from the international community.

(NB: - Kenyon International were contracted by the Australian Government to provide logistical support. For accounting purposes all intended purchases of items by Kenyon International had to be authorised by the Australian representative for the Joint Chiefs of Staff).

#### TTVI – IMC ORGANISATIONAL CHART



#### SECURITY

Security of the IMC was a vital consideration to restrict access only to those authorised and to manage the large numbers of visitors, media, families and foreign officials. A number of countries provided staff to assist with the security and reception duties on the second and third floors of the

TOT. The third floor of the IMC was designated for authorized staff only, as was the reconciliation area located on the second floor.

Security staff had to ensure that people entering the 3<sup>rd</sup> floor of the IMC registered at the security desk and if they were not permanent staff then they had to be provided with a security pass. Expressly no press or media were allowed into the IMC without the approval of the IMC DVI Commander.

When new staff commenced work within the IMC, the security officer was responsible for ensuring that the following tasks were completed:

- Each new staff member was required to complete the contact list (name, phone number, hotel name, expertise, country, arrival and departure date)
- New staff were required to complete an application form to work in the IMC, this was then delivered to the AM/PM coordinator
- Open the file DVI Name tag and fill in their name and country. Pick up the next available number. Print it out after saving and make laminated ID-card
- Update the electronic contact list

As a consequence of these procedures, accurate records were maintained of every person that worked within the IMC during the lifetime of the operation and what role they performed. This also proved to be extremely useful in tracking back on previous activities within the operation.

**Recommendation 52**

***It is recommended that all international DVI operations include a security strategy for managing the deployment of multi - national staff at one location.***

### **Recommendation 53**

*It is recommended that skills profiles are developed in agreement with INTERPOL which ensure that personnel deployed to future operations can evidence their qualifications and expertise against an agreed set criteria.*

### **RECEPTION**

All AM and PM information was required to be lodged at the reception desk on the second floor of the IMC to provide an accurate record of all data being received within the centre. Liaison officers from the various embassies or site officers who delivered documents to the IMC had to complete the AM or PM submission document.

Any Targeted Identification Requests (orange documents) received directly from an embassy had to be given directly to the AM/PM co-ordinator once they have been lodged at Reception.

### **ANTE MORTEM**

The AM File Section was divided into six functional areas. These included:

- File Receipt
- File Quality Assurance
- Data Entry
- File Tracking and Records
- File Management
- INTERPOL Missing Persons / Liaison Officer Tasking.

### **Receipt of AM Files in the IMC**

The AM Files were received in a number of different formats. Hard copies of the Yellow INTERPOL Ante Mortem forms on paper with various

attachments including photographs, dental X-rays, dental charts, fingerprints and medical X-rays. The AM files could also be received in XML electronic format which could be directly uploaded onto the Plass Data DVI program.

The following was the agreed procedure for receiving an AM file into the IMC. This process was intended to ensure that there were no mistakes with the documentation and that files were not confused with one another due to multiple submissions:

- Only one file is to be receipted at a time.
- The DVI numbers would be checked on the AM file.
- Countries who electronically imported their data into the Plass Data DVI system retained their country's own number and this was not changed.

AM49 - 2093

Country - Specific number for that individual.

- Countries supplying data by other means had a number assigned by the IMC based on the number of that individual on the INTERPOL Missing Person Database.

AM64 - 217

Country Specific Number for that individual – MP  
Data Base Number

- Whenever a number was changed, that country's own number was cross referenced and recorded on the A0 page of the standard INTERPOL forms under File Number / Dossier Number.
- Extra zeros before the Individual Specific Number would not be used as it detracted from the efficiency and search capability of the Plass Data search engine.

- The file was placed in either zip lock or re-useable plastic envelopes to ensure items were not misplaced or confused.
- The hard file was then delivered to the INTERPOL desk.
- The electronic XML file was delivered to either the AM Team Leader or the Plass Data Administrator for data importing.

#### **Recommendation 54**

*It is recommended that INTERPOL oversee the development of standard operating procedures and minimum data standards for the submission of quality ante mortem data by foreign countries.*

#### **Quality Assurance**

All QA officers must have been trained in the Plass Data System. Access to the system was provided by the Plass Data Administrator.

The QA team ensured that the following procedures were completed:-

- The contents listed on the cover sheet were in the file
- The DVI number was visible on each page/part of the file
- The DVI number was recorded correctly throughout the file
- That the yellow AM form was as complete as possible
- The AM cover sheet recorded what was on the file (either original documents or electronic)
- That the Liaison Officer had been tasked to supply additional information as required
- If the tasking was not fully complete, an INTERPOL Tasking Request was generated and INTERPOL were responsible for updating the tasking
- Any electronically imported files were checked on Plass data



Any identified errors were required to be recorded on the cover sheet. Appropriate inquiries were then made by the AM Team Leader or nominated officer to correct the inconsistency. This may include any amendments by the AM Team Leader or any full review of the file.

The officer checking the file had to endorse the AM cover sheet. If data was electronically imported, that information was written in the Plass Data check box on the right hand side of the AM cover sheet to the effect that it was an electronic file.

To ensure ongoing quality control was maintained, sample files entered onto the Plass Data system were checked on a weekly basis. The size of the sample should have been a minimum of three files for each staff member inputting data during that period.

Where an error was identified, the reason for the error was investigated. Where the error was deemed serious, or there appeared to be a systemic problem, the matter was to be reported to the AM Team Leader for necessary action.

The file was then delivered to the AM File Tracking and Records Section.

### **File Tracking**

The AM File Tracking and Records Section physically held the completed files and managed the file's movement around the Centre. They were responsible for ensuring that all files passed through all steps in the data entry process. All files then had to be returned for tracking before going onto other sections in the data entry processes to ensure the file could always be located at any time.

This section also maintained two forms of records to allow files to be located within the centre. A movement sheet existed within the suspended folder, which recorded the date, section and person who took possession of the file and a register was maintained of all movements of all files.

**On receiving a new file they would:**

- **Open a suspension folder for that new file in the filing cabinet under the country of origin of that file**
- **Label the suspension folder with the DVI number**
- **The tracking section would sign and date the logged check box on the right hand side of the ante mortem cover sheet on the creation of the suspension folder and the start of the tracking process**

**On receiving more information for existing files:**

- **The files would be combined and the cover sheet would be brought up to date**
- **The file would be directed to any data entry section required to complete the data entry process**

### **Data Entry**

**All staff involved in the entry of data onto the Plass Data system had to be trained in that system. Access to the system was provided by the Plass Data systems officer. Each file was entered onto the system. This was conducted in separate operations:-**

- **Parts A, B, C, D, E and G of the DVI form**
- **Parts F1 and F2 by the forensic dentists**

**If the file included fingerprints, the file was forwarded to the Fingerprint Team for scanning onto the Sagem Fingerprint System (provided by Australia).**

**In each case the AM File Cover Sheet was endorsed by the respective officer after each part of the data entry was completed. The officer was required to record their initials and the date. Boxes were provided for further information to be recorded by the Dental and Fingerprint Section as**

the process could be incomplete because the country of origin had supplied insufficient or substandard dental or fingerprint documents.

**Recommendation 55**

*It is recommended as good practice that the input of information onto Plass Data should be carried out by experts within the forensic disciplines to which the information appertains.*

**Importing of Electronic Files**

Disks that contained data / files on multiple individuals would be endorsed as uploaded, dated and signed in permanent ink on the disk. The IMC data / document receipt that accompanied that disk would also be endorsed. Such disks would be stored in the large exhibit drawer in the AM file tracking section. This allowed for re-importing of files if corruption occurred but again highlighted the business continuity risk of not storing additional data copies away from the Information Management Centre.

- Countries supplying a single disk for an individual would be endorsed as uploaded, dated and signed signature in permanent ink on the disk.
- At the end of each day a data import report would be printed and given to INTERPOL to update the MP system.

Photo CDs would not normally be printed unless requested by the Reconciliation Section. When a request was made for an image from a CD to be printed, a copy of the image was always required to be maintained within the individual PM file. Colour film would not be processed unless requested by the Reconciliation Section.

Any problems with the Plass Data system had to be referred to the AM Team Leader or the Plass Data Systems Officer.

#### **Recommendation 56**

*It is recommended that within future planning assumptions, it would be wise to engage and develop the established worldwide technical capabilities of the INTERPOL I-24/7 network infrastructure to provide a robust platform for managing the computerised systems, improve international communication and enhance data transfer of records between countries.*

#### **File Management**

When all the data entry was completed, the file was stored in the AM File storage cabinets. Files were stored numerically under each of the country codes and individual DVI numbers, e.g. 61 and the DVI number. CDs that contained data from one deceased were filed with the particular individual file.

All filing cabinets were located in a filing room which could be locked. One set of AM and PM record keys was maintained by the AM Team Leader and one set by the PM Team Leader. At the end of the working day, all files had to be returned to their document trays / hoppers. The tables on which the trays / hoppers were positioned had to be moved into the record rooms at the end of each day. Where possible ALL files had to be secured in the locked room 'after hours'.

When a file was removed from the file store, an entry was made in the movement register. A drop sheet would replace the file in the suspension folder in the filing cabinet.

