HUNTING
connecting hunter, animal and environment

Jamaine Fraser 2012  l  Exegesis  l  Master of Design by Project
Department of Design and Visual Arts  l  Unitec Institute of Technology  l  New Zealand
Primary Supervisor: Professor Mike Austin (Unitec)
Associate Supervisor: Kahutoi Te Kanawa (Unitec)
“IT DIED SO WE COULD LIVE”

Llewelyn Ottley-Karena (Aged 11)
(Burstyn 6:15)
Pepeha

Ko Te Arawa te waka
Ko Ngongotaha te maunga
Ko Awahou to awa
Ko Rotoruanui – a –Kahumatamomoe te moana
Ko Ngati Whakaue te iwi
Ko Awahou te Marae
Ko Ngati Rangaiwewehi te hapu
Ko Jamaine Raniera Fraser tōku ingoa
Abstract

This project addresses the field hunter who acknowledges the intangible values of hunting. This hunter respects the wilderness environment and is grateful to the animal for sharing its life. The meat is a symbol of unity between hunter, animal and the environment. A hunter's need to look after the meat is therefore paramount. The meat can be spoiled by heat, moisture, insects and rodents. These agents create challenges that are innate to the activity of hunting but also create a problem.

The aim of this project is to minimise the hunter's problem with the potential deterioration of game meat. Hunters are known to convey a somewhat reticent respect for the animal and the environment. The question is thus: how can we illustrate the respect the modern hunter conveys for the animal and the environment through containing the meat?
Acknowledgements

Firstly I would like to thank my whanau for their love and continuous support in my academic endeavours. My mother Deanna Roa and step father Don Roa - I hope to make you both proud. To my Nan and Koro for their inspirational influence. They are the foundation of our whanau (family) and epitomise the meaning of hard mahi (work). To my brother Andre and his fiancé Ngati who both encourage me to be grounded, honest and headstrong. My sister Hope and brother Hamuera, my two little pounamu (greenstone). I cherish you both for your innate ability to teach me what it means to be an older brother. To Steve and Janet Ross, thank you both for your constant support.

To the academic milieu of the project, thank you all for the advice and guidance, Kahutoi Te Kanawa (Unitec), Professor Mike Austin (Unitec), Associate Professor Ross Hemera (Massey University), Dr. Julia Charity (Scion Research), Dr. Norman Sheehan (Swinburne University of Technology), Associate Professor Dr. Herman Pi‘ikea Clark (Te Whare Wananga O Awanuiarangi), Dr. Cris Degroot (Unitec), and Scion Scientists.

A mihi (acknowledgement) to Jim and Cathy Schuster for all the help and support. The haerenga wananga (learning journey) with Jim in the ngahere (forest) was invaluable. The knowledge gained could have only been learnt in such a forum. To Cathy, thank you for supplying the muka (flax fibre). It is a design feature that I could not have achieved to such a high standard. Nga tino mihinui kia korua.

To the informants of the project, thank you all for your time and willingness to contribute to the project. Your insights have moulded me to become a holistic hunter. John Voorend (NZDA President Waikato), Chris Tapsell of Te Anau, Aaron Warren of Tauranga, Robert Hutchinson of Rotorua, Johan Bardoul of Hamilton, Peter Peeti of Rotorua, Maarten Verschuuren of Hamilton, Davey Hughes...
(SWAZI) of Levin, Howard Morrison Junior (Hunting Aotearoa - Host) of Rotorua, Terry Tapsell of Rotorua, Waikato New Zealand Deerstalkers Association members, Shelly Woison and Trevor Madden of Duncan Processors Limited. Thank you all.

It is with great gratitude that I thank my primary sponsors, Scion Research (Rotorua) and Nga Pae O Te Maramatanga. Both have made this project pragmatically possible. A special thanks to the Ngati Whakaue Education Endowment Board for their contribution towards my education. I hope to pass on my knowledge to rangatahi (youth) of Ngati Whakaue. I must also thank Greg and Fi Duley from NZ Hunter Magazine for their time and contribution. Their magazine has been and will be a great source of what it means to hunt. To Peter Hiemstra from Department of Conservation for producing a one-off map that identifies all the public land in New Zealand that hunters may hunt on, thank you.

Lastly, to my partner Anna Ross. Her patience, understanding, unwavering support and love throughout this project has been immeasurable. Thank you for everything. Nga tino aroha nui kia koe.
List of Figures

Fig. 1. Rock Carving ........................................ iv
Fig. 2. Traditional Hunter-Gatherers ......................... 13
Fig. 3. Modern Pikau Examples ................................ 16
Fig. 4. Japanese Packaging Examples ......................... 18
Fig. 5. Poha A .............................................. 18
Fig. 6. Taha Huahua .......................................... 18
Fig. 7. Hadza hunters transporting meat ...................... 19
Fig. 8. Te Whare Tapa Wha Model .......................... 23
Fig. 9. Myself carrying a fallow deer spiker ................... 37
Fig. 10. Egyptian hunter’s palette to bullet .................... 38
Fig. 11. Rock carving from Gärde in Jämtland, Sweden ...... 39
Fig. 12. Whiteboard visual development of Sweden rock carving 40
Fig. 13. Iconographic development inspired by Sweden rock carving 41
Fig. 14. Turtle Backpack ....................................... 41
Fig. 15. Portable Fridge Pack Sketch ........................ 42
Fig. 16. Instant Cold Pack, Aaxis ............................ 43
Fig. 17. Product Development Sketch 1 ....................... 44
Fig. 18. Urea prill test ........................................ 45
Fig. 19. Product Development Sketch 2 ........................ 46
Fig. 20. Product Development Sketch 3 ....................... 47
Fig. 21. Te Parapara Garden visit ............................ 48
Fig. 22. Te Parapara Garden ................................... 49
Fig. 23. Visual Inspiration ...................................... 50
Fig. 24. Product Development Sketch 4 ....................... 51
Fig. 25. Kaihaukai Concept ................................... 52
Fig. 26. Kaihaukai Colour Concepts .......................... 53
Fig. 27. Visual Cues .......................................... 53
Fig. 28. Kaihaukai 1 .......................................... 54
Fig. 29. Taratara-akai ........................................ 55
Fig. 30. Product Use Scenario .................................. 57
Fig. 31. Kaihaukai 2 .......................................... 58
Fig. 32. Kaihaukai 3 .......................................... 59
Fig. 33. Kaihaukai Materials ................................... 61
Fig. 34. Kaihaukai Volume ..................................... 62
Fig. 35. Product Cross Reference Matrix ....................... 64
Fig. 36. Product Cross Reference Matrix ....................... 65
Fig. 37. Korowai O Tane ....................................... 69
Fig. 38. Kaihaukai Manawa .................................... 70
Fig. 39. Kaihaukai Manawa Specifications .................... 72
Fig. 40. Kaihaukai Manawa Product .......................... 73
Fig. 41. Kaihaukai Manawa Product in Use .................... 74
Fig. 42. Kaihaukai Manawa Colour Range ..................... 75
Fig. 43. Kaihaukai Manawa Logo ............................. 76
Fig. 44. Print Design .......................................... 76
Fig. 45. Product Brand Story ................................... 77
Fig. 46. Hunting Scenario ..................................... 92
Fig. 47. Field Meat Test ....................................... 98
Fig. 48. Thermos containing liquid nitrogen .................. 109
Fig. 49. Chilly Bin and Dry Ice ............................... 109
Fig. 50. Singeing a Sow ....................................... 113
Fig. 51. Cloth Concept ....................................... 118
Fig. 52. Ribena Squeeze ....................................... 119
Fig. 53. Disposal Recommendation ............................ 120
Fig. 54. Safety Cover Option ................................... 120
Fig. 55. How to Pack a Back-pack ............................. 122
Fig. 56. Whole Carcass Carrying Methods .................... 124
Fig. 57. Ergonomic Transport Analysis ......................... 126
List of Tables
Table 1 - Modern Field Meat Preservation Methods ..................31
Table 2 - Matrix of Frameworks ........................................85
Table 3 - Physical Hunting Factors .....................................87
Table 4 - Hunting Equipment and Supplies .............................88
Table 5 - Transportation ..................................................89
Table 6 - Aging Venison ..................................................97
Table 7 - Urea and Water Endothermic Experiments ...............129
Table 8 - Water Crystal and Urea Prill Ratios 1 .....................130
Table 9 - Water Crystal and Urea Prill Experiments 1 .............131
Table 10 - Water Crystal and Urea Prill Ratios 2 ....................132
Table 11 - Water Crystal and Urea Prill Experiments 2 ..........133
# Table of Contents

**Pepeha** ................................................................. iii
**Acknowledgements** .................................................... v
**List of Figures** ........................................................... vii
**List of Tables** ............................................................ viii
**Table of Contents** ........................................................ ix

## Introduction
- Project Aim ................................................................. 10
- Context and Rationale ..................................................... 11
- Research Question ......................................................... 12
- Literature Review .......................................................... 12
- Project Objectives .......................................................... 22

## Chapter 2 – Research Methodology
- Research Paradigm ......................................................... 23
- Research Methods .......................................................... 27
  - Conversations and Discussions - The 4 Dimensions of Containing Game Meat .......................................................... 27
  - Field Research ............................................................. 27
  - Material Culture Patterning ............................................. 28
  - Reflective Design Process .............................................. 28
  - Ergonomic Analysis ...................................................... 28

## Chapter 3 – Research Results
- Conversations and Discussions - The 4 Dimensions of Containing Game Meat .......................................................... 29
- Field Research ............................................................... 33
- Material Culture Patterning .............................................. 36
- Reflective Design Process ............................................... 37

### Chapter 4 – Product Concepts
- Kaihaukai – A Gift of Food ............................................... 54
- Korowai O Tane – Cloak of the Forest .................................. 67
- Kaihaukai Manawa – Food is Life ....................................... 70
- Product Brand Story ........................................................ 76

## Conclusion ................................................................. 78

## Glossary ................................................................. 80

## Reference List .......................................................... 81

## Appendices .................................................................. 83

- 1. Questions for conversations and discussions .................. 83
- 2. Matrix of Frameworks ................................................ 85
- 3. Recreational Hunting Areas .......................................... 86
- 4. The Hunting Field ...................................................... 87
- 5. Hunting Scenario Description ....................................... 91
- 6. Deer Abattoir Field Visit - Duncan Processes Ltd .......... 97
- 7. Field Meat Experiment ............................................... 98
- 8. Material Culture Patterning Tables ............................... 100
- 9. Liquid Nitrogen and Dry Ice ......................................... 108
- 10. The Making Process of the Kaihaukai ....................... 110
- 11. Critical Appraisal of Kaihaukai ................................. 113
- 12. Ergonomic Analysis .................................................. 122
- 13. Urea and Water Experiment ....................................... 128
- 14. Water Storage Crystals and Urea Prills Experiments 1  130
- 15. Water Storage Crystals and Urea Prills Experiments 2  132
**Introduction**

Connecting the hunter, the animal and the environment is the basis for this project. It investigates traditional hunter-gather cultures and their traditions of hunting as a means to reveal and support the intangible values that somehow contemporary hunters find reluctant to narrate.

In particular, the research focuses on the containment and transport of meat that is obtained from the animal by the hunter. The research investigates different methods of preservation from historical and modern contexts. A variety of new materials and technologies are available some of which were investigated and others of which are difficult to access from New Zealand.

The foundation for this project stems from the Māori epistemological concepts of the Te Whare Tapa Wha (four dimensions of a meeting house) model that was developed by Sir Dr. Mason Durie.

With the knowledge of traditional hunting values, attitudes of modern hunters and some information from modern science a product is developed as a suggestion that meets and respects the latent values that motivate modern hunters. Foremost of these is the relation to the animal and its environment.
Chapter 1 – The Project

Project Aim
To illustrate the reticent affinity a hunter has with the animal and environment and to minimise the hunter’s problem with the potential deterioration of game meat by designing a product to contain and transport the meat.

Context and Rationale
Anthropologists state hunting has been a part of human life for 97% of human existence (Trier). The food obtained during a hunt provided nutritional subsistence and therefore aided in human growth and development. Hunting is a fundamental activity that all humans have a heritage with (Lee and Daly) and “killing game and eating its flesh is the very essence of life” (Willerslev 78). Yet today the topic of hunting is now undervalued by the wider public (Hunter). Dave Drangsholt writes “in today’s world, there are those who do not understand a hunter, in fact they may despise us” (Drangsholt 10).

In terms of the meat obtained during a hunt Greig Caigou tells us “with hunting, there’s definitely a strong link between the hunter and the meat on their plate. There’s a really strong connection because you were there at it’s (animals) death” (Nicholls). Some hunters would agree with Greig and can acknowledge that there is a connection between us (hunters) and the animal. Hunters also identify with the wilderness and have a special connection with the environment while hunting (Woods and Kerr). The meat gathered during the hunt is not a mere object or thing for consumption it is a symbol of deep seated emotions. Yet some hunters find it difficult to talk freely about his connection. Our actions in the field portray what is difficult to verbally explain.
Traditional hunter-gatherer societies place emphasis on the spiritual dimension of hunting and often have the point of view that the animal obtained during a hunt is a gift. Cultural practices are required to procure an animal and the material culture (artefacts) complements these intangible acts. Modern hunters also identify and acknowledge the spiritual or intangible elements of hunting; however the artefacts or products they use do not animate this.

As a hunter and a designer I wish to address this area as an opportunity to design a product to contain and transport the meat we gather. A product that reflects our connection with the animal and the environment that we as hunters find somewhat challenging to put in plain words.

Research Question

How can we illustrate the respect the modern hunter conveys for the animal and the environment through containing the meat?

Literature Review

Modern hunters have different ways of showing respect for the animal and the environment. Some hunters verbally thank the animal and pat it after it has been dispatched (On Target). Others place the heart of the animal in a tree (Curtis), and one Wanganui hunter sometimes buries the entrails of the dressed animal as a sign of respect (Chappel). Other hunters take care of the environment, living by an adage hunters often use, ‘leave only footprints’. Some hunters today strongly believe that showing respect to an animal means “what you shoot, you take out” (Verschuuren). Ensuring that the meat obtained from a hunting trip is not wasted is also a sign of respect to the animal. Showing respect to the animal and the environment has been part of the hunter-gathers culture The hunter-gatherer cultures referred to and their geographical location for this project is illustrated in Fig. 2. Traditional Hunter-Gathers.
In Egypt hunting was an activity for the royals but animals were respected as gods. From as early as c.5500 BC animals were given ritual burials where they were wrapped in cloth and buried with food and drink. Between the Old and New Kingdom periods animals were for a time mumified as they were considered equals in life (Velde).

A tradition for ancient Greek hunters was to vow a portion of the hunt’s spoils to the god Apollo and goddess Artemis (Anderson). The Mlabri, an indigenous peoples who are nomads of Northern Thailand and continue to dwell in the forests today are also known to offer gifts to the gods of the forest and often pray prior to a hunt (Trier). The Māori of Aotearoa as well as the Raute of Nepal (Fortier) and the Inuit of the circumpolar region were known to offer gifts to spiritual deities (Pelly; Lowenstein). Most traditional hunter-gatherers share with their gods and demonstrate respect for the animal through ceremonies and acts of gifting and are known to employ artefacts as aids. For example an old custom for the Iglulingmiut and Aivilingmiut inuit of the Canadian central arctic is to keep the seal’s soul warm by placing the spear head, that took the life of the seal, near a lamp because the soul of the seal remains at the head of the spear (Pelly). Therefore if a new spear or lamp is to be designed the maker must learn and understand this custom.