### **INTERPOL Missing Persons**

**INTERPOL were required on receipt of files or Plass Data importation reports to:**

- **Check the Missing Person Data Base to confirm that this person was known to the operation**
- **Place an AM cover sheet on the front of each new file**
- **Pull any previous file for that individual and combine the documents**
- **If they were known, INTERPOL would update what documents / data had been supplied and close such tasking as complete**
- **If they were not known, INTERPOL would enter them onto the MP system and then raise whatever tasking request was required to provide the most complete AM file on that individual;**
- **Update any tasking reports which were required and placed one copy of the most recent tasking sheet behind the AM cover sheet. The original would be delivered to the Liaison Officer by handing it to the reception desk**
- **Countries that did not have liaison officers in Thailand, would have tasking requests sent to them by the INTERPOL I-24/7 global communication system**
- **INTERPOL would check using a small tick in the check boxes (on the right hand side of the AM cover sheet) to indicate what was on this particular file**
- **When INTERPOL received information from a country that a person had been located alive they would:**
  1. **Ensure that the Liaison Officer provided written signed confirmation of the person's location**

2. Change that person's status on the Missing Person Data Base to 'located'
  3. Complete / close all outstanding tasking requests, print the tasking sheet and attach them to the documents
  4. Forward those files to the Quality Assurance Team
- When INTERPOL received information from the Reconciliation Section, that a person has been identified as a deceased person, they would:
    1. Ensure that the Reconciliation Section provided written signed confirmation of the person's status as confirmed deceased
    2. Change that person's status on the Missing Person Data Base to confirmed deceased
    3. Complete / close all outstanding tasking requests, print the tasking sheet and attach to the documents
    4. Forward those files to the Quality Assurance Team.

### **POST MORTEM**

The PM File Section was divided into four functional areas. These included:

- File Receipt
- Quality Control
- Data Entry - General
- File Management

### **Receipt of PM Files**

All PM files received from the mortuary sites should have been decontaminated at the site. This was achieved by ensuring that every

single page of the INTERPOL DVI post mortem forms was enclosed within a plastic laminated pouch and heat sealed. Each of the sealed laminated sheets was then cleaned with a disinfectant solution. If this had not occurred the files were sent back to the site and the matter was raised with the Site Commander for not ensuring within their quality control procedures that the necessary process had been completed. The following was the procedure for receiving a PM file:

- Only one file was to be receipted at a time to ensure that there was no confusion of documents between individual files
- The file was checked for any inconsistencies, e.g. multiple DVI numbers
- The PM form was separated into single pages
- Each page was placed 'back to back' in a plastic sleeve
- Dental radiographs, photographs, fingerprint forms and photo CD were placed in individual sleeves
- Where the photo CD included multiple PM files, the CD was filed separately
- The file number and date received was entered onto an individual log for each country code e.g. 47 for Norway
- A PM File Cover Sheet was prepared and placed on top of the file
- The sleeves were then heat sealed and the file stapled together
- The prepared files were then forwarded to the PM Co-ordinator's desk for checking by the PM Co-ordinator or a nominated officer.

Any identified errors had to be recorded on the cover sheet. Appropriate inquiries were then made by the PM Co-ordinator or nominated officer to correct the inconsistency. This may have included an individual amendment by the PM Co-ordinator or indeed a full review of the file.

The officer checking the file had to endorse the cover sheet with their initials and the date.

### **Quality Assurance**

A sample of files entered onto Plass Data (General and Dental) had to be checked on a weekly basis. The size of the sample had to be a minimum of three files for each staff member inputting data during that period. When a file was checked the officer checking the file had to endorse the cover sheet with their name and the date. A list of the files checked had to be maintained with the PM Co-ordinator.

Where an error was identified, the reason for the error had to be reviewed by the officer conducting the check in conjunction with the officer who entered the file and the entry duly corrected. Where the error was deemed serious or there appeared to be a systemic problem, the matter was reported to the PM Co-ordinator for appropriate action.

Where the corrective action was deemed serious, a corrective action report had to be completed by the PM Co-ordinator. The report included the name of the officer, the PM file number, the issue and identified reason for the error.. It also included the action taken to prevent the matter occurring again.

### **File Tracking**

The PM File Tracking and Records section physically held completed files and managed the file's movement around the IMC. They were responsible for ensuring that all files passed through all necessary steps in the data entry process. All files had to be returned to the tracking section before going onto other sections in the data entry processes. This ensured that a file could be located at any time.

On receiving a new file they would:



- Open a suspension folder for that new file in the filing cabinet under the country of origin of that file
- Label the suspension folder with the DVI number
- The tracking section would sign and date the Logged check box on the right hand side of the PM Cover Sheet on the creation of the suspension folder and the start of the tracking process.

On receiving more information for existing files:

- The files would be combined and the cover sheet brought up to date
- The file would be directed to a data entry section, to complete the data entry process.

### Data Entry

All staff involved in the entry of data onto the Plass Data System had to be trained in that system. Access was provided by the Plass Data Systems Officer.

Each file was entered onto the Plass Data System. This was conducted in two separate operations:-

- Parts B,C,D and E of the DVI form
- Parts F1 and F2 by the dentists

If the file included fingerprints the file was forwarded to the Fingerprint Team for scanning onto the Sagem Fingerprint System.

In each case the PM File Cover Sheet was endorsed by the respective officer after each part of the data entry was completed. The officer had to record their initials and the date.

Any problems with the Plass Data System had to be referred to the PM Co-ordinator or the Plass Data Systems Officer.

### **Filing Management**

Completed files were filed numerically under each country code, site code and individual DVI number, e.g. 61-1- and the DVI number. When all the data entry was completed, the file was stored in the PM File storage cabinets.

In some cases, single Photo CDs may have contained photographic images of a number of deceased persons. Photo CDs would not normally be printed unless requested by the Reconciliation Section. Where a request was made for an image from a CD to be printed, a copy of the image was maintained within the individual PM file.

Colour film would not be processed unless requested by the Reconciliation Section. Processing and printing of film would be arranged by the AM/PM Co-ordinator. Processed negatives and photographs would be maintained with the individual PM file.

All filing cabinets had to be locked. One key would be held by the PM Coordinator and one by the manager of the Kenyon team. Where possible, ALL files were required to be secured in locked filing cabinets 'after hours'.

### **Requests for Re-Examination or Review of Files**

There would be circumstances where a PM file would need further inquiries including further examination of the deceased. All requests for further examination of the body had to be in writing and endorsed by the IMC DVI Commander.

### **Data Mining Team**

The Data Mining Team were tasked by request and via their own initiated standard repetitive searches on key identifiers (and speculative searches) to interrogate the Plass Data System to maximise the opportunity for potential matches.

The Unit was coordinated by a Team Leader to ensure that work was prioritised accordingly, and that standard search types were recorded within the Unit to ensure that all new data entered onto the system was included in subsequent searches.

A Request form for Data Mining was available for AM and PM Indexes by which request searches were implemented when a w specific search was identified that may assist in the reconciliation process.

Officers undertaking Data Mining who identified potential matches would refer the information to officers from the reconciliation team, who would request the relevant files. Further investigation would then be undertaken as per other referrals to seek reconciliation.

The Data Mining team would create and maintain a spreadsheet data base where information gleaned from the DVI system could be used to create a reference of completed searches against AM data. This assisted in the management of the team's search routines.

#### **Integration of Thai body numbers into the TTVI – IMC**

An agreement was reached between the IMC staff and some of the Thai forensic experts regarding the integration of early Thai Post Mortem records into the International DVI process. This data had been collected prior to the arrival of the international teams.

As a result of this exercise, As anticipated, approximately 2500 additional records were entered into the Plass Data System, which in the main included only fingerprint and dental examinations.

Due to the large number of records being integrated into the process, and to ensure accuracy, it was agreed that one Thai forensic specialist would work with another specialist from the International DVI contingent, to enter the data into the DVI (Plass Data) computer system and (AFIS) Fingerprint Identification System.

It was also agreed that, as far as possible, the integration of the Thai records into the International DVI process would not hinder or restrict the identification processes and functions of the IMC and would run alongside day to day business.

The numbering system used for the Thai PM examinations was significantly different from the numbering system used via the International DVI response. To ensure that the link to the bodies was not removed, it was decided that the existing Thai numbers be retained, but to preface them with a unique reference number that would clearly identify them as being Thai PM examinations.

To facilitate this it was decided that the preface to the number would be the letters "PM" followed by the Thai country code "66", which would readily identify the case as being examined by the Thai Forensic team. For example, if the Thai body reference number was TK456 then the new number put on the Thai case would be PM66-TK456, "PM66-"clearly identifies that this case was examined by the Thai Forensic Team and the original Thai number that given to the bodies was "TK456".

Any re-examination requested from the IMC would use this unique number, ensuring that the Site Commander as well as the IMC staff was aware who performed the original examination to which deceased it referred.

This process reduced any confusion during the integration of the Thai data and removed the risk of duplication of numbers during the data entry phase on Plass Data.

### **TARGETED IDENTIFICATIONS**

The Thailand Tsunami Victim Identification Committee agreed on the process for specific requests for Targeted Identifications. The only procedure approved by the committee was that an orange 'Request for Targeted Identification Form' was submitted to the IMC by the individual country.

The requests were reviewed by the AM/PM Co-ordinator and if sufficient evidence was available and already entered onto Plass Data then the files needed to be brought together and forwarded to Reconciliation.

If the request was declined or the body had been excluded then the AM/PM Co-ordinator would advise the relevant country's Liaison Officer.

With the exception of fingerprints which had a large degree of international uniformity, the disciplines of Odontology and DNA caused much interesting debate amongst the international experts working together but at the same time brought together much combined expertise to develop workable solutions.

### **DENTAL (ODONTOLOGY)**

It was the goal of the dental team at the IMC to establish the identity of the victims accurately and quickly. To effect timely and accurate dental identification of as many victims as possible required the co-operation of

the countries from which assistance was requested. The failure of some jurisdictions to provide an appropriate quality level of ante mortem documentation seriously impeded this process.

Odontology procedures highlighted the significant differences in dental charting processes and techniques across the world in what was previously believed to be a relatively consistent international methodology amongst dentists. The differences needed to be taken into consideration and carefully managed to ensure that incorrect interpretations were not made by those examining the available data.

Despite the provision of what had been termed “high quality reproductions” the experience of the Tsunami identification teams was that copied information supplied is frequently flawed and often badly degraded in the copying process. Each step away from the original document or radiograph introduces the possibility and the probability of error, resulting in a significant waste of time and also the probability of non-identification.

Photocopies or faxes of radiographs and radiographs that are scanned and then printed are usually so degraded as to be diagnostically of no value. A synopsis of a record is not a suitable substitute for a treatment record as it may well not report data that is necessary. Original radiographs are required in most instances and in this context are defined as any radiograph that is transmitted from the oral x-ray sensor directly to a computer hard drive and stored there as digital data, OR the film produced by the “wet film” process and which normally would be used in the clinical setting to determine what (if any) dental treatment may be required including bitewings (BW, orthopantomographs (OPG) or lateral cephalographs or other films. In each case in the future, it is recommended that family liaison and other investigative personnel that

recover AM data only accept original dental records, including original dental radiographs (films or images).

**Recommendation 57**

***It is recommended that personnel dispatched to recover AM data only accept original dental records, including but not limited to original dental radiographs. All of the dental patient information is valuable and one cannot predict the specific aspect of an AM record that will be the most valuable so all records from all generalist and specialist dentists should be acquired.***

It must be recognized that the potential for significant error exists when photographing x-ray films with a digital camera and submitting these electronically as part of the treatment record. Such digital reproductions may be acceptable provided the files, when viewed on a monitor demonstrate an appropriate level of grey-scale densities that are typical of the origin termed “high quality reproductions”. The experience of the Tsunami identification teams was that copied information supplied was frequently flawed and often badly degraded in the process of photographing them.

In all cases, the dental data should be assessed by at least two forensic odontologists in the country from which the records are requested and transferred to the INTERPOL F1 and F2 forms by them. This acts as a quality control measure. This would speed up considerably the AM data entry process at the TTVI - IMC. To further expedite data entry and reconciliation, all records submitted, including those entered via the Plass Data System had to be in English.

Where the F1 and F2 forms were submitted electronically in Plass Data format, the original dental records and radiographs were also required to be forwarded to the IMC. As an insurance against loss, all of the AM dental records that are sent out of the country should be copied and these copies retained in the home country.

### **Recommendation 58**

*It is recommended that copies of all documents submitted, should be undertaken in the originating country and the copies should be retained there.*

### **Post Mortem Dental Information**

Guidelines on how to carry out the dental examinations were provided to the teams. Abbreviations to be used were attached to the guidelines. Dental treatments should be entered in the PM forms. Conventional radiographs were taken of all bodies. In particular, it was focused on taking “bite-wing” images. Two molars were extracted for DNA purposes. However, due to the conditions at the site, it was not possible to fully avoid contamination of samples. This might have been one of the main reasons why the DNA profiling in some cases failed.

In some PM cases consistent estimation of age was not given by the PM team. Some dentists described the body as either adult or child. Others gave descriptions such as between 40 and 50 years old. When bodies later were identified, it was learnt that the estimated age period was incorrect. Other dentists estimated age of adults in a different way, i.e. approximately 30 years old. When this method was used, these estimates were in most cases quite close to correct age of victims. Specific age estimates on



children/minors were quite accurately given because dental development patterns in these populations are more reliable.

Some dental records were not updated, as there were some difficulties in identifying which dentist had done the last treatment. It was therefore decided to search for fingerprints at the known addresses of those missing.

### **Ante Mortem Dental Information**

Some countries provided dental records and radiographs in an expedient manner. Some of the AM dental information was entered in DVI System Intl in the home countries and then transferred electronically to Thailand. Some incidents occurred with this method. A few radiographs were orientated incorrectly when photographed resulting in reversed images, which can eliminate a possibility for comparison.

Fortunately, these incidents had no consequences for any of the identifications. But it is important to take the necessary measures in order to avoid similar situations in the future.

### **Recommendation 59**

*It is recommended that where AM dental record transcription is provided remotely in the home country it is vital that it is undertaken by a suitably qualified forensic dentist.*

### **Recommendation 60**

*It is recommended that a quality control procedure is carried out by a second forensic dentist to ensure the accuracy and integrity of the information being provided.*

In some instances it will also be necessary for direct conversation to be undertaken between the AM dental team transcribing the patient record with the dentist(s) who treated the patient. There was clear evidence across the international dental community of countries undertaking dental charting in different ways and referencing dental sequences inconsistently. This could have a significant adverse effect on the interpretation of dental records when assessed by other foreign experts. Thus, conversations between the AM team and the originating dentist is advantageous.

Many countries did not have the options or tools to populate DVI System Intl directly, which resulted in the original AM data having to be transferred as hard copies (or written dental charts) to the IMC for this work to be undertaken on site.

Dentists processed the dental AM data. As an additional quality control measure, dentists worked together in groups of two. Dentists familiar with DVI System Intl provided guidelines in accordance with the SOPs. Dentists familiar with DVI System Intl trained dentists with no or little knowledge of it. This caused some delay in the identification process.

No standards were provided on how dental information should be coded in DVI System Intl since the database was so new at the time. A missing tooth was in some cases coded in many different ways. Subsequently, hits following searches for AM-PM matches were sometimes not possible. Some linguistic problems occurred from time to time seeing that some of the details in the PM forms were not written in the working language – English.

The quality of dental information entered in DVI System Intl varied. In particular, it was discovered that some specific dental information was not

recorded. This concerns tooth damage marked by the dentists during PM examinations.

With a few exceptions, dental information was recorded in a satisfactory way. However, quite a few dentists did not enter details such as stains on teeth from smoking and condition of the gum. Findings of orthodontics and artificial dentures were not entered in DVI System Intl. In the diagrammatic representations of the teeth the programme automatically marks the whole tooth surface as filled when this not always is the case, and characteristics are not featured.

The dental data is based on three-digit codes specific for this programme. There is a large selection of different codes for a variety of dental diagnoses. These were not organised in a hierarchical fashion, and at the beginning, this was confusing for most forensic odontologists, as they were not aware of the different possibilities of non-specific and specific search possibilities in the programme. In the beginning, the dental search functions were exceedingly slow and impractical to use in single cases. An additional dental search function was added to the program during summer 2005.

One of the other problems encountered was that only one digital photo or radiograph could be viewed at a time. However, this was corrected during spring/summer 2005. Furthermore, search for dental and non-dental findings together was not possible.

The search functions of the DVI programme have now been improved based on the experiences made in Thailand. In any case, only dentists with intimate knowledge of clinical dentistry and additional training in the search functions of DVI System Intl will be able to perform this task effectively. The search functions were difficult and very time-consuming,

and it was not easy to find matching data for identification. New search functions are considerably more refined.

For those countries that provided good quality and quantity AM dental records, the majority of the victims were identified on the basis of dental data. As DNA analysis started up very late in the process, it was noted that identifications given in the early phase of the operation were mainly based on dental information (and some fingerprints). Supplementary information was also provided in the form of forensic medicine and police evidence.

The AM dental information was entered directly in DVI System Intl. However, this procedure was not used for PM data. Direct entry of this PM data would have saved considerable time. Direct input of PM radiographs could also have been done if digital equipment had been used

**Recommendation 61**

*It is recommended to use digital techniques as a tool for the future. The various DVI related data should all be digitally recorded i.e. dental information, fingerprints, medical findings, property and forensic police evidence. The quality will increase and it will be easier to enter the information in DVI System Intl.*

**Recommendation 62**

*It is recommended that the use of digital techniques should also be included in manuals describing the various forensic police and scientific methods of tracing evidence. Digital information is easy to transfer between workstations.*