The Yukaghir of North-Eastern Russia are known to employ mimicry to attract an animal. This act is partly an objective display whereby a human imitates the behaviour and movements of an elk just to trick the elk into thinking it is seeing one of its own species. Also, it is an acknowledging act that identifies the equality of both the hunter and animal in the activity of hunting. When mimicking the animal, Willerslev tells us that the hunter’s self-consciousness transcends itself and becomes projected outward onto the elk, which is therefore experienced as taking on his human perspective”. [Simultaneously] “the hunter himself undergoes an experience of
dehumanization: through observing the elk's acts, which mirror his own mimetic performance, he comes to see himself from the outside as an object, from the viewpoint of the other subject... He can find himself mainly in the elk” [and therefore the hunter cannot disregard an animal’s] “personhood, because this would in effect mean rejecting his own personhood… the hunter psychological security, his self-awareness as a person, thus depends on the animal as a person (Willerslev 99).

The Raute of Nepal also depend on animals and the supernatural realm in order to define themselves. “They know themselves as part of a social world inhabited by humans, deities, animals-as-relatives, ancestors, and living plants all of whom live together in forests (Fortier 25). They are immersed in all realms concurrently when hunting.

Today some modern hunters do not relate to the idea of gods, mythology or the supernatural in respect to hunting. They acknowledge that intangible aspects of hunting do exist, but find it difficult to articulate these. However a part of a hunter’s psyche acknowledges there is an intangible connection between the hunter and the meat obtained during a hunt. There are different products today that are used to contain the meat but which do not animate this intangible aspect.

What is used today by hunters to contain meat is polar fleece backpacks known as pikau (see Fig. 3), cheese cloth, canvas bags and even pillow cases. These products lack intangible nourishment.

To protect meat and carcasses from flies and wasps modern hunters use an array of products: meat bags, large enough to cover an entire deer carcass, grounded coffee, pepper, ginger (Hunter) and diluted citric acid (Shead) (see Appendix 7. Field Meat Experiment).
Current products which are available on the New Zealand market for field packaging and preservation are mundane. They exhibit the status quo and lack feeling, “what is the use of a package if it shows no feeling?” (Oka). Packages are known to “serve as symbols of their contents and a way of life and, just as they can very powerfully communicate the satisfaction a product offers, they are equally potent symbols of wastefulness once the product is gone” (Robertson). However, traditional packaging of the Japanese and Māori were symbols of cultural wealth and spiritual being and are deemed treasures (Best; Oka).

A part of Japanese heritage is Kyōfû or Kyoto, grossly translated as ‘packaging’. If crafted artistically the package was regarded as of greater value than the contents and sometimes the contents became the package. However, the spiritual art of Japanese Kyōfû is rapidly diminishing due to its inefficiency in the dominant face of convenience and materiality aspirations. Oka believes all people can learn from the status of Kyōfû.

Should we not pause to reflect and ask ourselves whether we have not suffered a huge revocable loss in exchange for so much convenience and so much emphasis on material values? This … is one of the
Lessons to be learned from our traditional packaging—
that our inner, spiritual satisfaction cannot be found merely in material abundance (Oka13).

The Japanese take a holistic design approach to packaging (Streeter) and a key commonality between traditional Japanese and Māori packaging is the respect for nature and its primary resources. Nature is embedded within Japanese, Māori and other indigenous cultures, such as the Aborigines of Australia, Native Americans and Hawaiians. Nature sustains life and imparts meaning for these peoples.

Fig. 4 shows examples of Japanese packages. Plate 130 is a package used to contain long roots of mountain burdock and is made of bamboo strips. This package is from the Yamanashi prefecture. Plate 144 shows a package from Okinawa Island that wraps candied papaya in a betel-palm leaf. To package commodities like dried fish and preserved vegetables, straw is used as shown by plate145. This package is designed and made for rural necessity and is from the Niigata prefecture. Plate 146 is a package made of straw and is an old customary way to package cured wild-boar meat from Kyushu. The package was hung from a ceiling for use when required. Plate 208 is a package for Mochi (cakes of steam and pounded rice). It is designed to be well ventilated and hung from the eves of houses during winter. It serves as a tsuto (an elaborate package for superiors) and is of the Akita and Iwate prefecture.
Two examples of what Māori once used to contain and preserve birds are poha and taha huahua. Whale meat was also preserved in taha huahua.

All the materials employed are organic matter and are skilfully fashioned. The packages may be used just a few times due to the nature of the material.
The preservative was primarily the fat of the animal. The meat was cooked and the fat collected. The cooked meat was packed into the poha and the taha huahua. Then the fat was poured inside the package to cover the meat and preserve it. The material is organic and obtained from the forest. Once the package is no longer able to perform as a package “it is then deemed to have died a natural death and is allowed to go back to Papatuanuku to begin a new life cycle” (Puketapu-Hetet 2).

In spring the Inuits store their whale meat in abandoned igloos for the coming summer. The cooler climate of the circumpolar region allows for the meat to be preserved. Seal meat was at times dried and then stored in the seal’s own oil and consumed in the coming summer (Lowenstein).

The Hadza of Africa is shown by Woodburn to be transporting their kill in sections with no form of container or package. The Raute preserve their meat by drying it over a fire or in the sun (Fortier).

The Native Indians of America used the same technique, cutting their deer meat into thin strips and allowing it to dry in direct sunlight. The strips were then pounded into a paste adding the animal’s own fat as well as berries for taste and preservation qualities (Walrod).
On the other end of the preservation spectrum are scientifically enhanced materials for packaging meats and other foods. Science reminds us that there are four categories of packaging:

1. Primary - what the consumer interacts with.
2. Secondary - contains primary i.e. boxes
3. Tertiary - plastic wrapped pallets
4. Quaternary - ship containers for international trade (Robertson).

The four main functions of a package are 1) Containment, 2) Protection, 3) Convenience and 4) Communication. Furthermore, the environments a package is exposed to are the Physical, Ambient and Human (Robertson).

Food packaging science provides benefits for the outdoor recreation industry. The packaging is lightweight, durable and watertight, and contributes to the food contents’ shelf life (Robertson). Shelf life is a significant factor as it assists in the palatability and organoleptic qualities. In addition, the science and construction of packaging is now linked with physical performance of an individual (Lampi). Sometimes the meat obtained from the animal supplements a hunter’s diet whilst in the field. Field hygiene is also pertinent to consumption (New Zealand Food Safety Authority), therefore field meat preservation is important. With the purpose of developing a concept product for meat preservation Robertson stresses,

“knowledge of the kinds of deteriorative reactions that influence food quality is the first step in developing food packaging that will minimize undesirable changes in quality and maximize the development and maintenance of desirable properties” (Robertson195).
In particular, knowing what variants influence the red meat’s microbiology and colour will assist in designing a successful package (Robertson). Presently there is considerable research on the development of active and intelligent packaging. Active packaging is defined as; packaging in which subsidiary constituents have been deliberately included in or on either the packaging material or the package headspace to enhance the performance of the package system and intelligent packaging is defined as; packaging that contains an external or internal indicator to provide information about aspects of the history of the package and/or the quality of the food (Robertson).

Active packaging materials are absorbers and emitters. They are capable of absorbing oxygen, carbon dioxide, ethylene, flavours and odours, moisture and water and able to emit ethanol and release antioxidants and antimicrobials (Robertson). Antimicrobial science is of interest as it serves to “reduce the growth rate of micro-organisms to prolong shelf life and maintain food safety” (Robertson). Antimicrobial agents are either impregnated into or coated onto films. Robertson also highlights the work of Cagri, Ustunol and Ryser, *Antimicrobial Edible Films and Coatings* as potential innovations.

However, the packaging industry has not been without criticisms. During the 1980s in east coast America packaging’s main demise was concerning disposal and the diminishing land space. By weight, one third of the solid waste is packaging (Selke). In NZ, the Packaging Council of New Zealand states that packaging contributes just 10% by weight however, “recycling and lighter weight packaging have reduced potential packaging waste volumes by more than 40% over the past decade”. The NZ packaging industry is worth $2 billion and supplies over $17billion into the NZ economy (“Packaging Council of New Zealand (Inc)”).
With the research question in mind, how can we illustrate the respect the modern hunter conveys for the animal and the environment through containing the meat? Based on the literature reviewed on the ways modern and traditional hunters show respect for the animal and environment, an answer that is grounded on traditional values which employs science as a vehicle is suggested.

**Project Objectives**

- Survey modern hunters to reveal intangible affinities between themselves, the animal and the wider environment.
- Analyse conversations in the theoretical framework of Te Whare Tapa Wha.
- Study the material culture of traditional and historical hunter-gatherers that aid in imbuement of intangible affinities between hunter and animal.
- Develop concepts of containing meat with reference to the above affinities between hunter and animal.
- Generate a exegesis and presentation model of a final concept product that reflects the intersections of the above investigations
- Present project outcomes in an exhibition.
Chapter 2 – Research Methodology

Research Paradigm

Smith (1999) highlights that Māori Health research methods are being widely accepted in the medicine and health industries. Today, Māori health researchers employ the ‘Te Whare Tapa Wha’ (TWTW) model that was developed by psychiatrist Sir Dr. Mason Durie in 1982 (Career Services: Rapuara Seek the Path). This model is based on the four walls of a traditional Wharenui and therefore is founded on, but not exclusive to, Māori worldview. Each wall represents a key dimension that addresses the well-being of an individual. Metaphorically, each wall needs to be strong and stable in order to have a well-structured building. These dimensions are Te Taha Hinengaro - Psychological Health, Te Taha Wairua - Spiritual Health, Te Taha Tinana - Physical Health, and Te Taha Whanau Family/Social Health (see Fig. 8).

Fig. 8. Te Whare Tapa Wha Model


Each has a different path of investigation but they are all constructed to form a holistic cohesion. Dr Noman Sheehan, a Wiradjuri man (an indigenous people of Australia), a product designer and founding member of Swinburne University of
Technology’s Centre for Indigenous Knowledge and Design Anthropology is a precedent for advocating the combination of fields such as indigenous knowledge, psychiatry, design and anthropology (Derkley). Other design scholars follow similar frameworks. However they do not include the spiritual dimension to any great extent. This project considers this dimension to be just as valuable as the other three. Appendix 2. Matrix of Frameworks tables different frameworks in relation to this project’s approach.

Today there are academics in Botswana, Taiwan, China and Australia who are beginning to experiment with and incorporate intangible aspects of their culture into products. The work in this field has been noted in Press & Cooper, Norman and Christiaans & Diehl but the research depth is limited (Christiaans and Diehl; Moalosi, Popovic, and Hickling-Hudson). Product design from a cultural identity and inherently historical context is material culture (Moalosi, Popovic, and Hickling-Hudson; Yang), with which some Māori and other indigenous peoples would concur. Material culture is the physical artefacts (Christiaans and Diehl; Yang; Mead) which originate from narratives and are embodied with cultural significance; they are the books for indigenous people. Products “must not only function satisfactorily but must embody symbolic qualities appropriate to its intended user group and environment” (Taylor et al., 1999, p. 219) and it is part of a designer’s responsibility to embed cultural elements (Yang). This would discourage product design from continuing towards global homogeneity and potentially initiate local aspirations.

Works of which Lin (R. Lin, Transform) is the author and contributing author initiate the incorporation of local identities by transferring some cultural aspects from Taiwanese material culture into novel product concepts. He provides a framework to guide an investigation of material culture in terms of cultural dimensions which he categorises and synthesises with other works into three areas. These categories are; 1) Physical/material, 2) Social/Behaviour and 3) Spiritual/Ideal. He then sets these
alongside Norman’s Visceral Design, Behavioural Design and Reflective Design. Lin’s works are based on a cultural approach and are similar to Yang’s work.

Yang, proposes four cultural dimensions that contemporary design can integrate and consider. Firstly, Cultural Tastes which by Yang’s definition may relate to Norman’s Reflective Design: secondly, Cultural Function, coinciding with Norman’s Visceral Design: thirdly, Cultural Psychology which could be a Reflective attribute: lastly, Cultural Spirits which Lin (R. Lin, Transform) coincidently classes as Reflective Design.

Taylor, Roberts and Hall also offer four dimensions from the works of Tiger, *The Pursuit of Pleasure* as a model. These are not stated as cultural dimensions but from the concept of ‘person product relationships’. They are, Physiological Pleasure, Sociological Pleasure, Psychological Pleasure and Ideological Pleasure with all underlying concepts of the ‘Pleasure paradigm’ overlapping with Yang’s and others works, including this projects proposed model (see Appendix 2. Matrix of Frameworks).

Krippendorff’s, ‘The Semantic Turn’ operates within the constructs of the human-centred approach and aims at “moving meaning and interactivity into the centre of design considerations” (349). However, Moalosi implies that the human-centred approach excludes user-product interaction in social and cultural contexts of use (Moalosi). Moalosi’s socio-cultural paradigm perspective advocates cultural, local and to some degree indigenous identities and their integration with the human-centred perspective. He is perhaps unaware of the works of Shawn Wilson who advocates the need for indigeneity and the way in which indigenous peoples seek, make sense, learn and impart their meanings. What may have been the outcome/s of Moalosi’s work had he instituted an indigenous research paradigm, informed by his Botswana traditions and in void of and in contrast to conventional design paradigms?
Conventional design paradigms are primarily concerned with the constructs, of what Christiaans & Diehl describe as the ‘Object Perspective’, “based on mass customisation” (2). In contrast to the Object Perspective, Christiaans & Diehl describes the ‘Human Need Perspective’ which is an enabler of “emancipation, sustainable development, improvement of quality of life as well as the cultural identities of individuals and social groups” (2) and they invite others to consider the same principles of the Human Need Perspective because “another perspective is badly needed” (Christiaans and Diehl). Evidently, the above perspectives encourage growth of knowledge and diversification. It is anticipated that this project’s theoretical framework will stimulate discussion by employing a Māori epistemological framework unprecedented in product design.

This project employs the TWTW model as a means to assess conversations and discussions with hunters and ascertain the overall picture of hunting and what it means to hunters. Although the TWTW model is not obvious in other areas of the project, it is the underlying foundation of the project.
Research Methods

- Conversations and Discussions - The 4 Dimensions of Containing Game Meat

The purpose of this method was to gain a broader insight into hunting and to find some benefits that relate to the four dimensions of the Te Whare Tapa Wha Model.

The approach for the conversations and discussions with hunters was a narrative one as opposed to a prescriptive and closed-question survey. The narrative approach was selected because it helps to “redress some of the power differentials inherent in the research enterprise and can also provide good evidence about the everyday lives of research subjects and the meanings they attach to their experiences” (Elliott 17).

Nine individual hunters were able to give their time for a conversation and members of the New Zealand Deer Stalkers Association, Waikato branch participated in a group discussion.

- Field Research

The field research encompassed visiting a deer-processing abattoir, a personal haerenga (journey) with Jim Shuster through the native forest around Lake Okataina, Rotorua and taking part in hunting sojourns.

The tour of the abattoir was a personal tour during the meat processing of more than forty red deer at Duncan Processors Limited, Mamaku. The purpose of this visit was to gain an insight into the commercial sector of meat processing and to learn about the measures in place for meat preservation.

The haerenga wānanga with Jim Schuster, a local weaver, was insightful and fulfilling. The purpose of the haerenga was to learn about the practical uses and spiritual teachings the native bush has to offer to people.
Participating in hunting sojourns helped to impart tacit knowledge and provide opportunities to test modern field methods of containing and protecting meat from flies and wasps as well as setting the context for critical reflection of the end product.

- Material Culture Patterning

  The primary purpose of this research method is to learn how spiritual notions of hunting are imbued into material culture of traditional hunter-gatherers. Then to adopt the findings to inform and inspire the design process to create a product that complements the spiritual aspects of hunting.

- Reflective Design Process

  The reflective design process was a method to help document the design process to provide a record for design thinking and design decisions.