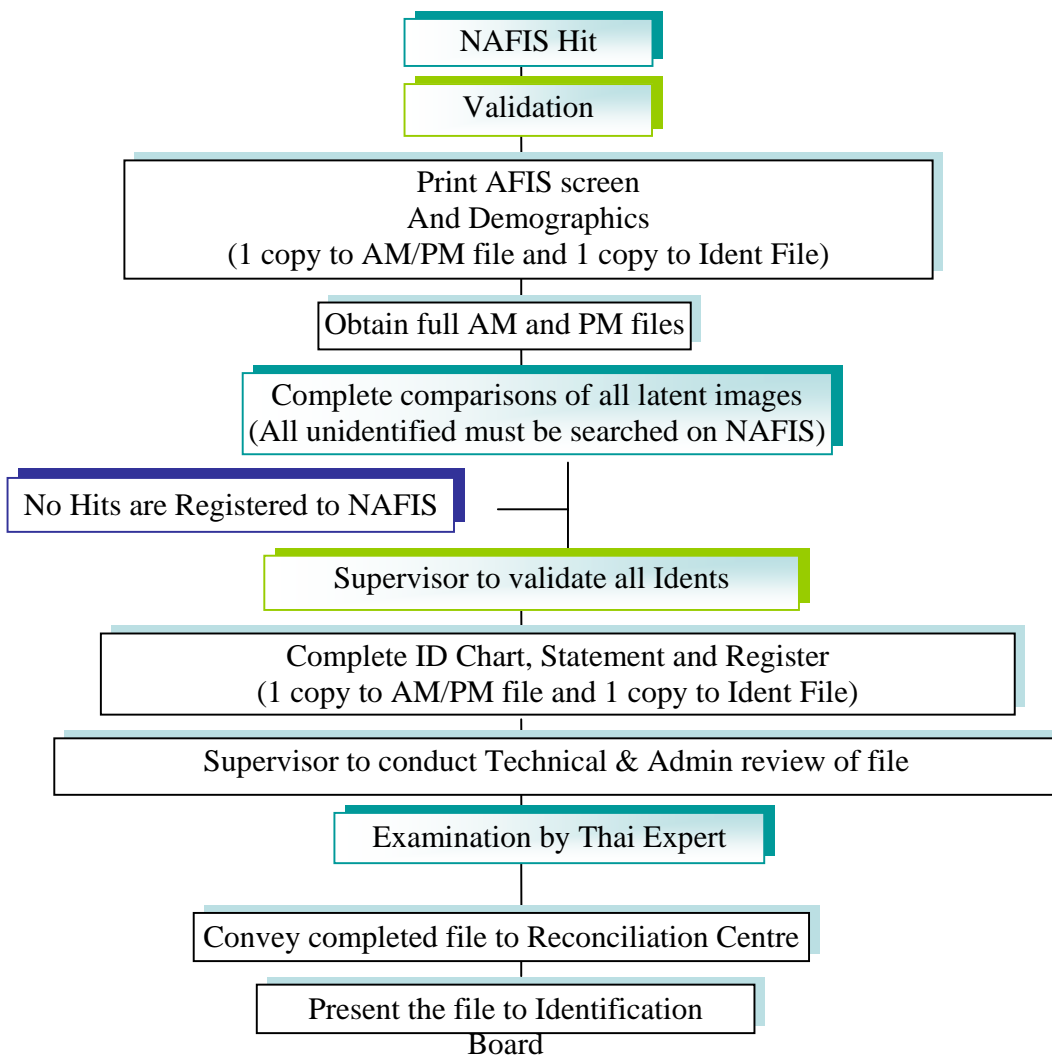
### **Recommendation 63**

***It is recommended that in DVI operations it is not necessary or culturally acceptable that both jaws (mandible and maxilla) are extracted and are removed from the body. Evidence from the TTVI Operation showed that in the few cases where this had been done, the jaws could not be retrieved for re-examination and considerable delay occurred.***

Disarticulation of the lower jaw (mandible) worked well in some cases, but should be avoided whenever possible. This procedure may not be acceptable in all communities from both an ethical and a religious aspect, so authorization to remove the lower jaw must be sought from the lead authority with jurisdiction during the DVI response. If permission is received and the jaw is removed, then it must be replaced in the correct anatomical position so that next of kin can view the body appropriately, which is their right and privilege.

## FINGERPRINTS

The fingerprint section was a multi-national response working on a Sagem AFIS processing system supplied by Australia. Identification matches found on the AFIS system were reported to the Reconciliation Team. The chart below describes the processing of fingerprints throughout the IMC.



## Post Mortem Fingerprints

The fingerprint work at the sites went through considerable change during the period from late December 2004 until the end of PM operation in August

2005. The SOPs were easy to follow for most fingerprint staff, but some problems arose, especially related to the level of skills in language and fingerprinting techniques.

However, being able to work closely with fingerprint experts from a large number of countries gave all the opportunity to share practises. Some bodies had “hollow” fingers. The French fingerprint team introduced a technique of boiling the fingers prior to the examination, which gave very good results.

The fingerprinting of minors was from time to time a significant challenge. In some cases the fingerprint experts used plastic material (Microsil) to lift prints. Some bodies were fingerprinted two or more times by different teams, especially during re-examinations. Unfortunately, they had no access to the prints taken previously, so comparisons could not be made.

This resulted in duplication of efforts and led to some frustration within the teams. The optimal working practice seemed to be a team of two fingerprints experts per deceased with an additional ‘clean’ expert to assist with the paperwork.

**Recommendation 64**

***It is recommended that consideration be given to deploying the Plass Data System within the mortuary facilities for quality control of recorded information within the system against the physical victim examination.***

Many of the fingerprint experts missed having a senior manager on the site. They also wanted to establish a specialised core group to be able to discuss methods and experiences at regular meetings. This would have enabled the teams to set common international standards and improve the quality of the work.

### **Ante Mortem Fingerprints**

When the fingerprint experts arrived in theatre, many had to receive training in the AFIS system set up at the IMC, as they were not familiar with it (not the same as in their respective country). However, this seemed to create no insurmountable problems. Coding of prints was similar to other AFIS systems, and it was fairly easy to learn some new software menus. Officers from Australia were responsible for the training, workflow and routines linked to it. Quality control was also part of the daily routines, and some errors were discovered and corrected.

All fingerprints were scanned before they were entered in the AFIS system at a resolution of 500 dpi. The resolution rate was not adequate, particularly in relation related to fingerprints from children. The fingerprint experts had to use a magnifying glass to be able to see all details. They were not machine-readable. It was not possible to increase the resolution, as the software was not sufficiently “sophisticated”. This was reported to the team of investigators in order to search for other details in relation to children. Identical procedures were implemented in cases with inadequate DNA profiles.

Initially, officers from Australia managed the quality control (QC) of fingerprints. However, the continuous increase in the volume of fingerprint records made it necessary to share the QC among the various fingerprint teams at the IMC. It had a positive effect not only in being able to share experience, but also to detect and correct errors and address missing details.

Working conditions were not ideal, noisy and crowded, but all fingerprint staff enjoyed the work, which they described as a positive experience (professionally and socially).



On 27 January 2005, the first request from the DVI Centre in Thailand was forwarded to obtain fingerprints, if any, from the homes of the missing people. The request was related to the cases where the existing information was inadequate to make identification and in particular the identification of children/minors. Some countries were able to produce good quality AM data in a very short time. Some countries were not able to collect AM prints.

Some countries found that most of the fingerprints were found on school papers, letters, drawings and books. Some of the children had also played with various toys, done palm printing in kindergartens and made hand impressions. Such material was received from schools and kindergartens.

In some countries footprints were also searched for and recovered. This was done because it was very difficult to recover fingerprints during PM examinations of small children. Teams from many countries adopted the method as they realised its value. One Swedish child was identified based on footprints, as Swedish colleagues had been able to obtain a footprint from a cast in putty made at the child's school in Sweden.

As seen in many DVI operations, AM collection is crucial to the process, and many countries were unfortunately not efficient in providing reference material in a timely manner.

Fingerprints also proved to be an important part of the identification process.

#### **Recommendation 65**

***It is recommended that the fingerprint experts should have a professional fingerprint manager to co-ordinate the work and to establish a fingerprint expert group.***

## **DNA**

The DNA team was represented by a number of nations from around the world. The role of the DNA team was to facilitate the identification of deceased persons by comparing and reconciling AM and PM DNA profiles.

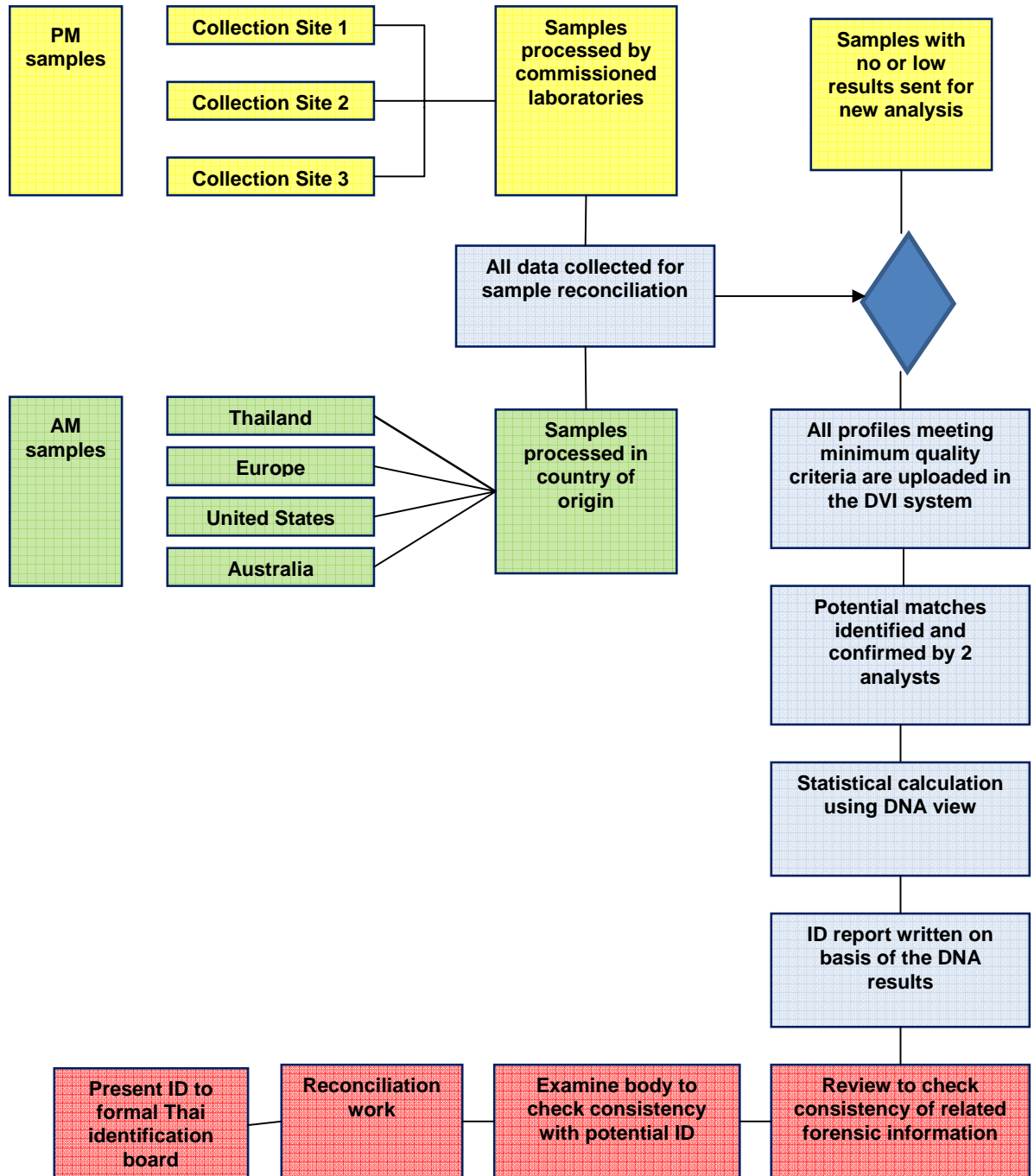
In the early stages of the operation protocols were developed in relation to the integration of DNA data into the IMC particularly for the receipt of AM DNA profiles being imported from countries around the world in differing formats. The establishment of a Scientific Sub-Committee allowed for the development of more detailed and comprehensive protocols over a period of time but the challenges of establishing a consensus of opinion of how this should be done cannot be overstated.

Initially DNA profiling of post mortem samples proved challenging. Despite engaging various laboratories around the world, the ability to obtain results from the samples available in the early stages of the operation were variable and dependent on the extraction techniques employed by the laboratories. It should also be noted that the samples provided in the initial stages were not optimal.

Several DNA laboratories were consulted in order to identify suitable service providers and eventually the International Commission on Missing Persons (ICMP) in Bosnia were commissioned to undertake the DNA analyses.

DNA matching software was problematic in that it required constant expert intervention to verify the outcomes of the matching process. Standardisation of this process in international incidents is a requirement for future development.

The following diagram represents the processes involved in the DNA sampling, analysis and comparison.



**DNA analysis was accepted as one of the primary methods for identification according to the INTERPOL standards. Experiences and learning of the tactical use of DNA from earlier events including the Bali bombings and September 11 terrorist attacks on the United States of America were helpful and the procedures had developed significantly since those incidents.**

**In the first outline of the processes of the TTVI operation it was not established how the DNA work should be organised. A Scientific Advisory Committee was established with the aim to guide the Executive Committee in questions concerning the different methods of identification. Issues for the use of DNA analysis become one of the main topics for this committee.**

**The DNA analysis included a comparison of the victim's DNA profile with a reference profile either from a direct reference sample taken before death or samples from close relatives such as parents, children or siblings.**

**The matching procedure and the statistical calculations differed depending on what kind of reference was used. With direct reference samples a straight forward comparison of the DNA profiles originating from the AM- and PM samples was undertaken. A much more complex comparison had to be performed with reference profiles from relatives. In the latter scenario the statistical analysis had to be performed by a computer system to save time.**

**The main problems experienced with the DNA analysis in the TTVI operation can be summarized in the following points:**

- **Problems with post mortem samples**

**Muscle and teeth samples removed from bodies within days after the tsunami were stored in ambient temperatures, which increased the decomposition of the samples with a limited number of full DNA profiles**

as a result. There were also problems with the labeling of samples sent for DNA analyses that increased the risk for mistakes. These problems and the difficulties experienced by the analysing laboratories to scale up the routines of extracting DNA from bones delayed the return of DNA results from PM samples.

- **Problems with ante mortem information**

There was an initial underestimation of the number of family samples that was needed to establish DNA identity taking into account the total number of missing persons. This and lack of family information (family tree or pedigree) from many countries showing which family members were missing, increased the risk for mistakes and delayed the process.

In families with many victims there was a need to use PM DNA results from identified bodies as proxy AM information for other missing relatives.

- **Problems with matching software**

There was no DNA matching facility implemented at TTVI-IMC until several months after the disaster. The main reason was lack of validated software for sophisticated handling of the information and probably also competing commercial interests. In the meantime a DNA searching facility was implemented in the DVI System International. This facility was further developed to export information for kinship analyses in DNA-View (C. Brenner).

- **Data managements and quality**

Initially there were no routines established for DNA data collection and transfer of information into DVI System International. Initially, it was decided that information derived from early DNA AM analysis work should be sent to Gene Codes in the USA for matching. In April 2005 AM DNA profiles were transferred to the Plass Data DVI System International. The AM DNA profiles coming from over 30 nations were

delivered in many different formats which increased the risk for mistakes and delayed the process. There was also a lack of communication of what information (raw data, quality controls and continuity information) should be supplemented with the AM DNA profiles. DVI System International had no capability to store results from multiple analysed samples from the same body which diminished the possibility to check the DNA profiling quality.

### **Opportunities to Identify Children Using DNA**

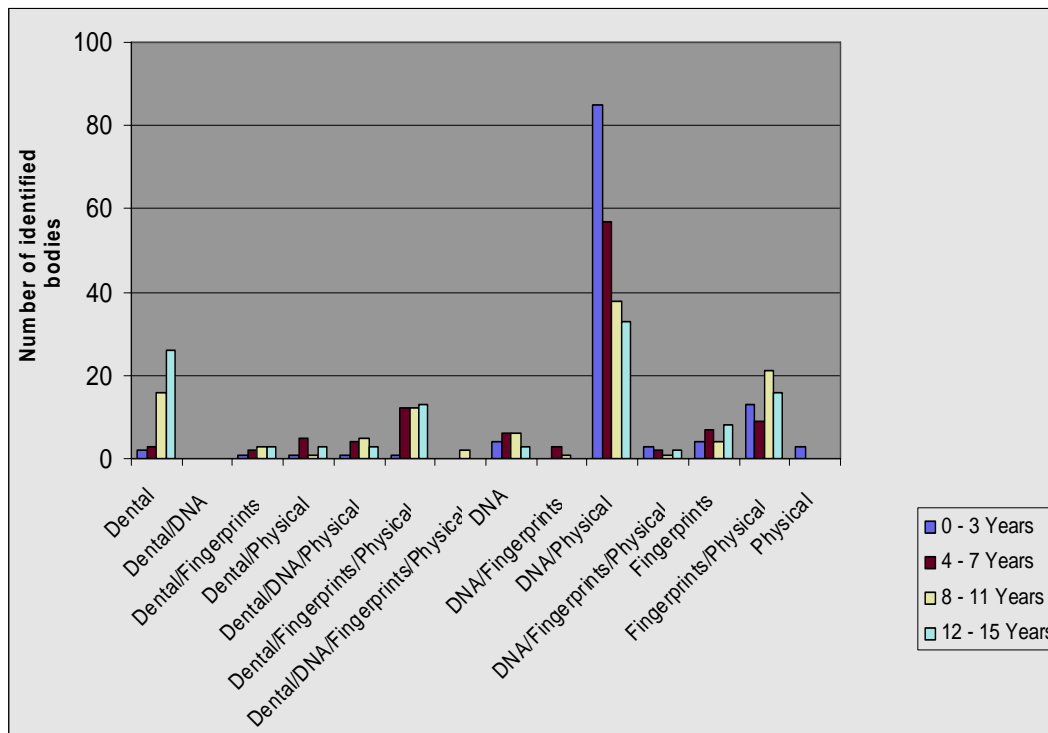
In April 2005 a majority of the adult foreign tourists had been identified mainly by dental analysis but so far very few children had been identified and that began to become a significant problem for the operation. The very successful outcomes of dental comparison for the adults could not be replicated as the children lacked sufficient dental history and recorded information due to their age.

Special efforts were therefore directed to perform DNA and fingerprint analysis on bodies less than 140 cm. Reference profiles (AM information) from relatives or direct reference samples, as for example stored phenylketonuria test samples (PKU – blood test undertaken on babies to test for the presence of an essential enzyme. These are undertaken by a simple pin prick on to a test card which is generally stored by the hospital). If these were available for missing children then this comparison was prioritised.

In many families more than one child was missing. In such cases it was not sufficient to make the identification of the individual solely on DNA matching of profiles from relatives. All children from the family were required to be identified but from the DNA profiles of the relatives it is not possible to decide which child is which, only that they are related..

Therefore most of the DNA matches were supplemented with a physical comparison providing corroborative support of gender, estimated age or other additional information.

The following chart shows the outcome of different methods in relation to the age of the children. As can be seen from the data most of the children were identified by DNA with the support of physical information. This effect increases with decreasing age and the opposite is noticed for dental analysis.



**Number of children, less than 16 years, identified with different methods. Data as of 19-1-2006**

### **DNA Analysis of Post Mortem samples**

China offered in mid January to undertake all DNA analysis on the PM samples at one of their leading laboratories. Some of the early autopsy body samples were sent to Beijing Genomic Institute (BGI) for analysis.

The first batches sent included rib, teeth and femur samples. The circumstances under which these samples were taken and stored were not optimal for the resulting DNA analysis. Problems also occurred due to degradation of the samples and perhaps also because of inadequate laboratory experience of this particularly difficult type of samples, in combination with the high number of degraded samples to be analysed. In a later report prepared by the Scientific Advisory Committee these problems were addressed.

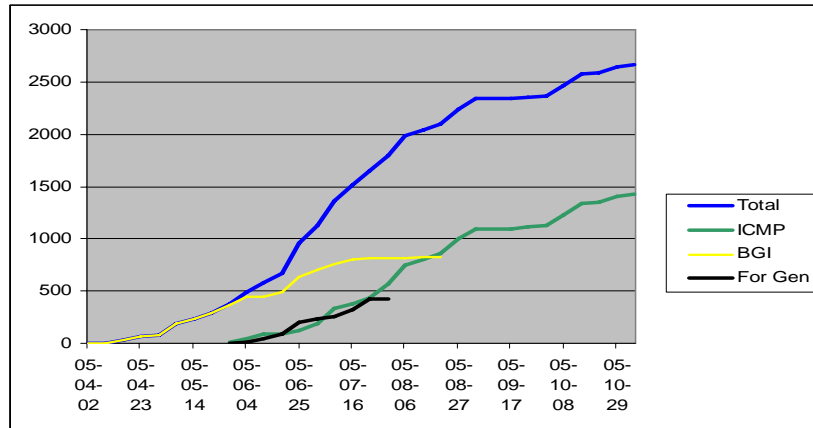
It was decided by the Executive Committee that samples should be sent to laboratories with interest and proven experience to undertake DNA analysis of PM samples. Therefore laboratories, who had expressed their willingness to participate in the work, were sent batches of 10 samples to check their capability to perform the analysis. The laboratories were:

- Australian Federal Police, Australia
- Department of Forensic Genetics, National Board of Forensic Medicine, Sweden
- Forensic Alliance, United Kingdom
- International Commission of Missing Persons, Bosnia
- Institute of Legal Medicine, Germany
- National institute of Scientific Investigations, Austria

By the end of March 2005, DNA results started to come from BGI and from the end of May the numbers increased as results were now also coming



back from the ICMP and the Swedish laboratory as seen in the following chart.