- Ergonomic Analysis

  An ergonomic analysis of different carcass carrying methods was undertaken to identify weight distribution issues and to identify areas of potential design opportunities (see Appendix 12. Ergonomic Analysis).
Chapter 3 – Research Results

Conversations and Discussions - The 4 Dimensions of Containing Game Meat

The employment of the Te Whare Tapa Wha model by Sir Dr. Manson Durie helps us understand hunting from four dimensions. The four dimensions are psychological, physical, social and spiritual. The model also helps us to deduce and begin the learning process of what it means to a hunter to contain game meat they have procured. The findings have been gathered from conversations with individual hunters and a group discussion with twenty plus hunters from the Waikato branch of New Zealand Deer Stalkers Association.

Firstly the psychological dimension addresses the aspects that relate to the mind and emotions of the hunter. One of the primary rewards is the sense of achievement over the challenges posed by the natural environment and animals.

Yea, I think it’s a sense of achievement. When you’re leaving the luxury of town and everything here and you go into the bush and your self sufficient… but for me it’s about the challenge. I get a sense of.. I feel good about.. yea achieve that goal. Some people get it through, whatever they do for work or whatever they do in other areas of their lives. Yea it’s about achieving in the bush (Informant of Waikato New Zealand Deer Stalkers Association).

Obtaining game meat from the wilderness elicits great satisfaction because of the amount of effort and the experience of the journey. Every hunter enjoys taking meat home. Containing the meat is one of the most important aspects. If it is not taken care of properly then a hunter risks losing the meat.
To preserve the meat we must consider the physical dimension. Hunters mention flies and ambient heat as challenges. These issues are prevalent in the summer months of hunting in New Zealand. This season ranges between December and February. Other challenges are protecting the meat from macro-organisms (i.e. rodents, birds and pigs). There are several current methods used by hunters today to help protect the meat (see Table 1 - Modern Field Meat Preservation Methods).
# Table 1 - Modern Field Meat Preservation Methods

<table>
<thead>
<tr>
<th>Product</th>
<th>Method</th>
<th>Cool</th>
<th>Dry (D=Dehydrates Surface of meat)</th>
<th>Protected from Flies (1=low degree; 5=high degree)</th>
<th>Protected from: Macro-organisms (1=low degree; 5=high degree)</th>
<th>Minimises bacterial growth</th>
<th>Source/s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grounded Black Pepper</td>
<td>Sprinkle liberally</td>
<td>✓</td>
<td>D</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>(Hunter; Eggleston; Drangsholt)</td>
</tr>
<tr>
<td>Diluted Citric Acid (in water)</td>
<td>Spray on with spray bottle</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>(Shead)</td>
</tr>
<tr>
<td>Ground Ginger</td>
<td>Sprinkle liberally over meat.</td>
<td>✓</td>
<td>D</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>(Hunter)</td>
</tr>
<tr>
<td>Ground Coffee</td>
<td>Sprinkle liberally over meat</td>
<td>✓</td>
<td>D</td>
<td></td>
<td></td>
<td>✓</td>
<td>(Hunter)</td>
</tr>
<tr>
<td>Meat Bag</td>
<td>Submerge meat bag in citric acid solution for approx 1 hour and hang to dry. Place and hang meat inside the bag.</td>
<td>✓</td>
<td>D</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>(Drum)</td>
</tr>
<tr>
<td>Meat Bag: Synthetic</td>
<td>Place inside bag and tie up opening.</td>
<td>✓</td>
<td>5</td>
<td></td>
<td>✓</td>
<td></td>
<td>Field Research</td>
</tr>
<tr>
<td>Meat Bag: Canvas</td>
<td>Place inside bag and tie up opening.</td>
<td>✓</td>
<td>5</td>
<td></td>
<td>✓</td>
<td></td>
<td>Field Research</td>
</tr>
<tr>
<td>Synthetic Netting Meat</td>
<td>Drape over hanging meat. Net should not be touching meat.</td>
<td>✓</td>
<td>5</td>
<td></td>
<td>✓</td>
<td></td>
<td>Field Research</td>
</tr>
<tr>
<td>Cheese Cloth</td>
<td>Cut a length to size and tie a knot at one end. Place the meat or quarters inside and tie off the opening.</td>
<td>✓</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td>Field Research</td>
</tr>
<tr>
<td>Plastic Bag</td>
<td>Submerged in water, river or stream.</td>
<td>✓</td>
<td>5</td>
<td></td>
<td></td>
<td>✓</td>
<td>(B. Anderson; Tapsell; Warren)</td>
</tr>
<tr>
<td>Salt</td>
<td>Rubbed or sprinkled on</td>
<td>✓</td>
<td>D</td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
</tr>
</tbody>
</table>

Source: Jamaine Fraser.
Socially, hunting can help foster relationships with friends and family. The game meat obtained while hunting serves as a symbol of social cohesion and can bring people together by distributing the meat or partaking in a meal with family and friends. Hunting can be educational as well. It can teach young people to become self-reliant and well rounded individuals.

There is also a deep spiritual connection acknowledged between the hunter and animal. One informant tells us:

> most animals that I shoot I'll lay a hand on them after.. you know, killed it, before I start cutting it up and I acknowledge it –give it a pat… yip

(Informant of Waikato New Zealand Deer Stalkers Association).

Other hunters present at the discussion also thank the animal in a similar fashion. Two kaumatua (Māori elders) are known to place the heart of the animal in a tree as a form of acknowledgement to the wairua (spirit) of the animal and the forest (Curtis).

Hunting can provide benefits psychologically, physically, socially and spiritually.

> It cleanses me, stress release. Good for the ticker, good for the body. It’s that whole well-being thing, personally for me

(Informant of Waikato New Zealand Deer Stalkers Association).
Field Research

- *Duncan Processors Ltd*

Duncan Processors Ltd is a commercial meat processing company. The key information gathered was the regulations which they are governed by. An applicable regulation suggests that storing meat between the ambient temperatures of 7°C and 10°C would be ideal. In addition to the regulation Walrod (2004) proposes an ideal temperature to age meat is 13.3°C for two days (see Appendix 6. Deer Abattoir Field Visit – Duncan Processors Ltd).

The process of aging helps to tenderise the meat and therefore make it more palatable (King et al.). Aging meat is a process of change in the properties of the meat’s structure over a period of time.

The optimal conditions between despatching the animal and consumption within a hunting context to enable a palatable piece of meat involve a step by step process. The animal should be dispatched humanely and as quickly as possible to limit the stress within the animal and therefore limit the unwanted biochemicals that are known to make the meat less palatable (Pollard et al.). The meat should be cooled with undue delay. Then the meat should be covered to protect it from insects and rodents. It then should be hung to allow a tough dry skin to form on the outside of the meat. If possible, the meat should be hung by itself so the meat is stretching under its own weight to lengthen the muscle fibres.
• *Haerenga Wānanga – Jim Schuster*

Jim introduced me to some plants and their uses. A fundamental lesson learnt while with Jim was seated in a spiritual context. This teaching was the greatest insight into how to respect and, more specifically, listen to the native bush.

The primary outcome of this teaching I believe is that nature will gift you its spoils. By extension and in the context of this project, the animals obtained from a hunt could be viewed as gifts from the forest.

* Jim and I were walking along the road side and viewing a large kiekie (*Freycinetia banksii*). Jim wanted to gather some of its flax leaves but they were out of reach. The roots kiekie act as tendrils around a large tree. Given my background training in product design I thought, ‘how could we access the leaves more conveniently? Let’s cut the kiekie from the root’. At which point I made my suggestion to Jim. Jim was already across the road and had found another kiekie closer to the forest floor. He said, “No, you grab the top of the plant from the crown end and wiggle it, if it comes out, then the plant will give it to you”. This teaching was immeasurable and one loaded with spiritual notions. If such a spiritual act of acknowledgement and respect can be applied to a product for hunters, the research question would be answered to a great extent.

• *Hunting Sojourns*

Participating in hunting sojourns helped to impart tacit knowledge and provided opportunities to test modern field methods of containing and protecting meat from flies and wasps as well as setting the context for critical reflection on the end product.

As a hunter I have participated in hunting trips prior to and during the project. Each hunting experience has provided me with the practical knowledge of how to prepare for a hunting excursion, what equipment and supplies might be required, and identifying transportation options. The existing knowledge gained has also helped to generate a hunting scenario which is illustrated in Fig. 44. Hunting Scenario. The scenario helps to identify different stages of the hunting trip from start to end and the potential challenges each stage might endure.
Preparing for the Hunt
When hunters are planning for a hunt they may consider the physical hunting factors (see Table 3 – Physical Hunting Factors, Appendix 4. The Hunting Field) in order to prepare accordingly. For example, if a hunter is to hunt on steep terrain they may train prior to the hunt in order to improve their fitness capabilities. In New Zealand there are many different places to hunt and all pose different challenges (see Appendix 3. Recreational Hunting Areas).

Hunting Equipment and Supplies
The hunting equipment needed for a solo hunter is influenced by a myriad of factors. These are the environmental, physical fitness, food, prey, equipment and modes of transport (see Table 5 – Transportation, Appendix 4. The Hunting Field). It must also be mentioned that equipment packed and taken on a hunting trip differs from hunter to hunter (see Table 4 – Hunting Equipment and Supplies, Appendix 4 – The Hunting Field).

The Hunting Scenario Implications
There are different phases to a hunting scenario (see Appendix 5. Hunting Scenario Description) and there are key implications for a solo field hunter. These are transportation, hanging and protection from macro and micro organisms.

Weight is a critical factor for the field hunter. The more weight the hunter carries the greater the physical expenditure. Therefore the product idea would need to be relatively light weight.

Hanging the meat is important to aid in the desirability of palatable properties and to help protect the meat from rodents. There are two ways to protect the meat from micro-organisms. One is to lower the ambient temperature and the other is to remove or avoid excess moisture.
Material Culture Patterning

It is evident that traditional hunter-gatherers had affinities with animals, material culture and the wider environment. These affinities range from spiritual connections to acts of respect through to acts of resourcefulness. Trier tells us their spears possess spirits and the Mlabri held ceremonies for the spirits of the spears (see Appendix 8. Material Culture Patterning Tables). The westerners used the antlers of deer for jewellery and handles for knives. The hides of deer were used by the native Indians of America to make clothing and blankets. Tendons and intestines were used for bowstrings and bones were used to make hooks, knives, awls, needles and combs (Walrod).

Today's hunters from developed countries acknowledge the concept of respect for the animal and the environment exists. However none of the modern hunting products today prompt hunter, animal and environmental relations.
Reflective Design Process

While looking at Fig. 9 I considered the heat generated from a hunter while carrying the carcass and considered a cooling jacket for both the hunter and the carcass. This would help to keep the hunter cool and therefore the carcass would cool quicker. Keeping the meat cool is the primary objective.

While looking at my pot plant on my desk I was caught by the contrasting effect of the fern like plant against the white wall and could visualise this effect on the back of a carcass being carried by the hunter. At the bottom right of Fig. 9 are images of preliminary sketches of the fern idea.

Fig. 9. Myself carrying a fallow deer spiker
When viewing an Egyptian hunter’s palette in Fig. 10 the shape reminded me of a bullet. The centre circle is also visually similar to the primer of a round (located at the bottom of a round or casing). These recognitions put the question of ‘can we design a round that would complement the intrinsic affinities between man and animal? 

Traditional hunter-gatherers acknowledged (and some still do) the animal to a great extent throughout their material culture. Today modern hunters affirm that hunting connects them to our hunter-gatherer roots (Informant of Waikato New Zealand Deer Stalkers Association). Upon researching the material culture of traditional and historical hunters their artefacts and imagery depict their affinities with the environment and the animals they hunted. Today however it appears that part the visual stimuli that reconciles man and animal in the act of hunting is absent in modern hunting products. Addressing this may complement a modern hunter’s connection with our hunting and gathering instincts. Below is a basic sketch employing the taratara-akai pattern, a Māori carving pattern that symbolises the cultivation of kumara and is, in essence a symbol of food.
Fig. 11 (right) is a rock carving from Gärde in Jämtland, Sweden. Bolin interprets the visual as a human transforming into an elk. The other elk prints may be part of the story. The ideology is man and animal are of the same physical being, depicted in a very simple way. Can this simplicity be achieved through a modern hunting product? It illustrates cleverly a hunter’s affiliation to an animal.

Pondering over the rock carving from Sweden, I developed the visual messages further. Fig. 12 outlines the stages I progressed through.

A) Bolin interprets the rock carving from Sweden as a visual that communicates transformation. Based on his interpretation I worked to complement the rock carving by adding a human figure to communicate who may have initially created the human foot prints.

B) I wanted to communicate an oscillation of transformation. To do this I drew prints of an elk leading to the human figure.

C) Following the previous stage it came to my attention to combine the prints into a single print. This indicates the story but in a simplified graphic. The graphic of the human print with an elk print inside provided an idea to develop and design a product for a hunter’s foot.

Fig. 12. Whiteboard visual development of Sweden rock carving
Jamaine Fraser.
Fig. 13. Iconographic development inspired by Sweden rock carving
Jamaine Fraser.

The iconographic development Fig. 13 was an extension of Fig. 12. It conveys a number of ways in which the hunter and animal are as one in the act of hunting. It is my intention to employ the visuals as part of the brand for my product.

Fig. 14 and the below sketch in Fig. 15 is of a small portable fridge as a backpack. With the idea of a cooling system such as the fridge, I began considering keeping the meat cool for the hunter with small sections attached to a small backpack.

Fig. 14. Turtle Backpack
It was suggested that I explore liquid nitrogen. I found home experiments had a problem of explosions. I continued the search and came across dry ice as a potential cooling system. When searching for dry-ice I came across medical products that house a gel-like substance which is used for bruises and other injuries. This I knew was too heavy for a field hunter to carry. However I came across an instant ice pack distributed by Protecsolutions Limited (www.proctecsolutions.co.nz).

I visited a number of pharmacies and grocery stores to locate and purchase similar products for consideration. One product I found called Instant Cold Pack (ICP) manufactured by Aaxis (see Fig. 16) works by squeezing the package and popping the air and water filled internal package. The water then mixes with the urea crystals that are found within the cavity between the two packages. A chemical reaction known as an endothermic reaction occurs and creates a cold chilling effect. Once the user has finished with it, the urea is disposed of. The ICP comes in different sizes, small - 16 x 9cm, medium - 18.5 x 15.5cm and large - 21.5 x 15.5cm and are relatively light in weight (“Aaxis Pacific”). The cooling effect of the small pack lasted just 1 hour. The other larger packs lasted just over an hour. If they were housed in a cooling bag they may last longer. Using these packs housed inside sections of a pack seems
to be a promising idea. They are inexpensive retailing only between $3.50 and $5.50 at pharmacies.