***This chart shows the registration of DNA results from analysis of PM samples in a period from March to November 2005. The laboratories are:***

- ***International Commission of Missing Persons (ICMP), Bosnia.***
- ***Beijing Genomic Institute, China (BGI).***
- ***Department of Forensic Genetics, National Board of Forensic Medicine, Sweden (ForGen).***

### **DNA Systems**

DNA analysis was performed using short tandem repeat (STR) markers. It was decided to use the AmpF/STR® Identifiler™ PCR Amplification kit from Applied Biosystems including the STR systems: D8S1179, D21S11, D7S820, CFS1PO, D3S1358, TH01, D13S317, D16S539, D2S1338, D19S433, vWA, TPOX, D18S51, Amelogenin, D5S818 and FGA. In a few cases Y-STR markers were used. Mt DNA markers was not used in the operation.

## **Recommendations regarding the use of DNA analysis as an identifier**

### **Initial scene assessment**

The major issues include:

- An overview of the number of victims, their origin, family structure, sex and age
- The condition of bodies and body parts
- The environmental conditions such as temperature, humidity and other circumstances that can influence the decomposition of bodies, body parts and samples
- Make an inventory of possibilities for sampling, labeling and storage of samples.
- Make an inventory of where DNA analysis of post mortem samples can be made. Depending on the size of the disaster and what kind of samples that will be taken one or more laboratories may be engaged.
  - National laboratories accredited for DNA analyses of post mortem samples.
  - International laboratories accredited for DNA analyses of post mortem samples.
- Make sure that DNA information (results and continuity documentation) can be stored and matched in a proper way.

### **Recommendation 66**

***It is recommended and important that persons with appropriate experience and skills of DNA analysis within laboratory work and DVI, take part in the initial assessment of the disaster scene and be involved in the decisions taken after such an assessment.***

## **Organisation**

**The DNA work will include the following tasks:**

- **Preparations and decisions for management of the DNA part of the DVI work**
- **Management of the DNA team**
  - **Working plan for the DNA tasks**
  - **Recruiting members to the team**
  - **Facilities for the work taking into account the number of samples from victims and references to be analysed**
- **Information to the different teams and home commissions (liaison officers) and engaged laboratories about decisions taken and requirements needed for the DNA work**
  - **What markers (kit) will be used for the operation**
  - **In which format should DNA results and continuity information be sent**
  - **Where to send DNA results and continuity information**
  - **An e-mail address for specific questions about the DNA work**
- **Collection and file documentation of PM samples taken for DNA analysis**
- **Shipment of PM samples to laboratories engaged for DNA analyses**
- **Receiving and checking the quality of AM and PM DNA results before transferring them to the central DVI system for matching**
- **Matching and reporting to the reconciliation board**

## **Requirements at site**

- **Personnel**
  - **Head of the DNA team should have documented experiences from a leading position in a DNA laboratory working with forensic genetics and trained for DVI operations**
  - **Only persons with experiences of direct matching, family analysis and kinship calculations should undertake DNA matching and reporting**
  - **Registrations and quality checks should be performed by persons working with DNA profiling and are familiar with the DNA nomenclature**
  - **Positions for all the different tasks depending of the amount of work.**
  
- **Facilities required**
  - **Software for DNA matching. If possible implemented in the central DVI system used for the operation.**
  - **Software copies for interpreting DNA profile raw data (ABI Gene Mapper) and a normal office package (Windows Office)**
  - **Hardware as servers, PC terminals for all tasks and positions, printers and at least one copier**
  - **Maintenance of hard and software**
  - **Internet connection with e-mail facility**
  - **A secure connection for data transfer**

### **DNA markers**

AM and PM samples must be analysed with the same DNA markers. In the tsunami work most of the samples were analyzed with one gender and 15 autosomal markers included in the ABI Identifiler kit. Complementary analysis with for example Y-STR markers, special SNP kits and mtDNA methods can also be utilised in special cases.

- The markers must be internationally known and provided as commercially available kits
- Peer reviewed DNA marker frequencies for the relevant populations must be available. INTERPOL may take the responsibility to provide frequencies to use for different populations.
- Analysing laboratories must have the kits implemented in their analysis and be familiar with the markers and kits that are selected for the operation
- International allele calling should be used

### **Post mortem DNA samples**

PM samples should be taken based on best practice for the special kind of disaster and environmental conditions enforced by the situation. Experiences from the tsunami showed that most femoral samples worked well. However, it took too long before the laboratories completed the process from bone to profile but once established, the DNA analysis process worked well. The most critical impact on success for DNA analysis is the state of decomposition of the bodies. Before any decision is taken, it is imperative that a discussion is held with the laboratories to be engaged to ensure that they have the capabilities to manage the nature of the material to be presented for analysis. Be aware of the possibility that samples can be secured early in the process via an FTA sample.

- Samples for DNA analysis should be taken under the supervision of a forensic pathologist.

- Which kind of samples can be investigated?
  - Blood sample, if no decomposition
  - Muscle tissue, if no decomposition
  - Midshaft of femur
  - Teeth (molars)
  - Extra FTA sample can be taken from a clean open part of the body
- The labeling and numbering system must ensure that samples can be traced back to the deceased body or body part. Preprinted labels from rescue kits are preferable. Never change a given number!
- Samples should be documented and filed in a way that it is possible to trace from which body or body part a sample was taken, what kind of sample it is, when and where (at which site, if more than one) it was taken, where it is stored, when and where it has been sent for analysis and when the result is received.
- The samples should be stored in a way that they are secure, protected from decomposition and easy to find.
- Transportation of samples should be performed in a way that the chain of custody is maintained and that they are protected from decomposition.

**Recommendation 67**

***It is recommended that INTERPOL in collaboration with the member states decides on a format for the labelling of post mortem samples.***

**Ante mortem DNA analysis**

Information should be sent to the home countries (commissions) confirming which telling what DNA markers will be analyzed and what AM

**DNA information is required (raw data, quality control information, continuity documentation).**

- **Two possibilities for analysis should be addressed: Analysis performed in the missing person's home country or analysis performed in a laboratory holding an agreement with the national identification committee. Participating laboratories should be accredited for forensic DNA analysis according to ISO/IEC 17025 or similar international standards.**
- **AM DNA analysis can be performed on:**
  - **Direct samples obtained from national bio banks**
  - **Samples from close relatives (parent, child) and if possible from at least two individuals**
  - **Direct samples from personal belongings if possible supplemented with a sample from a close relative to ensure the relation**
- **All DNA analysis should be checked for negative and genomic controls, peak balance and peak height**
- **Results should be transferred electronically according to information given as XML (INTERPOL DVI AM Form Page E4) or Excel files**
- **At the same time, additional information (raw data, quality control information copy of continuity documentation) and a family tree (pedigree) showing, the relation between the persons investigated and the missing person should be transferred to the identification centre.**
- **AM samples, and documentation relevant to these samples, should be stored and filed at the analysing laboratory during the whole operation, if no other information is given.**

### **Post mortem DNA analysis**

Agreements should officially be made with laboratories for PM DNA analysis. Laboratories should be accredited for DNA analysis of PM samples according to ISO/IEC 17025 or similar international standards. The number of laboratories analyzing PM samples should depend on the number of deceased individuals and expected samples. From the Tsunami operation it was found that the most rapid input of post mortem profiles was during the time when Beijing Genome Institute, Department of Forensic Genetics in Sweden and ICMP delivered post mortem results from May to August 2005.2005.

- Routines for the PM analysis should include
  - Documentation of incoming samples including date of arrival and type of sample
  - Photo documentation of the sample showing original test tube label with number, local laboratory number and a size standard
- All DNA analysis should be check for negative and genomic controls, peak balance and peak height
- Results should be transferred electronically according to information given as XML (INTERPOL DVI PM Form Page E4) or Excel files
- At the same time additional information (raw data, quality control information, copy of continuity documentation) should be transferred to the identification centre.

### **Recommendation 68**

***It is recommended that INTERPOL makes an inventory of accredited laboratories prepared and skilled to perform DNA analyses of post mortem samples and deliver results according to the requirements stated.***



### **Registration of incoming DNA results**

Before AM and PM results are transferred to the DVI information system a quality check should be performed. This check should include

- **For the DNA profile:**
  - If all markers have a profile (Full house profile) or if one or more markers lack the profile (Partial profile)
  - The signal to noise ratio in the electroferrograms and possible artefacts
  - If the profiles are identical in cases where multiple samples from the same body have been analysed
  - If the profiles correspond to the relations given for multiple AM samples
- **Corresponding continuity record:**
  - Check that continuity information is provided
  - Concordance between sample numbers given on electroferrograms and tables provided.

### **Matching**

When AM and PM DNA results are present at the information management centre, a comparison (matching) between the profiles can be undertaken.

- **The comparison is dependent on software for matching installed in the DVI software package. The software should be capable of:**
  - Direct match comparison with AM DNA profiles obtained from the missing persons themselves
  - Kinship comparisons with AM DNA profiles from close relatives (Family match) and a statistical calculation including the likelihood ratio for all matches found

- Finding possible relatives by DNA comparisons within the PM profiles
- Handling incomplete profiles or profiles including single mutations
- Downloading information for (or write) reports according to what is stated below
- The software should be validated for use according to international standards (ISO/IEC 17025). The software should also be familiar to the persons engaged in the DNA-matching part of the operation.
- Peer reviewed frequencies for the actual populations should be used for the statistical calculations. This could be supplied by INTERPOL DVI Standing Committee as a service.

### **Recommendation 69**

***It is recommended that INTERPOL initiate a development of the DVI System to also include facilities for kinship analysis of PM and AM DNA results of profiles from at least close family members.***

### **Reporting DNA matches**

If a match is found, a report will be written after the information and the continuity is checked.

A check of AM and PM data should be obtained that includes:include:

- Check of AM and PM profiles
- Check of continuity

A report should be written for every match found and this should include:

- PM and AM reference numbers

- Information about type of match - Direct or Family
- The number of systems investigated
- Where analyses have been performed
- Gender of the missing person according to the DNA investigation
- Statistics
- Signed by the persons who have checked the match and reviewed the report.

### **RECONCILIATION**

The role of the reconciliation centre was to identify persons killed in the Tsunami disaster by reconciling Ante and Post Mortem data and assist the Identification Board in the identification process, culminating in the repatriation of all individuals where required. The procedure worked under the auspices of the Disaster Victim (DVI) Protocols for all Countries Conducting DVI Operations in Thailand in response to the Tsunami Disaster of December 26 2004.

### **Referrals**

Referrals were received into the Reconciliation Team (hereafter referred to as the (Team) as a result of information supplied by the DVI system including where Primary Indicators, Data Mining, Liaison Officer referrals and those cases highlighted for targeted investigation were to be actioned by Reconciliation Officers.

### **Ante Mortem and Post Mortem Reconciliation**

The Police Reconciliation Officers within the Team undertook tasks to ensure that all avenues of investigation were identified and the necessary

referral requests were made to maximise the effectiveness of the reconciliation and repatriation process.

Requests for enquiries by Liaison Officers from individual countries, IMC based Investigators and specialist expert reconciliation were channelled via the administrator to ensure that all requests were recorded.

Referrals were entered onto a computer database that was used to track all subsequent action taken within the Team's office.

A reconciliation cover sheet form (RCN1) was initiated by the Administrator. The AM/PM numbers were entered and any request made recorded. AM/PM File requests would be made using a file request form (RCN2). All requests were managed via the administrator who acted as liaison with other DVI departments and updated the reconciliation database as to the current position of the investigation/enquiry.

The administrator ensured that all requests were followed up on a regular basis to ensure that both AM and PM data was made available to the reconciliation officers at the earliest opportunity for consideration. Form RCN1 would then be updated with the date of the request and papers filed within the team's records section to await delivery of requested information.

When both AM and PM data were received within the Team by the administrator, these would be given to a Police Reconciliation Officer (PRO) along with the original request documentation. On receipt of these papers for reconciliation, the PRO would conduct a detailed examination of the information supplied and ensure that the correct documentation was present. If discrepancies were identified, these had to be highlighted and returned to the administrator with the appropriate comment recorded, in order that rectification could proceed.

Requests for expert reconciliation or Liaison Officer enquiries were made by the PRO on an Inquiry Request form. Requested investigations to the Royal Thai Police or IMS Investigation officers were requested on a separate form.

The above requests were then channelled via the Team administrator who would maintain the appropriate records and file the papers awaiting the required response. On receipt of the requested data, the administrator forwarded the full file to a nominated PRO for consideration.

If the PRO considered that the file was complete, reconciliation assessment would take place. If not it was returned to the Administrator. Where requested data did not exist or was insufficient for this purpose, consideration was given to alternative requests.

If sufficient evidence was identified by the PRO to indicate reconciliation and identification, an Identification Cover Sheet was completed. Supporting secondary indicators would, if in existence, be recorded on a Reconciliation (Police officer) form.

An identification report by the relevant expert was included in the file, returned to the PRO to facilitate the update of the Plass Data System and resulted in the generation of the Comparison and Victim Identification reports.

A file check list was initiated by the PRO who indicated the presence of all the relevant data and signed it off to that effect. This form was used by both the Team Leader and Reconciliation Co-ordinator to confirm the quality and accuracy of all information contained within the file. The Reconciliation Team Leader and Reconciliation Co-ordinator would sign the Victim Identification Report only if both were satisfied with the file..

### **Repatriation Board Team**

Once the above process had been completed, the file would be returned to the Reconciliation Administrator, who would forward the completed file to the Repatriation Board Team Leader. On receipt of the file, the Team Leader quality assured the contents in preparation for inclusion in the next Identification Board hearing.

The Team Leader had to ensure that the IMC DVI Commander had signed the comparison documents prior to them going to the Identification Board.

Requests for repatriation were dealt with by the team, in consultation with the Liaison Officers attached to the relevant consulate, to ensure requests were handled expeditiously. It was essential that written requests for repatriation from the respective Embassy were received prior to the Board sitting.

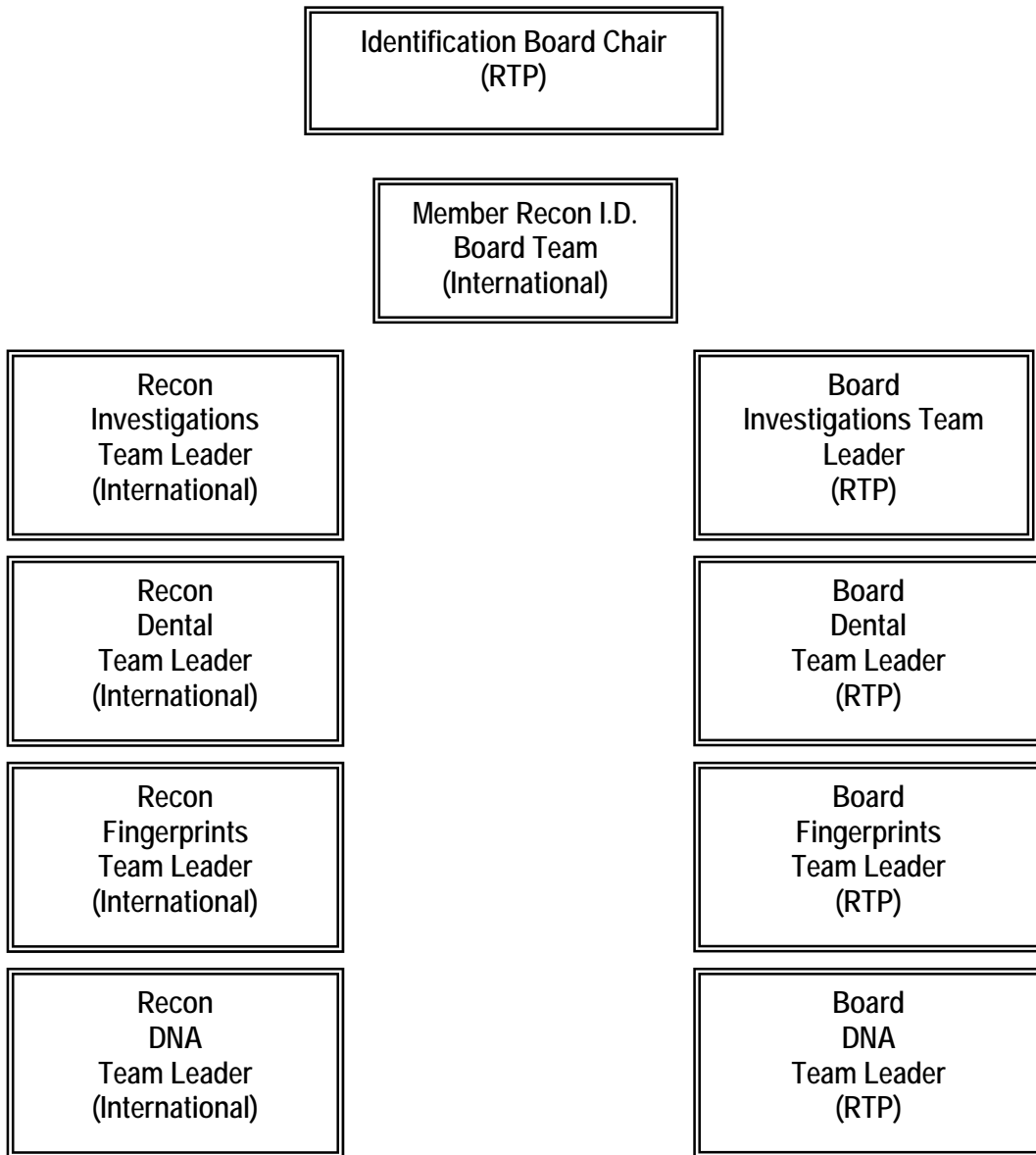
A schedule of files for presentation to the ID Board would be completed by the team to facilitate the management of the system and ensure that all Board members were aware of the individual cases to be presented, the number and the identification indicators. This schedule was then used to present all cases to the Board in a professional and efficient manner.

The Team Leader who prepared the files for the Identification Board hearing, needed to ensure that each case was complete, to enable the presentation of identification evidence in relation to secondary identifiers and to introduce the relevant expert who was to provide the evidence of the primary identification indicators.