I explored the possibility of employing liquid nitrogen and dry ice (see Appendix 9. Liquid Nitrogen and Dry Ice). A major implication of both options was the production of condensation and excessive weight. Condensation produces water and moisture which can harbour bacteria. The unwanted weight and the uncontrollable
Fig. 17 is a series of sketches illustrating the process from a portable fridge conception to a range of products that use the science of the ICPs (see Fig. 16). The concept developed from this process is a range of products. The last three sketches located at the bottom right hand corner propose a primary cooling package, a cooling pack and a cooling cape for carcass carrying. The idea is that the urea granules are housed within sections of all three products. The hunter fills the sections of either the package, pack or cape that contain urea granules with water from his drinking container or from creeks, rivers and lakes. Instantly the cooling process begins. This method of cooling is critical in summer months. Adding water to a pack would be of concern due to unwanted weight by hunters. Further experiments with the urea were needed to determine the volume of water needed to sustain the cooling effect for a period of time. The longevity of the cooling effect is important to the preservation of the meat.
In Fig. 18 the urea prills are primarily used as a fertiliser for pastures and crops in the agriculture sector of New Zealand. It has a high concentration of nitrogen which is an essential nutrient for plant growth. The urea was tested for the cooling effect in a single preliminary experiment. In a resealable plastic bag 5 teaspoons and 50mls of water were added to the plastic bag. Instantly the cooling effect was tactiley evident. However the cooling effect lasted approximately 10-15 minutes. More tests of different quantities are required and perhaps the urea may need to be in a crystal state like the ICP’s from Aaxis (Fig. 16) in order to increase the longevity of the cooling effect. However to make a fair comparison between the prills in Fig. 18 with the crystals in Fig. 16 both products would need to be tested in identical packages and quantities. On reflection I noticed the urea crystals in the ICP’s (Fig. 16) took longer to dissolve than the urea prills (Fig. 18), which perhaps increases the longevity of the cooling effect. However the limitation of this statement is the unequal variables in the two separate preliminary experiments. Roberts surmises that the cooling effect is governed by the surface area of the vessel and its insulating properties (if any), ambient air temperature and the latent heat produced by the vaporisation of the water. He also says that the cooling effect should be evident after the dissolution phase.
As the cooling effect is what I am trying to achieve for hunters I wanted to employ symbols that represent cold or freezing. Beginning at the top right hand corner of Fig. 19 I began thumbnail sketching which progressed down the page and then along the bottom to the left. The last two visuals are interpretations of ice cube containers. The sketch which resembles a backpack has triangular shapes that are somewhat embossed. They would ideally be soft textile housing sections of urea prills or crystals (urea is the chemical substance used in ICP’s (Fig. 17). Following this sketch to the left is the final one on the page. It is a loose ice-pack concept which stemmed from the idea of a modular system that can be adopted and used in the transportation methods of game which are,

- Whole or partial carcass carrying
- Butchered meat packed in a backpack or
- Primary packaging (meat packaged in a small package).
In Fig. 20 I used images that are iconic with the notion of the cold. I began with sketching a mussel shape and then employing shapes that are visual derivatives from the images.

The bottom section illustrates a user scenario. 1. Place meat from deboned animal inside pack and zip up. 2. Remove releasable bioplastic packets of urea prills from external pocket. 3. Add water from drink bottle or waterway. 4. Put packet back inside external pocket and zip up. 5. Hang or place in backpack.

On reflection I became personally unsatisfied with the design as it perpetuates traditional product design aesthetics. I want to design a product that speaks to some extent about the craft of traditional hunter-gathers and to make reference to Māori aesthetics.
I visited Te Parapara garden at Hamilton Gardens, Hamilton. It is a Māori garden display that demonstrates pre European Māori horticultural traditions and technologies. Parapara is the name of a pa that used to be situated where the gardens are today.

I spent a number of hours immersed in the area for creative inspiration for my sketch work. On observation I noticed many spiritual guardians around the area. Horticulture was not just an intentional exercise but also a spiritual one. The top left photograph shows a pataka (food store house), a single rock and small mounds of soil and ash for plantations. The rock is a spiritual guardian of the plantation. The small mounds of soil make a pattern which is what the whakairo (carving) pattern taratara-akai is derived from. The pattern represents food and all its ambiguities. The pattern is often found on the maihi (barge boards) of pataka. The taratara-akai is what I want to employ for my design.
Fig. 22. Te Parapara Garden

Photograph, Jamaine Fraser.
Fig. 23. Visual Inspiration
This sketch development was a result of my visit to Te Parapara garden and a visual referral to Māori and Japanese meat packaging concepts in Fig. 23. The natural feel of the traditional packages was an aspect I wanted to capture and illustrate through my product concept.
Fig. 25. Kaihaukai Concept

Jamaine Fraser.
Fig. 26. Kaihaukai Colour Concepts

Jamaine Fraser.

Fig. 27. Visual Cues
Chapter 4 – Product Concepts

Kaihaukai – A Gift of Food

- *The Meaning of the Intangible*

The name of the product ‘Kaihaukai’ is a Māori term and means ‘a gift of food from one party to another’. This concept aligns with the affinity between the hunter, animal and environment.

Design aesthetics are important to many hunters (Frison). As a hunter myself, I wanted to design a product that complements the hunting environment and is reflective of the Māori culture because I am Māori and wish to incorporate visuals from my culture. The shape is my interpretation of a kete (Māori basket) shape, practical and pleasing. The weaving design serves a pragmatic purpose. It is sewn on the external faces of the Kaihaukai to keep the internal insulation in place. The intangible meaning of the design is illustrated by the employment of the Māori design pattern taratara-akai (Māori food pattern). This pattern is not intended to serve a purely decorative purpose. When a pattern such as the taratara-akai is applied to an artefact, such as the Kaihaukai it embodies the artefact with relational meaning (see Fig. 29 – Taratara-akai). The taratara-akai is found on Pataka (Māori food store houses) and is a
visual derivative of the kumara (sweet potato) mounds of traditional plantations (see Fig. 22 – Te Parapara Garden). This pattern connects the Kaihaukai with the notion and purposes of a Pataka and by extension, to the land.

Caruana writes about aboriginal art and states that “religious images and designs, when applied to any surface, whether the body of a participant in ritual or the surface of a shield or a carrying bag, have the power to transform the nature of the thing from a mundane state to an extraordinary one, from the profane to the sacred” (Caruana 14). This is very much applicable to many indigenous cultures around the world.

It was important that the Kaihaukai and the forest possessed an aesthetic cohesion to complement the meaning of the taratara-akai. I believe this has been achieved and is illustrated in Fig. 31. The colours and textures were intentional.

- **The Meaning of the Tangible**

A primary objective for hunters is to take good care of the meat obtained from an animal. One way to help keep meat palatable for a later date is to keep it cool. The Kaihaukai is not a backpack. It is designed to be either placed within a hunter’s existing backpack or hung, (see stages 10 and 11 of Fig. 42). The functional intention for the Kaihaukai is to keep the boned-out meat cool for field hunters to minimise the hunter’s unease at potentially losing the meat to heat and insects in the summer months. The intended cooling feature
gives assurance to the hunter that the meat will not deteriorate. It is considered disrespectful to the animal if the meat goes to waste (Informant of Waikato New Zealand Deer Stalkers Association).

The Kaihaukai is not comparable to the cooling abilities of a fridge. The technology at this stage retains a cooling effect sufficient enough for thirty minutes and the intention is not to keep the meat cool for many hours otherwise as this could be detrimental to the culture of hunting. If the cooling effect can be sustained for two to three hours then this would be ideal. This length of time will be sufficient to keep a field hunter’s meat cool during the warmest hours of a summer day whilst retaining the challenge of keeping the meat.

The cooling effect is created when the hunter adds water from their water bottle or waterway to the urea prills in the bio-plastic packages (see stage 6 of Fig. 42 – Product Use Scenario). The chemical reaction is known as an endothermic reaction. The cooling technology is marketed in the pharmaceutical sector, and it is used as cooling packets for bruising and strains sustained during physical activity. The resulting solution of the urea and water is also used in the horticultural and agricultural sectors as fertiliser due to its high level of nitrogen. This very fact makes the employment of urea suitable for the foundation and context of this project. The animal provides the hunter with a gift, the gift of its life and the hunter through using the Kaihaukai fertilises the land. Enabling new plant growth which other animals can benefit from. The functional use of the Kaihaukai intimately connects the hunter with the animal and the environment, (refer to stage 14 of Fig. 42 – Product Use Scenario). The Kaihaukai is my interpretation of the affinity between the hunter, animal and the environment through containing the meat.
Fig. 30. Product Use Scenario

Jamaine Fraser.
Fig. 31. Kaihaukai 2

Photographs, Jamaine Fraser.
Fig. 32. Kaihaukai 3

Photographs, Anna Ross.
• **Materiality**

Most of the materials are synthetic. However the muka (flax fibre) ropes are made of harakeke. The bio-plastic packaging and PLA (polylactic acid) insulation are partly organic. Urea is found in urine but is now synthetically synthesised. The sewing thread would be canvas grade.

The materials of the casing architecture of the Kaihaukai were chosen for their lightweight properties and aesthetic qualities. Urea was chosen for its tangible qualities and environmental benefits.

For model making purposes other materials were used in lieu of some of those stated above and identified in Fig. 33. Kaihaukai Materials. A substitute for the bio-plastic re-sealable packaging was a standard re-sealable sandwich bag. To demonstrate the PLA foam insulation silver lined under floor insulation was used. For the proposed harakeke strand/handle and reinforcing harakeke strands on the side of the Kaihaukai rope was employed. Appendix 10.

The Making Process of the Kaihaukai shows the substituted materials and the construction process.
Fig. 33. Kaihaukai Materials

Jamaine Fraser.
Measurements

Fig. 34. Kaihaukai Volume

The Kaihaukai is large enough to contain the shaded areas of the animal in Fig. 34. Wapati deer are much larger than the average red deer. Hunters are also known to harvest the front legs of the stag. Noticeably the Kaihaukai is capable of containing several fawns, however, the killing of fawns is discouraged in the hunting milieu. The Kaihaukai has the capacity to contain most, if not all of the commonly harvested meat (back legs, front legs and back steaks) of either the male or the female of all other large game species in New Zealand.

The Kaihaukai weighs just 610g empty and with a volume of approximately 15L would potentially be capable of containing meat totalling a weight of approximately 15kgs.

The cooling packages inside the Kaihaukai would have a ratio of one part urea prill to one part water. The Kaihaukai concept uses 100g of urea to 100mls of water within its internal bio-plastic resalable packages. The amount of packets needed would be at the discretion of the hunter.

Critical Appraisal

The Kaihaukai was critically appraised by hunters in the field and by scientists (see Appendix 11. Critical Appraisal of Kaihaukai).
- **Health and Safety**

Urea prills can pose some health and safety risks. The toxicological considerations stated on the urea safety data sheet by Ravensdown are:

*Inhalation:* Slight irritant. Elevated exposure may result in mucous membrane irritation (nose & throat)

*Skin:* Irritant. Prolonged contact may result in irritation, itching and possible skin rash.

*Eyes:* Irritant. May cause lachrymation, irritation, pain & redness.

*Ingestion:* Has diuretic effect. Ingestion of large quantities may lead to nausea and vomiting.

This technology would therefore be used only by people of a certain age. Even though the risks are unlikely events, precautions must be taken. For example, if the urea solution was to be accidently spilt on the meat then the contaminated pieces must be removed and disposed of. If the contaminated pieces cannot be clearly identified then dispose of the meat that has been potentially contaminated.

- **Product Cross Reference**

The Kaihaukai is a physical manifestation of the culmination of traditional and modern hunting values. It is also a product that is technologically simple to use, yet innovative. It was important to keep the use of the product uncomplicated as a means to pay homage to the natural technology employed by traditional hunter-gathers. The Product Cross Reference Matrix charts the Kaihaukai with traditional and modern preservation technologies in order to provide some context and also for differentiation purposes. The matrix also asks if the product and/or culture possesses intangible values in relation to the meat preservation.
Fig. 35. Product Cross Reference Matrix

Jamaine Fraser.
Fig. 36. Product Cross Reference Matrix

Jamaine Fraser.
Materials

The potential use of rimu (bull-kelp) which is used for containing titi (mutton bird), animal intestines which are used for sausage casings and harakeke (flax) were investigated. Consulting two experts Dougal Austin of Te Papa Museum (Austin) and Dr. Michael Stevens of Otago University (Stevens) on the application of rimu was explored as a means of containing the meat provided advice that rimu would be impractical due to the exhaustive processes needed to render the material useful within a hunting context.

Researching animal intestines as a material for a channel system to prolong the endothermic reaction was carried out. What was found was a labour intensive process to clean the intestine from an animal. This process requires large amounts of salt and at least two days of ideal weather conditions. Therefore this material would not be practical for a hunting context. Another material that was considered was harakeke. Harakeke is affordable and readily available however the process to make harakeke usable is very expensive. The materials used, were selected because they are familiar and are proven to function within a hunting context.
Korowai O Tane – Cloak of the Forest

- The Meaning of the Intangible
This concept employs the spiritual notion of Tane (Māori god of the forest) as a protector of his children who are people and the animals within the forest. The concept cloaks the meat as a symbol of respect towards the animal and helps to ensure that the animal’s offerings, i.e. meat, are not wasted by aiding in keeping the meat cool.

- The Meaning of the Tangible
The chemicals from within the Korowai O Tane are similar to the Kaihaukai concept. The use and disposal of them by the hunter helps to encourage plant growth. Therefore feeding the animal, and thus the animal providing sustenance for the hunter.

- Measurements
The concept would be offered in a range of sizes to accommodate for different sized animals and different scenarios. A small sized product to contain ‘back steaks’ and goats and a larger sized product to package bigger game and larger volumes of meat.

- Materiality
The internal material will be a silver lining known as hyprotech. It is easy to wipe or spray clean. The external material would be polar-fleece for silent purposes, with a sewn cross hatched construction of rip-stop to provide added strength to carry heavy volumes of meat. The internal bladder that houses the chemicals will be made of pvc and constructed using heat-sealing technology. The cord located at each corner will be nylon and is sewn into and around the edges of the square design.
Feedback forms were sent to past interviewees and a group discussion was held at the New Zealand Deer Stalkers Association (New Zealand Deer Stalkers Association Inc Waikato Branch). Two from seven of the interviewees replied (Hutchinson, “Product Feedback”) one of whom does not wish to be mentioned. The questions in the feedback form were:

a. What other products or articles come to mind when looking at this concept?

b. What other products have similar functions?

c. What additional function/s might you incorporate and how

d. Would this product be useful in warm to hot conditions?

e. What do you find most useful about the product idea?

f. Please feel free to add any additional comments below.

Questions a. and b. yielded the same responses. Both the interviewees were not aware of similar products that had similar functions. A search also yielded no products that were similar for the hunting market. This would suggest that both the Kaihaukai and Korowai O Tane are innovative concepts for the hunting market. For c. hunters could identify that these concept ideas can be used in others markets such as fishing and another wished to see blaze orange on the exterior of the product for a safety feature. For question d. the response was positive. Each interviewee agreed that the concept would be useful in warm conditions. One interviewee stated that the product could become part of his everyday hunting kit. Responses to question e. were that the varying ways of carrying extra volume was an ideal feature. Also that the product contains, protects, and cools the meat is beneficial. One hunter advised that this product could be used to take in ‘luxury’ food items. For question f. a hunter was puzzled as to why this area has not been addressed until now. Hunters agreed that the concept
appeared to be easy to use. In passing another hunter would not want to use fluid as an agent due to weight related issues.

Fig. 37. Korowai O Tane
Kaihaukai Manawa – Food is Life

The name of the product, Kaihaukai Manawa means, a gift of food for ones life. The pattern on the exterior is a Māori pattern known as the hohonga, which means to work together. The product acts as a medium between the hunter, animal and the environment.

- The Meaning of the Intangible
The meanings of the functions are similar to the previous concepts. One difference is that the band on the exterior of the Kaihaukai Manawa represents the Manawa of the product. When not in use by the hunter the manawa is not connected between the hunter, animal and the environment. When the product is in use by the hunter they connect the manawa. Connecting the manawa around the waist is achieved by the clip. When draped around the neck the manawa is connected by the hunter's hands and through him.

- Measurements
This product will be available in two sizes to accommodate different physical abilities of different sized hunters and for different quantities of meat. In-terms of the cooling technology it can remain cool for a little over two hours (see Appendices 13, 14, 15).
Materiality

The main body is polar-fleece to minimise noise whilst hunting in the bush. The manawa band is webbing material and is used on the shoulder straps. Synthetic foam is used for the padding panel. The internal material of the product is hypro-tech for easy cleaning and to keep the cooling effect within the product. The bladder is heat sealed pvc (see Fig. 39).
Fig. 39. Kauhaukai Manawa Specifications

- **Manawa Band**: Synthetic webbing contains a visual story between hunter and animal.
- **Clip**: Black plastic clip to secure around waist and to connect the manawa.
- **Double Zip**: Product length zip for easy access.
- **Padding**: Removable padding for comfort and to insulate the meat from the user's body heat.
- **Bladder**: PVC heat sealed bladder containing pre-purchased chemical mixtures.
- **Hypro-tech**: Silver internal lining for easy cleaning.
Fig. 40. Kaihaukai Manawa Product
Fig. 41. Kaihaukai Manawa Product in Use
Critical Appraisal

The colour palette is to complement the rough colour range found in the bush environment (see Fig. 39). The colours are similar to that of the wild animals found in the backcountry of New Zealand. This is concerning to some hunters as they could be easily mistaken for an animal by another hunter. Proposed in Fig. 42. Kaihaukai Manawa Colour Range is a range of colour combinations to address this issue.

Fig. 42. Kaihaukai Manawa Colour Range
Product Brand Story

The Product Brand Story Model (Fig. 45) illustrates the cycle of sharing through gifts of food. The fertilising solution poured out by the hunter from the bladder into the bush after the cooling effect has finished encourages plant growth. The plants that grow provide feed for the animals and the animals gift themselves to hunters for sustenance. This cycle is a conceptual interpretation informed by research results. As identified by the haerenga wānanga with Jim Schuster, the conversations with hunters and literature, gifting and sharing between hunter, animal and environment is a key aspect of hunting. Yet today in the hunting market no product demonstrates the acts of sharing. The Kaihaukai model also relates to the notion posed by the TWTW model (Fig. 8). That is, that not one element can exist without the other. All are needed to co-exist to exist.

Figures 43 and 44 are the designs that are on the product to depict the hunter-animal relationship. It portrays that the hunter and animal are one in the act of hunting.
Fig. 45. Product Brand Story

**Animal**
The animal provides a meal for the hunter.

**Environment**
The mixture disposed in the bush by hunter from the cooling packets encourages new plant growth for animals.

**Hunter**
Hunter uses the cooling technology to keep the meat cool to provide assurance that the gift from the animal will be shared with family and friends.
Conclusion

The research conducted for this exegesis shows there has been an intangible connection between the hunter, animal and environment for thousands of years that still exists today. Today we can be fooled into thinking this affinity does not exist for modern hunters. Existing products do not serve the intangible notion of connectedness especially in the area of meat containment. Taking good care of the meat so that it does not deteriorate is important. The meat obtained by a hunter from an animal during a hunt is a symbol of this connectedness between the hunter, animal and environment. Therefore I offer the Kaihaukai Manawa (Fig. 38) as a potential idea on how one may minimise the hunter’s problem with the potential deterioration of game meat. It is also my interpretation of the affinity a hunter has with the animal and environment.

The Kaihaukai Manawa is influenced by the traditional values of the hunter-gatherers mentioned in the literature review. A key value was the concept of ‘sharing’ and acknowledging the ‘co-operative existence’ of the hunter, animal and environment in the activity of hunting. The Kaihaukai Manawa demonstrates this notion of sharing (see Fig. 45. Product Brand Story) through visual designs and through its functional use.

This project provided the platform for me to understand what hunting meant for other hunters and what the meat represented to them. The meaning of hunting and the significance of the meat appeared not to be a common topic of discussion amongst hunters however, latent information was revealed. This information was assessed by using the TWTW model (see Fig. 8). The model helped impart and identify the essence of what hunting and the meat meant to hunters from four dimensions. The TWTW model also provided a holistic philosophical framework that served as a metaphoric synonym for the care of and the relationship with the animal, whanau, land and the wairuatanga (spiritual) of koha (gifting).
Learning the values of traditional hunter-gatherer societies helps to contextualise the conceptual ideology of this project. Speaking with modern hunters has broadened my perspective of modern hunting culture. As a hunter with some experience this project has broadened my existing knowledge of containing meat in the context of hunting.
## Glossary

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Haerenga</td>
<td>Learning journey</td>
</tr>
<tr>
<td>wānanga</td>
<td></td>
</tr>
<tr>
<td>Harakeke</td>
<td>Flax</td>
</tr>
<tr>
<td>Hui</td>
<td>Gathering</td>
</tr>
<tr>
<td>Kaihaukai</td>
<td>Gift of food from one party to another.</td>
</tr>
<tr>
<td>Kiekie</td>
<td>Native New Zealand Epiphyte.</td>
</tr>
<tr>
<td>Koha</td>
<td>Gift</td>
</tr>
<tr>
<td>Manawa</td>
<td>Heart</td>
</tr>
<tr>
<td>Marae</td>
<td>Meeting house</td>
</tr>
<tr>
<td>Māori</td>
<td>Indigenous people of NZ</td>
</tr>
<tr>
<td>Muka</td>
<td>Harakeke fibre</td>
</tr>
<tr>
<td>Poha</td>
<td>Māori food preservation package for mutton bird</td>
</tr>
<tr>
<td>Taha huahua</td>
<td>Māori food preservation container.</td>
</tr>
<tr>
<td>Tangi</td>
<td>Funeral</td>
</tr>
<tr>
<td>Taratara-akai</td>
<td>Māori cultivating pattern</td>
</tr>
<tr>
<td>Titi</td>
<td>Mutton bird</td>
</tr>
<tr>
<td>Wairuatanga</td>
<td>Spiritual</td>
</tr>
<tr>
<td>Wharenui</td>
<td>Meeting house</td>
</tr>
</tbody>
</table>
Reference List

Burstyn, Thomas. This Way of Life. 2009. Film.
---. Product Feedback. 5 Dec. 2002. E-mail.


---. *Wild Food Safety - Wild Game*. NZFSA. Film.

Nicholls, Willy. *The Hunter Philosopher*. StartFilm. Film.


On Target. DVD.


Appendices

1. Questions for conversations and discussions

Conversations with nine individual hunters and one discussion circle with members of the New Zealand Deerstalkers Association of the Waikato Branch were undertaken. I had a number of questions prepared to ask the hunters (see below). The hunters' narratives were the steering agent of the conversation. I had conversations, free flowing and natural, not prescriptive interviews. It was important to let the hunter tell me how it is from their point of view in what ever way they felt.

- How long have you been hunting for? And how were you introduced to hunting? How often do you hunt?
- Why hunt? When you purchase meat from the supermarkets, surely more convenient?
- Do you hunt solo or with others? Do you have a preference? Why?
- What does the practice of hunting give you that the town, city or farm cannot?
- Is there a hunting etiquette? If so, what are some key principles?
- Do you have favourite hunting places? Are you open to sharing hunting spots? Has anyone hunted one of your spot you have shown without your prior knowledge? Would you go into another mans fridge without asking?
- Have you ever wounded an animal? If so could you walk me through the scenario.
- Would you encourage young people to partake in hunting? If so why, if not, why not?
- ‘Its not what you know, its

- How would you describe the media coverage of hunting in New Zealand?
- What would you say to people who viewed the practice of hunting and use of firearms as unorthodox?
- Do you consider hunting a sport? If so, how so? If not, could you elaborate.
- What are your views of heli-hunting?
- What are your views on Game Parks? Would you hunt at one?
- Do you hunt for meat or trophy? Have ever taken the trophy without the meat?
- What hunt has been your most memorable? Why?
- If someone has the willingness to learn, what sorts of things can a person learn from hunting who has never hunted?
- Tell me what goes through your mind when you...
  - When you draw down on the animal
  - Just let a shot off
  - When looking at an animal you have killed
who you know’ does that resonate in a hunting context for you?

- If you’re not successful in obtaining an animal be it for meat or a trophy, do you consider yourself empty handed?
- What do you consider to be your most valuable asset of your kit? Why?
- Other than animals, what else to you seek?
- What makes a hunter? Or What does it mean to be a hunter?
- Technology for hunting today. To far?
- Is there any respect for the animal/s? Could you elaborate?
- What does your family think about your hunting?

Have the animal on your back

Sitting and having a cup of tea

Steering into the landscape

When dressing the animal (gutting, skinning, steak-ing, boning)

When driving home with or without an animal

When your family are partaking in your spoils

- Could you narrate one of your hunting scenarios.
- What is your families thoughts of you hunting?
- What is your definition of hunting?
## Matrix of Frameworks

### Table 2 - Matrix of Frameworks

The table below represents the matrix of frameworks between cultural dimensions/elements and conventional design in relation to the proposed TAM and TWTW combination model. The frameworks are categorized by different authors and their associated paradigms, with key dimensions/elements classified under physical, social, psychological, and spiritual categories.

<table>
<thead>
<tr>
<th>AUTHOR</th>
<th>PARADIGM</th>
<th>Key Dimension/Elements</th>
</tr>
</thead>
</table>
3. Recreational Hunting Areas

![Map of Recreational Hunting Areas](image-url)
4. The Hunting Field

Table 3 - Physical Hunting Factors

<table>
<thead>
<tr>
<th>Personal</th>
<th>Food</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stamina and Fitness</td>
<td>Weight</td>
</tr>
<tr>
<td>Strength</td>
<td>Nutritional Value</td>
</tr>
<tr>
<td>Backcountry Experience</td>
<td>Amount</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Environment</td>
<td>Prey</td>
</tr>
<tr>
<td>Location</td>
<td>Pig</td>
</tr>
<tr>
<td>Altitude</td>
<td>Deer</td>
</tr>
<tr>
<td>Weather</td>
<td>Chamois</td>
</tr>
<tr>
<td>Terrain</td>
<td>Tahr</td>
</tr>
<tr>
<td>Time (Day/Night)</td>
<td>Feral Goat</td>
</tr>
<tr>
<td>Time of Year</td>
<td>Feral Cattle</td>
</tr>
<tr>
<td></td>
<td>Feral Sheep</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Equipment</td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td></td>
</tr>
<tr>
<td>Durability</td>
<td></td>
</tr>
<tr>
<td>Size</td>
<td></td>
</tr>
<tr>
<td>Colour</td>
<td></td>
</tr>
<tr>
<td>Table 4 - Hunting Equipment and Supplies</td>
<td></td>
</tr>
<tr>
<td>-----------------------------------------</td>
<td></td>
</tr>
<tr>
<td><strong>Food</strong></td>
<td><strong>Safety and Survival</strong></td>
</tr>
<tr>
<td>(Enough for the planned sojourn + spare in case of emergency)</td>
<td>- First Aid Kit</td>
</tr>
<tr>
<td>- Porridge</td>
<td>- Lighter</td>
</tr>
<tr>
<td>- Sugar</td>
<td>- Water-proof matches</td>
</tr>
<tr>
<td>- Salt</td>
<td>- Spare dehydrated food</td>
</tr>
<tr>
<td>- Tea bags/Coffee</td>
<td>- Strips of bicycle rubber</td>
</tr>
<tr>
<td>- Milk Powder</td>
<td>- Extra rounds (for notification shots)</td>
</tr>
<tr>
<td>- Nut/Energy/Chocolate Bars</td>
<td>- Survival Blanket</td>
</tr>
<tr>
<td>- Dehydrated Fruit</td>
<td>- Knife</td>
</tr>
<tr>
<td>- Dehydrated Meals</td>
<td>- Headlamp + spare batteries</td>
</tr>
<tr>
<td>- Small Canned Fish</td>
<td>- Mountain Radio</td>
</tr>
<tr>
<td>- Plastic Bags (for rubbish)</td>
<td>- Epurb (Personal Locator Beacon - PLB)</td>
</tr>
<tr>
<td>- Slices of bread</td>
<td>- Scroggin</td>
</tr>
</tbody>
</table>

| **Hunting** | **Clothing** |
| - Hunting knife | - Jersey/s |
| - Rifle | - Shorts |
| - Bow and Arrow | - Rain Jacket |
| - Spear | - Boots |
| - Ammunition | - Pants |
| - Cheese Cloth | - Water-proof pants |
| - Small back pack | - Thermals (top and bottom) |
| - Game Bag (large bag to cover meat) | - Gloves |
| - Field cleaning kit (for rifle) | - Bennie |
| - Steel (for sharpening knife) | - Underwear |
| - Rope | - Shirt/s |
| - Hunting Belt | - Plastic Bag (for water proofing) |

| **Accommodation** | **Cooking** |
| - Tent/Fly/Hammock and Pegs | - Pot/s (Billie) |
| - Sleeping bag | - Portable Cooker |
| - Bevy Bag (Optional) | - Gas canisters |
| - Inflatable Mat (Optional) | - Eating utensil/s |
| - Small Canvas (for lying on) | - Water Bottle |
| | - Cup |

<p>| <strong>Navigation</strong> | <strong>Other</strong> |
| - GPS | - Toilet paper |
| - Compass | - Portable gas lantern (Optional) |
| - Typographical Map | - Torch (with spare batteries) (Optional) |</p>
<table>
<thead>
<tr>
<th>Mode of Transport</th>
<th>Stage of Use</th>
<th>Positives</th>
<th>Negatives</th>
</tr>
</thead>
</table>
| Motor Car         | • From home to hunting destination. | • Efficient on roads.  
• Economical. | • Limited to tar sealed and maintained metal roads.  
• Not ideal to carry a whole carcass. |
| 4x4 Vehicle       | • From home to hunting destination. | • Makes access to areas easier.  
• If diesel, cheaper fuel costs.  
• Ideal to carry whole carcasses. | |
| ATV (All Terrain Vehicle) | • From home to hunting destination.  
• From parked vehicle to the proposed hunting accommodation | • Makes access to inaccessible areas by motor cars easier.  
• Rugged and durable.  
• Capable of carting a whole carcass.  
• Cheap fuel cost. | • Needs to be transported by trailer adding to fuel consumption. |
| By Foot           | • From parked vehicle to the proposed hunting accommodation | • Increase fitness.  
• Liberating | • Physically demanding.  
• Time consuming |
| Helicopter        | • From helicopter head quarters direct to hunting accommodation or remote area. | • Makes access to remote areas easier.  
• Can cart a large amount of equipment for solo hunter.  
• Fast and convenient.  
• Can land in remote areas | • Expensive.  
• Removes an element experiencing success through hard work. |
Table 5 – Transportation Continued

<table>
<thead>
<tr>
<th>Mode</th>
<th>Description</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Train</td>
<td>From station to hunting region.</td>
<td>Affordable.</td>
<td>Need clearance for firearm/s.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Meat will not keep.</td>
</tr>
<tr>
<td>Boat (ferry)</td>
<td>From wharf to hunting region.</td>
<td>Affordable.</td>
<td>Need clearance for firearm/s.</td>
</tr>
<tr>
<td>Aeroplane</td>
<td>From aeroplane headquarters direct to hunting accommodation or remote area.</td>
<td>Makes access to remote areas easier.</td>
<td>Expensive.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Can cart a large amount of equipment for solo hunter.</td>
<td>Removes an element of experiencing success through hard work.</td>
</tr>
</tbody>
</table>
5. Hunting Scenario Description

There are many factors involved and all influence the events within a scenario. Below is a very general insight of a big game field hunting scenario. The storyboard below illustrates stages from organising and packing for the hunt to the consumption of the field meat.
Fig. 46. Hunting Scenario

Jamaine Fraser.
1. **Organisation and Packing**

The organisation and packing of equipment and supplies could be considered one of the most important stages of a hunt. Organising a hunt involves gathering the right supplies and equipment to exercise a hunt safely. Factors as mentioned above determine what supplies are necessary. In terms of packing a back-pack, it is recommended that the lighter equipment be packed at the bottom (e.g. sleeping bag) and the heavier be packed higher (not at the very top) (e.g. mountain radio, filled water bottle) and closer towards your torso. This helps with the distribution of weight and minimises back strain.

2. **Home to Destination**

This stage is the travelling from home to the desired hunting area. Depending on where a hunter lives and the location where he or she has planned to hunt, travelling time and mode of transport will differ.