To facilitate the above process, the following action must take place. The original Comparison and Victim Identification reports, along with copies of the Dental, Fingerprint or DNA reconciliation report, Embassy letter and Reconciliation Board Schedule was forwarded to the Thai Foreign Affairs Division situated within the IMC.

**Post Board actions for successful identification were as follows. The members of the Reconciliation Board signed the Schedule and this was then sent to and filed within the Unit. The relevant Site Commander was also informed of the identification. INTERPOL and Fingerprint sections within the IMC sent a copy of the completed Reconciliation Board Schedule. The master list of reconciled persons held within the Unit was updated after each board and a copy sent to the IMC Commander.**

## **IDENTIFICATION BOARD STRUCTURE**



### **IDENTIFICATION BOARD ROLES**

#### **Identification Board Chair**

This position is the head of the Identification (ID) Board and was a senior Royal Thai Police Officer. They would control the meetings and apply the legal framework of Thailand to the conduct of the Identification Board.



**Member Reconciliation ID Board Team**

This position was responsible for announcing the identifications and presenting the documentation to the ID Board.

**Reconciliation Investigations Team Leader**

**Board Investigations Team leader**

These two positions were responsible for presenting comparison reports, ID reports and all supportive evidence to the ID Board.

**Reconciliation Dental Team Leader**

**Board Dental Team Leader**

These positions had responsibility for giving expert dental evidence to the ID Board to support dental identifications. Both the reconciliation and board dental team leaders had to agree on the dental identification for the evidence to be accepted.

**Reconciliation Fingerprints Team Leader**

**Board Fingerprints Team Leader**

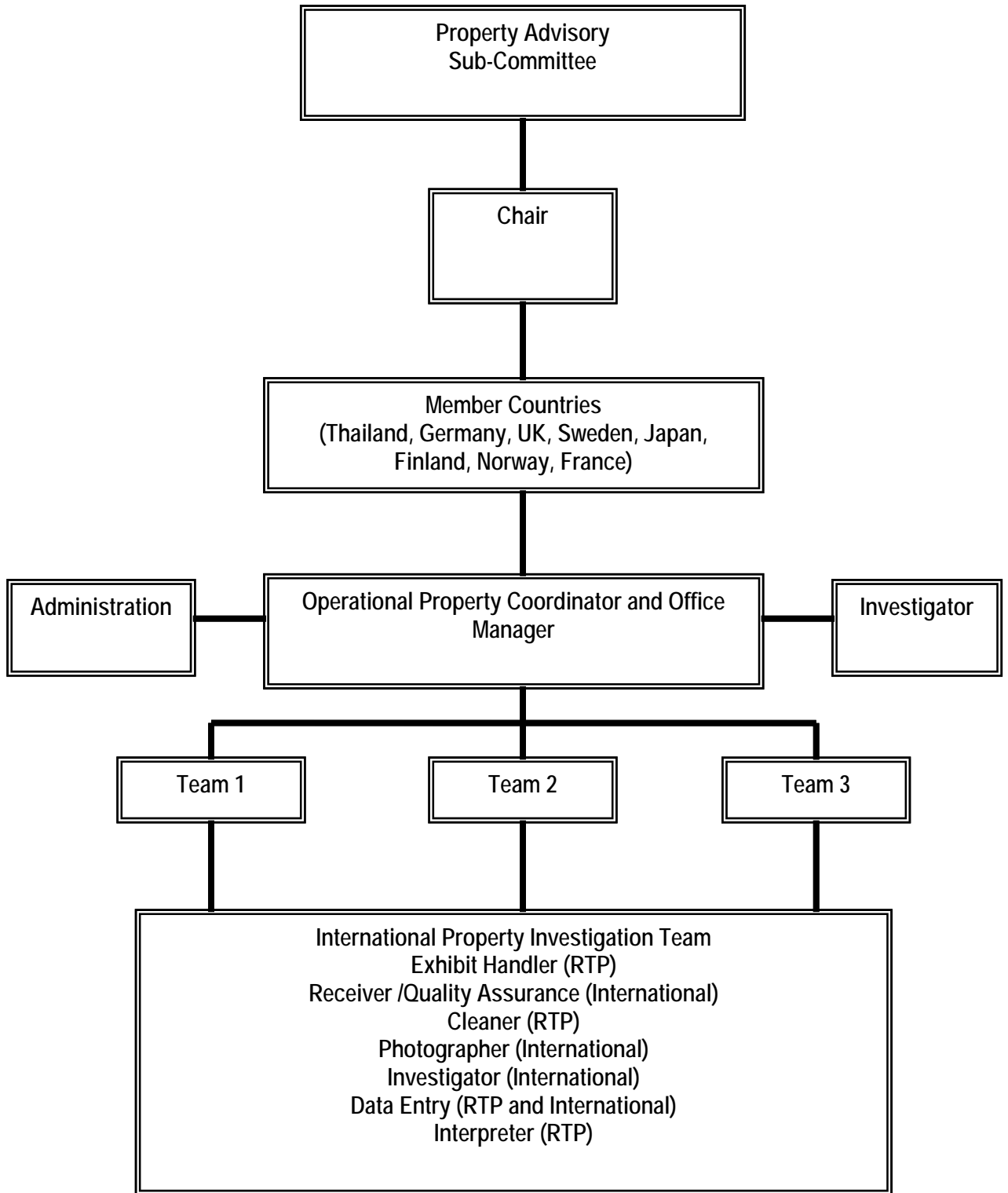
These two positions were responsible for giving expert fingerprint evidence to the ID Board to support fingerprint identifications. Both the reconciliation and board fingerprint team leaders had to agree on the fingerprint identification for the evidence to be accepted.

**Reconciliation DNA Team Leader**

**Board DNA Team Leader**

These two positions were responsible for giving expert DNA evidence to the ID Board to support DNA identifications. Both the reconciliation and board DNA team leaders had to agree on the DNA identification for the evidence to be accepted.

PROPERTY INVESTIGATION TEAMS STRUCTURE



## **Property Investigation Team Roles**

### **Property Advisory Sub-Committee (PASc)**

This group was the principle advisory group to the TTVI Executive Committee regarding all aspects of DVI property management.

#### **Chair**

This position undertook the responsibility to provide a representative to the TTVI Executive Committee who gave advice on all property issues. The Chair would conduct regular sub-committee meetings, maintain accurate written outcomes and revise and enhance existing protocols.

#### **Operational Property Co-ordinator and Office Manager**

This role was responsible for ensuring that the daily activities of the property teams were conducted according to procedures and protocols. This co-ordinator maintained a close liaison with the Chair (PASc), IMC Commander and Site Commanders. They were responsible for identifying and monitoring all resources required by the teams, including human resources (duty rosters), health and safety of team members and equipment levels. As Deputy to the Chair, in their absence the Operational Co-ordinator was also required to attend TTVI Executive Committee meetings when necessary.

#### **Exhibit Handler**

This RTP member was responsible for releasing property under RTP control to international property investigation teams for processing in accordance with agreed protocols.

### **Property Investigator**

The property investigator was responsible for investigating the identification of property processed by the property team. Essentially they maintained a close link with IMC investigation teams and were responsible for updating and maintaining international databases. The property investigator also maintained a register containing information relating to items processed through the international property database, including the acknowledgement of safe return of these items. Once property had been linked to an identified deceased person, the property investigator ensured the timely return of property in accordance with the agreed TTVI protocols.

## Conclusion

The nature and magnitude of the Tsunami response within South East Asia was a first for a global Disaster Victim Identification mission. It may never be repeated to such an extent in the future. However should such a multi-national catastrophic incident ever occur again, the international community must be better prepared to recover the deceased and identify them for return to their homelands, and to their families as quickly as possible.

Clearly from the lessons learned from the South East Tsunami, there is a requirement for pre defined political agreement amongst affected nations, albeit developed on a staged response basis.

The establishment of an international operational fund is an essential element capable of ensuring that the responders are reassured of financial support in establishing and maintaining such a mission.

The role of other agencies including the Red Cross in DVI operations play a critical supporting role and provide unquestioned service to survivors and families of those who are killed. However, when law enforcement engagement is not so clear and the Red Cross and similar organisations are left to lead the DVI response, such as the Earthquake of 2005 that left 70,000 dead in India and Pakistan, with virtually no international law enforcement support on the ground the situation becomes less certain.

Without doubt, International policy, protocols, and procedures should be identified, improved and distributed within the INTERPOL network of 192 countries and INTERPOL has a leading role in ensuring that these improvements take place.

Clearly the standardisation of training of Disaster Victim Identification response teams should specifically include reference to cultural and faith considerations and to respect diverse beliefs whilst delivering a fair and accurate non-prejudicial identification process.

Improved time scales, given the time taken in Thailand to identify 5,384 victims need to be urgently considered, and questions answered such as - Could the INTERPOL DVI process be delivered on a much larger scale in a relatively short time frame of say 12 months maximum?

It is believed that larger operations could still be managed in reasonable and acceptable time scales but this would probably need to be developed around a number of smaller individual operational bases running side by side working to geographic areas of a disaster zone but networked to each other to produce a joined up overall outcome.

One day this will become an operational need and is only a question of 'when' and not 'if' it will be required. The present thinking for a massive death toll situation is not fit for purpose in delivering our principles of forensic identification and the South East Asian Tsunami of 2004 tells us it is in urgent need of revision.

Specifically, in relation to the Tsunami operation, there are many facets of this mission that could be explored in greater detail, but it is without doubt a mission that produced many challenges and many solutions to the overall DVI Procedures as we know them today and will practise them tomorrow..

This report makes many recommendations and it is appropriate that the INTERPOL DVI Standing Committee review these and decide how internationally they would wish to enhance not only the INTERPOL DVI

**Process and Procedures, but also to demonstrate in a positive manner that where improvements can be identified that we have the will and commitment to carry them through.**