3. **Vehicle to Accommodation**

From vehicle to accommodation is often achieved by the field hunter on foot. This is carrying all the equipment in a large back-pack and walking to a hut or an area for camping. This stage can be physically demanding. The weight of the pack, terrain and distance are contributing factors.

4. **Camp Chores**

Taking the time to assess camp supplies is a necessity. Water and dry timber are essential for camp (New Zealand Backcountry huts are available for hunters and some have water collection tanks installed). If the accommodation is a camp site then erecting the tent, hammock or fly is advisable prior to hunting. When selecting a camping area, consider the wind and its direction. If possible, camp in an area that is shaded from the wind. It is advised not to camp close to riverbeds or streams as these can become flooded during
heavy rain. However, camping too far from a water supply means obtaining water for camp will be an arduous exercise; therefore, considering both factors is important when selecting a site. Camping below large branches should be avoided as these may fall in high winds.

5. **Hunt**

Hunting requires immense concentration and skill. This can be psychologically draining and it is advisable to take periodic breaks to rest. An animal’s senses are far more acute than man’s and because of this a hunter faces the challenges of keeping the wind in his or her favour, keeping silent and remaining from view of the animal.

6. **Dispatch**

Dispatching an animal can be achieved by cutting the throat, impalement to the heart by knife or by inflicting a fatal wound by a propulsion implement such as a spear, bow and arrow or firearm. The placement of the blow is critical in dispatching the animal humanely and efficiently. Placement also influences the palatable flavours and quality of the meat. High levels of stress can cause the meat to be less desirable.

7. **Elation and Remorse**

It is often said by hunters that there is a sense of elation and remorse for the animal they have killed (Nicholls; Informant of Waikato New Zealand Deer Stalkers Association; Drangsholt; Walrod; Burstyn). There is also a sense of appreciation for the animal as it provides nutritional sustenance for the hunter and their family.

8. **Dressing**

Dressing is the removal of the entrails. Care must be taken to not puncture any of the organs and should be carried out
as hygienically as possible. Offal such as liver, kidneys and tongue can be consumed.

9. **Kill Site to Camp**

   In the above scenario the entire carcass is made into a back-pack and carted from the kill site to camp with the skin on. Leaving the skin on protects the meat from bacteria. This back-pack method is one of two back-pack methods. The other is carrying the animal on the back but horizontally with the animal’s legs pointing skyward and attached to a back-pack frame. In other instances hunters dismember the legs from the torso. There is also a method of making a back-pack out of the two hind legs. Hunters also remove and pack the back-steaks of an animal.

10. **Containing and Hanging**

    By covering and hanging a carcass or parts of an animal inside a large game bag the meat matures and is protected from flies and other various insects. However rodents and other animals may break through the bag and consume portions of the meat. This renders the surrounding areas unusable. If the weather is warm or dry, hang meat in shaded area. If portions of the animal are taken instead of the entire carcass, an option for storage is placing the meat portions in plastic bags and submerging them in a stream or river (Warren). This will keep them cool and protected from flies and other insects. However beware, as eels are known to consume meat.

11. **Butchering**

    Butchering a carcass is ideal to make it easier to pack and transport from camp site to vehicle. Some hunters may carry the entire carcass out to the vehicle and hang it at home for several days and then dissect the carcass. This project addresses the hunter who de-bones the animal in the field and has to carry the meat out for a number of hours.
12. **Camp Site to Vehicle**
   This stage involves repacking all equipment and rubbish into a pack and hiking out from the camp site or hut to the vehicle. If an animal has been obtained the pack will be heavier than the initial walk in.

13. **Destination to Home**
   This is often a time for reflection on the events of the hunt.

14. **Cool or Freeze**
   Cooling and freezing butchered meat in plastic bags with labelled cuts and date of freezing will help preserve and identify various cuts for different meals.

15. **Consumption**
   Consumption provides physical, psychological, social and spiritual benefits. The meat provides protein. The act of eating a hard-earned meal evokes feelings of reward and achievement. If the meat is consumed by others it helps to strengthen relationships (Hunter; Informant of Waikato New Zealand Deer Stalkers Association). The animal is remembered intrinsically what it has provided. The animal literally becomes part of the consumer. This spiritual aspect is supported through the actual act of hunting and obtaining food from the land.
6. Deer Abattoir Field Visit - Duncan Processes Ltd

They are regulated by standards set by the New Zealand government agency, New Zealand Food Safety Authority (NZFSA).

Regulation specifies that the carcass must be cooled to 7°C prior to deboning (New Zealand Food Safety Authority, “Industry Standard 6/Industry Agreed Standard 6 (IS6/IAS6) Processing of Edible Product” 68), Duncan Processors hang and store their dressed deer in a large fridge between 0°C to 2.5°C for 24 hours prior to deboning.

Regulation 3.6.1.5 Carcass Chilling (47-48) would suggest hanging a whole carcass obtained from the wilderness between the ambient temperatures of 7°C and 10°C would be better preserved, than in the ambient temperatures between 20°C to 30°C which are temperatures often found in the summer months of the New Zealand back-country hunting environment.

However in an unregulated context Walrod (2004) advises if the ambient temperature is 13.3°C venison will age well for two days (see Table 7 - Aging Venison).

Table 6 - Aging Venison

<table>
<thead>
<tr>
<th>Time (Days)</th>
<th>(°F)</th>
<th>(°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>32</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td>40</td>
<td>4.4</td>
</tr>
<tr>
<td>4</td>
<td>48</td>
<td>8.8</td>
</tr>
<tr>
<td>2</td>
<td>56</td>
<td>13.3</td>
</tr>
</tbody>
</table>

Source: Dennis Walrod. *Making the Most of your Deer* (Stackpole Books, United States of America, 2004, print, 52)
a. Column °F has been converted into °C.
7. Field Meat Experiment

Agents tested: Grounded ginger, black pepper and diluted citric acid.

Test Description:
The experiment was a one-off experiment to validate the findings from Hunter and Shead. Hunter notes that products such as grounded ginger and pepper and Shead notes that diluted citric acid (2 ounce (56g) of citric acid to 1 quart (0.94L) of water) can be used to protect meat from flies. One piece of meat was the control, one liberally covered with ground ginger and another with ground pepper and the final piece was sprayed with diluted citric acid.

Photos were taken at three different intervals which recorded the number of flies and wasps. Ginger achieved a greater result than both the pepper and citric acid options by a large margin. The citric acid performed as though it was not treated and from the outset the pepper sample performed similarly to the ginger sample, however the wasps eventually began consuming the meat.

Fig. 47. Field Meat Test
Photographs, Anna Ross. 2011.

Date: 30.01.2011

Protein: Four fresh goat meat pieces (back leg meat)
Location: Wanganui National Park
An interesting finding was the low number of flies in comparison to wasps. One theory is the flies may have been deterred by the wasps.

This finding was shared with members of Nga Aho (a collective of Māori designers) during a hui (gathering) at Te Takinga Marae. One member, Terry Badham, suggested designing a product that reflected the visual qualities of a wasp to keep flies at bay. This idea is worth future exploration.
### Material Culture Patterning Tables

<table>
<thead>
<tr>
<th>Material Culture (Object / Imagery)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Culture</strong></td>
<td>Māori – New Zealand</td>
</tr>
<tr>
<td><strong>Purpose</strong></td>
<td>To package titi (mutton bird) for a feast at a later date. Designed in such a way so that it may be passed from person to person by tossing.</td>
</tr>
</tbody>
</table>
| **Materiality**                   | - Harakeke (flax)  
- Kiri tōtara (tōtara bark) or cabbage tree leaves  
- Rimu rapa (bull kelp) |
| **Meaning**                       | Given the materiality and the woven works of the poha in combination with Erenora Puketapu-Hetet’s (Puketapu-Hetet) description of the intrinsic values of weaving harakeke for Māori, there is no doubt that this object is imbued with spiritual connotations. The poha is a nature-based article that serves a particular purpose and is not designed to be used for many years. Puketapu-Hetet notes when referring to a woven article, “it is used until it can no longer serve the purpose for which it was created. It is then deemed to have died a natural death and is allowed to go back to Papatuanuku to begin a new life cycle” (Puketapu-Hetet 2). All plant life, including the plants used for the poha comes directly from Papatuanuku (earth mother) which should be returned to her. |
| **Sources**                       | (Best; Museum of New Zealand Te Papa Tongarewa; Richdale) |

---

**Fig. 48. Poha B**

<table>
<thead>
<tr>
<th>Material Culture (Object / Imagery)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fig. 49. Calydonian Boar Hunt</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Description</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Culture</strong></td>
</tr>
<tr>
<td>Greek - Greece</td>
</tr>
<tr>
<td><strong>Purpose</strong></td>
</tr>
<tr>
<td>Visual narration of the mythological hunt, the Calydonian Boar Hunt.</td>
</tr>
<tr>
<td><strong>Materiality</strong></td>
</tr>
<tr>
<td>Vase painting</td>
</tr>
<tr>
<td><strong>Meaning</strong></td>
</tr>
<tr>
<td>This visual depicts the Calydonian Boar Hunt, one of the most significant hunts in Greek mythology.</td>
</tr>
</tbody>
</table>

> The ruler of Calydon made a sacrifice in which he omitted the goddess Artemis, which angered her. As punishment, she sent a boar to ravage the land of Calydon in Aetolia. The king called upon his son, Meleager, to organize a hunt to kill the boar. Meleager assembled a group of huntsman, including his maternal uncles and heroes from neighbouring cities, and they set out to kill the boar. The boar was killed; there was an altercation over the spoils of the hunt, the hide and the head of the boar; Meleager killed his uncle or uncles; and the Meleager himself was killed (Barringer 147–48). |

This story tells of the demise of hunters should they not follow protocols. Before partaking in a hunt the Greek hunter should offer the gods Apollo and Artemis gifts (J. K. Anderson)

<table>
<thead>
<tr>
<th><strong>Sources</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>(J. K. Anderson; Barringer)</td>
</tr>
</tbody>
</table>
| **Material Culture**  
<table>
<thead>
<tr>
<th><strong>(Object / Imagery)</strong></th>
<th><strong>Description</strong></th>
</tr>
</thead>
</table>
| **Culture**  
American – United States of America | **Purpose**  
Deer antler handles to serve as decorative features. |
| **Materiality**  
Deer antler and steel. | **Meaning**  
Hunting was an integral part of life for westerners throughout the world in the 1800’s. Hunting influenced the built environment as well as the material culture. The tactility of the antler handle would evoke a sense of nostalgia and acknowledgement towards the animal. The handle serves both intangible and tangible purposes. The pendant is a sliced disc from an antler. The steel feature is also decorated and would likely serve as a relational symbol and spring forth affinities between parties. It serves intangible purposes rather than tangible. |
| **Sources**  
(Walrod) |  
Photograph from Dennis Walrod, *Making the Most of Your Deer*, (Stackpole Books, United States of America, 2004; print; 197). |
### Material Culture
*(Object / Imagery)*

**Fig. 51. Inuit Seal Amulets**

Photograph from David Pelly, *Sacred Hunt: a Portrait of the Relationship between Seals and Inuit.* (University of Washington Press, 2001; print; 43)

<table>
<thead>
<tr>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Culture</strong></td>
</tr>
<tr>
<td>Inuit</td>
</tr>
<tr>
<td><strong>Purpose</strong></td>
</tr>
<tr>
<td>To invoke spiritual animal guardians.</td>
</tr>
<tr>
<td><strong>Materiality</strong></td>
</tr>
<tr>
<td>Ivory</td>
</tr>
<tr>
<td><strong>Meaning</strong></td>
</tr>
<tr>
<td>These amulets represent guardian spirits. As described by Lowenstein, amulets bring order, protection and connection between man and animal, and support in times of need. Lowenstein also records wolf and bear amulets. Wolf amulets are often carried on board the skinboats during whale hunts because the leader of the whale spirits is a wolf being and it is this being that will help guide them to whales. There is an intrinsic relationship between man and animal and this is illustrated through the fashioning of amulets as well as practiced rituals.</td>
</tr>
<tr>
<td><strong>Sources</strong></td>
</tr>
<tr>
<td>(Pelly; Lowenstein)</td>
</tr>
</tbody>
</table>
| Material Culture  
| (Object / Imagery) |

**Fig. 52. The Hunters Palette or The Lion Hunt.**


<table>
<thead>
<tr>
<th>Description</th>
</tr>
</thead>
</table>
| **Culture**  
Egyptian |
| **Purpose**  
Slate palette to ground kohl.  
A cosmetic tool. |
| **Materiality**  
Slate |
| **Meaning**  
This is a slate palette used for grinding minerals. It is highly decorated suggesting it belonged to a person of great social significance. The circle is also thought to represent ceremonial notions. Rice thinks the imagery tells a story between two princes of the early pre-dynastic period. A lion at one end is wounded with a cub in tow. The cub represents a lion prince while the leader of the most numerous file number of men is a falcon prince. This is represented by the man behind the leader carrying a pole with a falcon attached. In the early pre-dynastic period battles were fought over the unification of separate lands of which grew the foundations of Egypt.  

It seems hunting and cosmetics had a link. The cosmetic process could be viewed as ordered and elegant. While hunting may be considered turbulent in comparison. However, Rice argues that the two canines depicted symbolise order over chaos. In this sense hunting becomes refined and elegant through the use of dogs. |

<table>
<thead>
<tr>
<th>Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>(British Museum; Rice)</td>
</tr>
<tr>
<td>Material Culture (Object / Imagery)</td>
</tr>
<tr>
<td>-----------------------------------</td>
</tr>
<tr>
<td><strong>Culture</strong></td>
</tr>
<tr>
<td><strong>Purpose</strong></td>
</tr>
<tr>
<td><strong>Materiality</strong></td>
</tr>
<tr>
<td><strong>Meaning</strong></td>
</tr>
<tr>
<td><strong>Sources</strong></td>
</tr>
</tbody>
</table>

*Fig. 53. Rameses III Hunting Scenes*

| Material Culture  
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(Object / Imagery)</td>
<td>Description</td>
</tr>
</tbody>
</table>

**Culture**
Aboriginal – Australia

**Purpose**
To illustrate the story of Gunmirringgu, the Great Hunter.

**Materiality**
Bark

**Meaning**
This visual art expresses the story of a great aboriginal hunter, Gunmirringgu. Gunmirringgu is the figure on the centre left with ceremonial dances around him. He was killed by a brown snake while hunting kangaroo. The ceremony involves the killing and eating of kangaroo which signifies the death of a human. This is depicted at the right top centre. The dissection of the kangaroo represents the exhumation of human bones that are buried in a hollow log. The death of an animal is as significant as the death of a human. The pelican in the tree at he top left is a guardian of the spirit who guides the spirit to the land of the dead.

The white dots depict berries of the tree – Morning star or Banumbirr they represent the morning star. This star is significant in post-funeral ceremonies. They are elements that symbolise the passage of a soul from one state to another, from birth, physical life and death. The morning star also tells of the transition from day to night. The spirits of the dead keep the morning stars in a bag and cast them into the night sky. The stars are attached to a rope and are pulled in when the sun begins to rise. Without the souls of the dead, there would be no stars.

**Sources**
(Caruana)
<table>
<thead>
<tr>
<th>Material Culture (Object / Imagery)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Culture</strong></td>
<td>Mlabri - Thailand</td>
</tr>
<tr>
<td><strong>Purpose</strong></td>
<td>To dispatch animals.</td>
</tr>
<tr>
<td><strong>Materiality</strong></td>
<td>Steel, wicker</td>
</tr>
<tr>
<td><strong>Meaning</strong></td>
<td>The Spear is a sacred item. There is a ceremony dedicated to the spear and the spirit that lives within it. This ceremony had never been seen in its full display by foreigners as the Mlabri fear that this would be disrespecting the spirit of the spear. It wasn't until 1987 that they performed the full ceremony in front of foreigners. Each spear was only to be handled by its owner: should anyone touch the spear the spirit would be offended. If the spirit was offended it would cause illness and accidents within the tribe as a form of retribution. To balance out any wrong doings an animal must be sacrificed to the spirits as a sign of forgiveness.</td>
</tr>
<tr>
<td><strong>Sources</strong></td>
<td>(Trier)</td>
</tr>
</tbody>
</table>
9. Liquid Nitrogen and Dry Ice

I also visited BOC Hamilton who specialise in gases and spoke to Troy Fell in regards to liquid nitrogen and dry ice. The liquid nitrogen is housed in a 4kg dewar and can also be housed in a consumer thermos. The insulating properties of the dewar or thermos (Only thermoses with no glass can be used as the glass will shatter) helps to stem the liquid nitrogen from converting into a gas. The gas produced when contained in a plastic coca-cola bottle for example will explode because the liquid nitrogen is boiling in effect and the gas produced is larger in volume than its liquid state.

My next thought was to question whether or not a small thermos-like container could be designed that housed liquid nitrogen as a cooling block. An identical thermos was cut in half in order to learn how and what insulates the contents of a thermos. Essentially the product’s architecture consists of a double wall construction that traps a pocket of air or a vacuum in some cases to increase the insulation of the contents. However the issues with liquid nitrogen are the weight and the need for it to constantly evaporate. It is a liquid with a similar weight to water which will add unwanted weight to a hunter’s pack. If it is housed and screwed tightly in a thermos (the only consumer recommended product), the gas produced by the liquid nitrogen will create pressures beyond the limits of the thermos and it will explode (BOC Consultant). Therefore the thermos lid must only be screwed on loosely to allow for evaporation. In this manner the liquid nitrogen will only last approximately three days in a fridge (BOC Consultant), but I have found it to last just that long outside the fridge as well. The other negative fact of employing liquid nitrogen is the build up of condensation around the opening of the thermos and also the lack of cooling retention on the external casing of the thermos. If a thermos is the only recommended consumer product to house liquid nitrogen then this avenue of using it as a potential application for keeping a hunter’s meat cool is not feasible.
Troy Fell of BOC Hamilton (Fell) also advised me that dry ice is kept in chilly bins and can last for weeks. I then considered whether a small container could be designed with similar housing and insulating properties to a chilly bin, providing a small cooling block. The chilly bin in Fig. 57 was insulated by a two wall cavity with a polystyrene fill. Weight as well as continuous and uncontrolled cooling may be a problem. The weight of dry ice would be undesirable for a field hunter as it also continues to evaporate but will last for days in a chilly bin like container (BOC Consultant). It housed 4kg of dry ice and lasted two days. Troy's anecdotal account was presumably based on a large chilly bin with a much greater amount of dry ice. I also found the outside of the chilly bin beginning to produce condensation, which is unwanted when storing meat.
10. The Making Process of the Kaihaukai
11. Critical Appraisal of Kaihaukai

Hunters Feedback on Cooling

The Kaihaukai is a lightweight option that intends to keep deboned meat cool for the field hunter. However prior to designing the final concept, Kaihaukai, some hunters did not identify that keeping the meat cool is a major concern while others do. Yet I would argue that hunters do not hang their meat in the open sun in the summer months and would hang the meat in the shade as a means to keep the meat cool. Also “what people say is often very different from what people do” (Hodder 158).

One hunter suggested that a backpack with a cooling section would be ideal as it would serve additional purposes while another hunter suggested a liner like concept as an option. I decided to explore the option of a liner concept because I felt the design may fall into the category of just another backpack.

Weight is a major concern to hunters so the design had to be lightweight and also compactable so it can fit easily into backpacks.

Kaihaukai Trial – 26\textsuperscript{th} September 2011 – By Robert Hutchinson

Fig. 58. Singeing a Sow

From left to right: Jamaine Fraser, Johan Bardoul and Robert Hutchinson
The hunting sojourn was in Te Urewera National Park and the attendees were Johan Bardoul, Robert Hutchinson and myself. We were in the Te Ureweras from the 25th to the 27th of September 20011. We often went separate routes when hunting and during the trial I was absent. What follows below is an account by Robert Hutchinson, the hunter who trialled the prototype.

I found during this trip the principles of the product to be sound and also highly applicable to the modern day foot hunter. I believe the success of this product lies in its simplicity. It is not cumbersome and its weight is minimal. However, I do believe that the products weight and materiality does warrant further investigation.

I see this products application within the field to be after the shooting, field dressing and initial cooling of the meat. If I was to use this product in the future on any hunting trip I would see this product as one that does not come along on the hunt nor would it have a permanent place in my day pack in its current design. Rather this product would remain at base camp to be used to protect and maintain the meat’s quality for the remaining period of the hunt. (Hutchinson).

There are some positive and critical points raised by Robert Hutchinson. The positives were:

- The Kaihaukai is simple to use.
- It is lightweight

The critical points were:

- The materiality needs further exploration
- The Kaihaukai would not be used during an actual hunt but would be used at camp.
In response to the positive points highlighted, the easy use of the product was a major aspect for me. Simple and quick use is what I wanted to achieve because hunting today commonly involves much organising and many different variables. Not to over-complicate a hunting scenario is necessary. The use of the Kaihaukai needed to be user-friendly.

The selection of materials was primarily made based on insulation capabilities, aesthetics and weight. Weight is a major concern for hunters during stages three and twelve of the Hunting Scenario Fig. 46. Ensuring that materials were as light as possible was paramount. However Robert Hutchinson believes further exploration in regards to materiality and weight is needed.

Roberts’ final point made was the Kaihaukai would not be used by him in the actual hunting excursion itself. This was the initial intention of the Kaihaukai. However, on reflection during my hunting excursions I found myself considering the same thing and made a note that I too would not take it on a field hunt but would use it back at camp. Personally I would not want to take extra gear during the actual hunt. However I would like a product to keep the meat cool during the summer months. Perhaps a product designed small enough to fit into a hunter’s pouch often found on a hunter’s belt would be an avenue worth future exploration and may be more versatile.

Robert made no reference to the design aesthetic and its intrinsic aspects. I did not mention its intangible meaning because I would want the user to learn and understand it's meaning through continual and contextual. I believe Robert did not comment about the aesthetic and intangible design meaning because he was not made aware of its significance since his epistemological understanding would not permit comprehension. The design aesthetic and meaning is inspired from a Māori designer's perspective and not everyone is expected to understand or provide critical assessment about these specific elements. As Caruana says
“the levels of interpretation of an image or design depend on the ritual knowledge of both artist (myself as designer) and viewer (Robert as user), and on an understanding of the ancestral landscape” (14), therefore Roberts perspective would probably differ from the intended meaning of the Kaihaukai. What will be beneficial in analysing this aspect is feedback from other Māori designers. A forum post was created on the Nga Aho (collective of Māori designers) website for feedback on the intangible qualities of the product. After six weeks only one comment was made. Four points were put forward by a member, all of which had been investigated and addressed prior to the comment.

**Presentation to Scion Scientists - 28th September 2011**

A presentation titled Kaihaukai was held on the 28th of September 2011 to the primary sponsors of this Masters of Design project, Scion Research. Scion Research’s expertise lay within the bio-composite materials and commercialisation. The major questions posed to the scientists in regard to the final concept idea were based primarily on objective inquiries:

1. What materials could be used for this product?
2. Is there a way to prolong the cooling effect of the endothermic reaction between urea and water?
3. Is there any other environmentally friendly endothermic chemicals that could be used in a hunting scenario?
4. How might we make the product permeable whilst retaining the cold?

Time just allowed feedback on questions one and two. What materials could be used for this product produced some great feedback. Jeremy Warnes advised me commercially recycled polypropylene has more options in comparison to raw bio-plastics. The material designed by Teigain for use by Toyota would be an ideal option for insulation. He also suggested a bladder-like concept for insulation could be an option. The bladder is flat and is then
inflated by the hunter to provide insulation to help retain the cooling effect. These options suggested would be worth future exploration and tests would be necessary to record differences in effectiveness.

The second question, is there a way to prolong the cooling effect of the endothermic reaction between urea and water? Since, when water at a temperature of 20°C in a lab ambient temperature of 21°C is added to a glass of urea prills at a ratio of 1:1 in one minute the temperature of the water decreases from 20°C to an average of 5.6°C and takes just 40 minutes to reach an average temperature of 14.6°C (see Appendix 13. Urea and Water Experiment). If we refer to Table 6 – Aging Venison it provides us with a guide. A retained temperature of 14.6°C would keep meat from deteriorating from heat for two days. However the limitation here is that the cooling temperature does not last long enough. It must be mentioned at this point that the intention of the Kaihaukai is not to act as a fridge whereby the cooling effect lasts for days. It would be ideal if the cooling effect could be extended, whereby it takes four to six hours to reach a temperature of 14.6°C. Graham West suggested doubling the insulation and also using the diluted solution of urea and water as a cooling agent through the process of evaporation. When the hunter is moving through the bush the wind generated could evaporate the urea and water solution to create a cooling effect. He was alluding to utilising everything of the concept idea.

Trevor Struthbridge suggested Peltier, a metal, used for cooling scientific instruments could be used to prolong the cooling effect. The concept idea would need electricity and perhaps a small solar panel could be attached to the package to provide the electricity. This was an ideal option, though the minimal use of electricity in the field helps to retain the simplicity of the hunting environment. Too much technology can detract from the beautiful environment of hunting in the wild. Greig Caigou quotes David Peterson
the more artifacts of techno-culture we haul into the wilds, the less relaxing, challenging, focused, adventurous, gratifying, memorable and I believe, moral, our time there will ultimately be (Caigou 76).

Greig also states himself that

*hunting is often just about simplicity; it’s essentially ‘primitive’ and part of the value lies in the contrast it provides to our cluttered everyday lives* (Caigou 79).

Trevor also highlighted that the cooling effect is quick and instant if used in the current proposed manner. Most of the endothermic reaction occurs when water is poured into the packets. We need to slow this process down in order to prolong the cooling effect. Perhaps a cloth-like material soaked in urea that possesses a crystalline. When water is added to the cloth the water is soaked up slowly and therefore prolonging the cooling effect. This option has merit and is worth future exploration. See sketch below for visual explanation.

![Fig. 59. Cloth Concept](image)

*Jamaine Fraser.*

Another option to slow down the endothermic reaction would be to have a channel-like system whereby water is added and works its way around the channels. The system would have a small screw-on lid to retain the water. As with the cloth concept this option also has merit and is worth future exploration because both theoretically could prolong the cooling effect. To what length of time this may potentially extend the reaction, is not known.

One concern for me highlighted by a person at the annual Nga Aho hui was, would the urea and water solution be of ecological concern
when it is disposed of by the hunter in the native forest once the cooling effect has ceased? I believed the combination of urea and water to be of a benefit for the native bush environment. The solution is used as a fertiliser for plants in nurseries, homes and in the agricultural sector. I investigated further and contacted Ants Robert of Ravensdown, an agricultural fertilising company that stocks urea, and he believed the small amounts of urea and water solutions used in the concept is unlikely to have much effect on the ecology of the bush environment (Roberts). His feedback would probably be based on a urea to water ratio of 50:50 (Ravensdown). As a gardener Marcus Williams stated that a highly concentrated urea and water solution can kill a plant. This statement can be supported by the ratio stipulated on the urea Egmont Commercial Limited 750g packet 8:1000 (8g to 1L) for applying to household plants over one square metre. However, Jeremy Warnes of Scion Research advised me that higher levels of nitrogen (the primary chemical in urea) are released from a carcass of an animal than in the potential amounts of urea water volumes the Kaihaukai concept.

These statements by Ants and Jeremy provide some plausibility to the idea that the use of urea and water for the Kaihaukai concept would not be of detrimental concern to the ecology of the native bush environment. The key point here is the dispersal of the urea and water solution of the Kaihaukai. Therefore a recommendation for the small plastic cooling packages from the Kaihaukai is the employment of a plastic screw lid that is designed to attach to plastic packaging as shown in Fig. 60. Ribena Squeeze.

Fig. 60. Ribena Squeeze

When the cooling effect of the water and urea solutions ceases then the hunter unscrews the lid and disposes the solution by squeezing the package allowing the solution to exit. (refer to Fig. 61). Inside the neck of the screw would be a perforated piece that would create a spray-like effect. This would minimise the impact of the direct pouring of the solution on plants would have.

![Fig. 61. Disposal Recommendation](image)

From a marketing perspective Jeremy suggested that the product could possess another feature such as a safety blanket. It could be used to keep the core of a hunters body covered and warm should the hunter find him or herself out over night in the bush. This idea is good, as it provides a safety function for hunters as safety is important to them. This idea would require minimal development of the Kaihaukai and in its current design could still serve as a safety cover should it be needed to perform as a safety blanket (see Fig. 62. Safety Cover option).

![Fig. 62. Safety Cover Option](image)
The safety option may not be applicable based on my personal reflection and Roberts's account which is, that taking the product on a hunting excursion may not be suitable in its current design. However if designed smaller it may be used for both a cooling and safety product.

In terms of the intrinsic visual design aspects of the Kaihaukai, Jeremy Warnes suggested the use of a koru design as the koru is a symbol of new life and with the death of an animal comes new life because it provides food for the hunter to eat and live.
12. Ergonomic Analysis

- Loading and weight distribution for hiking

What needs to be achieved when considering the distribution of weight for carrying meat is balance. Balancing the weight horizontally and vertically is critical to maintaining a stable footing and minimising the potential for injury. Additionally, the extra weight must be close to the body to minimise torque forces that need counteracting by the users back muscles.

When hiking and using either an external frame back-pack system or an internal frame system there are two main types of terrain, flat and steep. Outdoor Action (Outdoor Action) advises that there are two different methods for distributing the weight for each terrain. For an Internal frame system on flat terrain, heavy items should be stored relatively higher and close to the frame/back. In steep country, the weight should be stored lower in the pack and close to the back to ensure the centre of gravity is lower to the ground thus providing better balance (see Fig. 63).

Men usually have a higher centre of gravity compared to women. Therefore, heavier weight should be stored lower in the back for women in comparison to men. This is the case for packing for steep terrain.

Based on the analyses from Outdoor Action, we can conclude that the weight must be close to the body and balanced so to maintain stability and comfort. Furthermore, Holewun and Lotens advise the
best positions for extra weight and volume to be distributed around the human body with the least amount of impact on the physical performance of the carrier is the back, chest and the waist (Holewun and Lotens). Based on these premises we can conclude that extra weight distribution should be balanced and close to the body. Weight at the posterior balanced by weight at the anterior and weight at the right hand side balanced by the weight on the left hand side would be most beneficial physiologically.

- **Carrying Methods**

This study is concerned with the carrying of deboned meat not the entire or parts of the carcass. However analysing different carrying methods may provide some insights.
<table>
<thead>
<tr>
<th>Fig. 64. Whole Carcass Carrying Methods</th>
</tr>
</thead>
</table>
Image (a) shows a simple two part strap product system for carrying a deer carcass horizontally. The hind legs and front legs are tied together with a shoulder leather strap creating a back-pack like concept. A hind and front leg are in front and the remainder of the carcass is found at the back. The next image (b) is also a horizontal carrying system. The entire carcass is found at the rear and is held in place by a single large piece of nylon material. Both (a) and (b) methods are ideal for steep terrain as the distribution lowers the centre of gravity. Image (c) is also a horizontal carrying system however the carcass is carried across the shoulders whereas the previous horizontal methods the carcass is suspended from the shoulders. This method would be ideal for flat terrain but not ideal for steep terrain (Outdoor Action). Image (d) is a carrying method known as the ‘pikau’ (bag) method (On Target). This method is a vertical carrying system. The left hand side hind leg and front leg are tied together, likewise with the right hand side, with either rope or with the limbs themselves. The hunter can shoulder the animal like a back-pack. This method ensures the weight of the carcass is positioned between the shoulder blades. The next image (e) is a suspension carrying method that uses two people under either end of a study post or branch. This method serves well to balance the weight and even out the workload. The Lastenkraxe carrying frame, image (f), is a new product titled for carrying difficult objects one of which is an animal carcass. The frame is made of aluminium and ideal for carrying loads up to 50kg.

All methods, except image (e) keep the extra weight and volume of the animal close to the body but vary in position vertically. Images a,b,c,d,f all show an unbalanced load and image (e) is a relatively balanced concept.
Fig. 65. Ergonomic Transport Analysis
Figure 65 illustrates the weight distribution of the different carcass carrying methods. Numbers 1 and 2 show that the transporters torso is bent forward to compensate for the weight of the carcass. This is because the weight of the carcass is distant from the transporters centre of gravity. Numbers 3 and 4 show that these methods show smaller compensation leans than 1 and 2. However number 4 has a slightly greater degree of lean than number 3. Number three would be the most comfortable transporting method of extra weight.
13. Urea and Water Experiment

Place of Experiment: Scion Research Rotorua Laboratory
Date: June 10, 2011
Time: 10.00am

Researchers/Authors:
Dr. Julia Charity (Scion Research – Rotorua)
Jamaine Fraser (Master of Design Student)

Aim:
To find and validate the most effective ratio (saturation point) to sustain the cooling effect produced by the endothermic reaction between water and urea prills.

Variables:
- Water (20°C)
- Urea Prills (Egmont Commercial Limited 750g packet)
- Aaxis Instant Cool Pack (Medium)
- Ambient Temperature

Experiment Description:
Two experiments were carried out for comparative and validation purposes.

- Test One
  Four solutions with different ratios were made in glass jars. The water volume was kept uniform for all four samples. The water was first added to the jars and the temperature was taken prior to adding the urea with mercury thermometers.

<table>
<thead>
<tr>
<th>WATER (20°C)</th>
<th>UREA</th>
<th>RATIO</th>
</tr>
</thead>
<tbody>
<tr>
<td>80mls</td>
<td>80g</td>
<td>1:1</td>
</tr>
<tr>
<td>Control 1: (Aaxis Instant Cool Pack (Medium))</td>
<td></td>
<td></td>
</tr>
<tr>
<td>80mls</td>
<td>80g</td>
<td>1:1</td>
</tr>
<tr>
<td>Control 2: (Egmont Commercial Limited)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>80mls</td>
<td>120g</td>
<td>1:1.5</td>
</tr>
<tr>
<td>Sample 1: (Egmont Commercial Limited)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>80mls</td>
<td>160g</td>
<td>1:2</td>
</tr>
<tr>
<td>Sample 2: (Egmont Commercial Limited)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Temperature readings were taken with mercury thermometers at varying intervals. They were taken at 0, 1, 10, 20, 30, 40, 50, 60, 90, 120 minutes with timers and a watch. The jars were swirled after the urea was added to the jars for approximately 20 seconds.

- Test Two
  This test was identical to Test 1, however the Control 1 was absent.
### Table 7 - Urea and Water Endothermic Experiments

<table>
<thead>
<tr>
<th>Time (Mins)</th>
<th>Control 1 1:1</th>
<th>Control 2 1:1</th>
<th>Sample 1 1:1.5</th>
<th>Sample 2 1:2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Test 1</td>
<td>Test 1</td>
<td>Test 2</td>
<td>Test 1</td>
</tr>
<tr>
<td>0</td>
<td>20°C</td>
<td>20°C</td>
<td>20°C</td>
<td>20°C</td>
</tr>
<tr>
<td>1</td>
<td>7°C</td>
<td>6°C</td>
<td>4°C</td>
<td>5.5°C</td>
</tr>
<tr>
<td>5</td>
<td>5°C</td>
<td>7°C</td>
<td>5°C</td>
<td>6.5°C</td>
</tr>
<tr>
<td>10</td>
<td>8°C</td>
<td>10°C</td>
<td>7°C</td>
<td>8°C</td>
</tr>
<tr>
<td>20</td>
<td>10°C</td>
<td>12°C</td>
<td>10°C</td>
<td>11°C</td>
</tr>
<tr>
<td>30</td>
<td>13°C</td>
<td>14°C</td>
<td>12.5°C</td>
<td>13°C</td>
</tr>
<tr>
<td>40</td>
<td>15°C</td>
<td>15°C</td>
<td>14°C</td>
<td>14°C</td>
</tr>
<tr>
<td>50</td>
<td>16°C</td>
<td>16.5°C</td>
<td>14°C</td>
<td>15°C</td>
</tr>
<tr>
<td>60</td>
<td>17°C</td>
<td>17.5°C</td>
<td>15.5°C</td>
<td>16°C</td>
</tr>
<tr>
<td>90</td>
<td>18°C</td>
<td>19°C</td>
<td>18°C</td>
<td>19°C</td>
</tr>
<tr>
<td>120</td>
<td>20°C</td>
<td>20°C</td>
<td>20°C</td>
<td>20°C</td>
</tr>
</tbody>
</table>

**Observational Notes:**
- Photographs were taken at the 5min and 60 minute readings for visual dissolution reference.
- Both authors took visual temperature readings at most time intervals. At times only one person recorded temperature readings.
14. Water Storage Crystals and Urea Prills Experiments 1

Place of Experiment Date: Time:
19 Earlswood Avenue May 09, 2012 14.30am
Hamilton

Researchers/Authors:
Jamaine Fraser (Master of Design Student)

Aim:
To determine and validate the most effect ratio (saturation point) to sustain the cooling effect produced by the endothermic reaction between water, urea prills and polyacrylamide

Variables:
- Tap Water (20°C)
- Urea Prills (Egmont Commercial Limited 750g packet) (UP)
- Water Storage Crystals (Yates 85g container) (WSC)

Experiment Description:
Two experiments were carried out for comparative and validation purposes.

- Test One and Test Two
  Four different ratios were measured. 25g of WSC’s were put into 3750ml (as per Yates label) of tap water and left for 20 minutes to change their state from crystal to jelly. The WSC jelly weight was kept uniform for all four samples. 100g of WSC jelly was first added to the jars and the temperature was taken prior to adding the urea with mercury thermometers. The urea prills were then added. After this step the WSC jelly and urea prills were mixed thoroughly with a teaspoon until the urea prills were evenly distributed amongst the WSC jelly.

| Table 8 - Water Crystal and Urea Prill Ratios 1 |
|-----------------|-----------------|-----|
|                | WSC Jelly (g)   | Urea Prills (g) | Ratio |
| Control        | 200             | 200             | 1:1   |
| Sample 1       | 200             | 100             | 1:0.75 |
| Sample 2       | 200             | 150             | 1:0.50 |
| Sample 3       | 200             | 50              | 1:0.25 |

Temperature readings were taken with mercury thermometers at varying intervals. They were taken at 0, 1, 10, 20, 30, 40, 50 and so on at continuing 10 minute intervals until 150 minutes.
<table>
<thead>
<tr>
<th>Time (Mins)</th>
<th>Control 1 200g-200g 1:1</th>
<th>Sample 1 200g-150g 1:0.75</th>
<th>Sample 2 200g-100g 1:0.5</th>
<th>Sample 3 200g-50g 1:0.25</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Test 1</td>
<td>Test 2</td>
<td>Test 1</td>
<td>Test 2</td>
</tr>
<tr>
<td>0</td>
<td>21°C</td>
<td>21°C</td>
<td>21°C</td>
<td>20°C</td>
</tr>
<tr>
<td>1</td>
<td>10°C</td>
<td>10°C</td>
<td>10°C</td>
<td>9°C</td>
</tr>
<tr>
<td>5</td>
<td>6°C</td>
<td>5°C</td>
<td>6°C</td>
<td>6°C</td>
</tr>
<tr>
<td>10</td>
<td>4°C</td>
<td>4°C</td>
<td>5°C</td>
<td>5°C</td>
</tr>
<tr>
<td>20</td>
<td>4°C</td>
<td>3°C</td>
<td>5°C</td>
<td>5°C</td>
</tr>
<tr>
<td>30</td>
<td>4°C</td>
<td>4°C</td>
<td>6°C</td>
<td>6°C</td>
</tr>
<tr>
<td>40</td>
<td>6°C</td>
<td>5°C</td>
<td>7°C</td>
<td>7°C</td>
</tr>
<tr>
<td>50</td>
<td>6°C</td>
<td>6°C</td>
<td>8°C</td>
<td>8°C</td>
</tr>
<tr>
<td>60</td>
<td>8°C</td>
<td>8°C</td>
<td>9°C</td>
<td>10°C</td>
</tr>
<tr>
<td>70</td>
<td>9°C</td>
<td>9°C</td>
<td>10°C</td>
<td>11°C</td>
</tr>
<tr>
<td>80</td>
<td>10°C</td>
<td>10°C</td>
<td>11°C</td>
<td>12°C</td>
</tr>
<tr>
<td>90</td>
<td>10°C</td>
<td>11°C</td>
<td>12°C</td>
<td>13°C</td>
</tr>
<tr>
<td>100</td>
<td>11°C</td>
<td>12°C</td>
<td>13°C</td>
<td>14°C</td>
</tr>
<tr>
<td>110</td>
<td>12°C</td>
<td>13°C</td>
<td>14°C</td>
<td>15°C</td>
</tr>
<tr>
<td>120</td>
<td>13°C</td>
<td>14°C</td>
<td>14°C</td>
<td>16°C</td>
</tr>
<tr>
<td>130</td>
<td>13°C</td>
<td>14°C</td>
<td>15°C</td>
<td>16°C</td>
</tr>
<tr>
<td>140</td>
<td>14°C</td>
<td>15°C</td>
<td>16°C</td>
<td>17°C</td>
</tr>
<tr>
<td>150</td>
<td>14°C</td>
<td>16°C</td>
<td>17°C</td>
<td>18°C</td>
</tr>
</tbody>
</table>

**Observational Notes:**
- Time was recorded with a wrist watch stop-watch setting.
- Only Jamaine Fraser read visual temperature readings at time intervals.
15. Water Storage Crystals and Urea Prills Experiments 2

**Place of Experiment**: 19 Earlswood Avenue
**Date**: May 16, 2012
**Time**: 9.30am

**Researchers/Authors**: Jamaine Fraser (Master of Design Student)

**Aim**:
1. To determine if adding water last to a combination of urea prills and polyacrylamide crystals produces prolonged endothermic results as Polyacrylamide and Urea Experiments 2.
2. To determine an ideal ratio.

**Variables**:
- Tap Water (14°C)
- Urea Prills (Egmont Commercial Limited 750g packet) (UP)
- Water Storage Crystals (Yates 85g container) (WSC)

**Experiment Description**:
Two experiments were carried out for comparative and validation purposes.

- **Test One and Test Two**
  Four different ratios were measured. The WSC were measured to 5g and the water was measured to 100ml. The altering variable is the UP (see below table).

  The WSC and UP were added first to the vessels. And then the water was added last. The mixture was then stirred using a teaspoon 5 times clockwise. Then the thermometers were placed inside the vessels and the temperature readings were recorded.

<table>
<thead>
<tr>
<th>WSC Crystals (g)</th>
<th>Tap Water (ml)</th>
<th>Urea Prills (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>5</td>
<td>200</td>
</tr>
<tr>
<td>Sample 1</td>
<td>5</td>
<td>200</td>
</tr>
<tr>
<td>Sample 2</td>
<td>5</td>
<td>200</td>
</tr>
<tr>
<td>Sample 3</td>
<td>5</td>
<td>200</td>
</tr>
</tbody>
</table>

Temperature readings were taken with mercury thermometers at varying intervals. They were taken at 0, 1, 10, 20, 30, 40, 50 and so on at continuing 10 minute intervals until 150 minutes.
<table>
<thead>
<tr>
<th>Time (Mins)</th>
<th>Control 1 5:200:100</th>
<th>Sample 1 5:200:50</th>
<th>Sample 2 5:200:150</th>
<th>Sample 3 5:200:200</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Test 1</td>
<td>Test 1</td>
<td>Test 2</td>
<td>Test 1</td>
</tr>
<tr>
<td>0</td>
<td>17°C18</td>
<td>17°C</td>
<td>18°C</td>
<td>16°C</td>
</tr>
<tr>
<td>1</td>
<td>13°C17</td>
<td>16°C</td>
<td>18°C</td>
<td>7°C</td>
</tr>
<tr>
<td>5</td>
<td>12°C12</td>
<td>15°C</td>
<td>16°C</td>
<td>4°C</td>
</tr>
<tr>
<td>10</td>
<td>10°C10</td>
<td>14°C</td>
<td>15°C</td>
<td>2°C</td>
</tr>
<tr>
<td>20</td>
<td>8°C9</td>
<td>12°C</td>
<td>14°C</td>
<td>2°C</td>
</tr>
<tr>
<td>30</td>
<td>8°C9</td>
<td>12°C</td>
<td>14°C</td>
<td>3°C</td>
</tr>
<tr>
<td>40</td>
<td>9°C10</td>
<td>12°C</td>
<td>14°C</td>
<td>4°C</td>
</tr>
<tr>
<td>50</td>
<td>9°C10</td>
<td>13°C</td>
<td>14°C</td>
<td>5°C</td>
</tr>
<tr>
<td>60</td>
<td>10°C11</td>
<td>13°C</td>
<td>14°C</td>
<td>6°C</td>
</tr>
<tr>
<td>70</td>
<td>11°C11</td>
<td>14°C</td>
<td>14°C</td>
<td>8°C</td>
</tr>
<tr>
<td>80</td>
<td>11°C11</td>
<td>14°C</td>
<td>14°C</td>
<td>8°C</td>
</tr>
<tr>
<td>90</td>
<td>12°C12</td>
<td>14°C</td>
<td>15°C</td>
<td>9°C</td>
</tr>
<tr>
<td>100</td>
<td>12°C12</td>
<td>15°C</td>
<td>15°C</td>
<td>10°C</td>
</tr>
<tr>
<td>110</td>
<td>13°C13</td>
<td>15°C</td>
<td>15°C</td>
<td>10°C</td>
</tr>
<tr>
<td>120</td>
<td>13°C13</td>
<td>16°C</td>
<td>16°C</td>
<td>11°C</td>
</tr>
<tr>
<td>130</td>
<td>14°C13</td>
<td>16°C</td>
<td>16°C</td>
<td>12°C</td>
</tr>
<tr>
<td>140</td>
<td>14°C14</td>
<td>16°C</td>
<td>16°C</td>
<td>12°C</td>
</tr>
<tr>
<td>150</td>
<td>14°C14</td>
<td>16°C</td>
<td>16°C</td>
<td>12°C</td>
</tr>
</tbody>
</table>
Observational Notes:

- Photographs
- Time was recorded with a wrist watch stop-watch setting, mobile phone stop-watch and internet website stop-watch.
- Only Jamaine Fraser read visual temperature readings at time intervals.
- There was an obvious separation between the WSC jelly and UP. The UP settled at the bottom and the WSC jelly rose above the UP. However, the separation was not complete. WSC jelly was still amongst the UP. It appeared the UP were encased in a block-like jelly. The UP did not seem to dissolve rapidly. An ideal situation when the aim is to prolong the endothermic reaction.
- In test 1 control 1 and sample 1 thermometers were not submerged in the combination mixture. The bulb of the thermometers were submerged only in the top layer which was the PC jelly only. However, there was still some effective endothermic reaction occurring. This unfortunate situation would no doubt produce inconclusive results.
- TEST 2: In addition to stirring the mixture of WSC, UP and water, for this test, the UP and WSC were added to the vessels and mixed through before the water was added.