Copyright Statement

The digital copy of this thesis is protected by the Copyright Act 1994 (New Zealand). This thesis may be consulted by you, provided you comply with the provisions of the Act and the following conditions of use:

- Any use you make of these documents or images must be for research or private study purposes only, and you may not make them available to any other person.

- Authors control the copyright of their thesis. You will recognise the author's right to be identified as the author of this thesis, and due acknowledgement will be made to the author where appropriate.

- You will obtain the author's permission before publishing any material from their thesis.

To request permissions please use the Feedback form on our webpage. [http://researchspace.auckland.ac.nz/feedback](http://researchspace.auckland.ac.nz/feedback)

General copyright and disclaimer

In addition to the above conditions, authors give their consent for the digital copy of their work to be used subject to the conditions specified on the Library Thesis Consent Form.
The Function, Design and Distribution of New Zealand Adzes

Marianne Teresa Turner

A thesis submitted in partial fulfilment of the requirements for the degree of

Doctor of Philosophy in
Anthropology

University of Auckland

2006
ABSTRACT

The main objective of this thesis was to understand the function, design and distribution of New Zealand adzes, aspects little studied in Polynesia as a whole. Methodology involved functional and manufacturing replication experiments and comparisons of these results with statistics derived from the analysis of almost 12,000 archaeological adzes. Methodology was guided by technological organization theory which states that technological strategies reflect human behaviours and that artefacts like adzes are physical manifestations of the strategies employed by people to overcome problems posed by environmental and resource conditions.

Variability in adze morphology was discovered to be the outcome of ongoing technological adjustments to a range of conditions that were constrained by a set of functionally defined parameters. The nature of the raw material, both for the adzes themselves and to make them, had a major influence on adze technology and morphology within these functional parameters. Four basic functional adze types were identified from distinct and consistent combinations of design attributes not previously recognized explicitly in previous adze typologies. It was found that design attributes previously considered significant like cross-section shape and butt reduction were more heavily influenced by raw material quality than functional specifications.

It was also important to recognize that form and function changed over time with use, and because adzes were so valuable due to manufacturing costs, they were intensively curated. The majority of archaeological specimens studied for this thesis had seen major morphological and functional change. This dynamic was included in a typology based on ‘adze state’ as findings suggested (1) that extending adze use-life and optimizing reworking potential was incorporated in initial design strategies, (2) that intensive curation may have played a major role in changes in adze morphology over time, and (3) that it had a major influence on distribution and discard patterns in the archaeological record.

Having identified these influences on adze discard and distribution, two complex production and distribution networks were observed for the North Island based around Tahanga basalt and Nelson/Marlborough argillite. Each was complimentary to the other and involved other major and minor products and materials. Influential factors in the roles different settlements played in distribution included where people and raw materials were in relation to one another and the mode of transportation. The coastal location of early period settlements and important stone sources was an important aspect of these networks.
ACKNOWLEDGEMENTS

I would like to thank the following people for their assistance, support, hospitality, patience and fortitude during the compilation of this thesis:

The staff and or/custodians of the museum and private collections listed in Appendix B, and those others who provided assistance during data collection. Special thanks to Kath Prickett, Jim Eyles, Pat Stodart, Murray Thacker, Eric Wagener, Karl Gillies, Wynne Spring-Rice and Wiremu Puke.

The Staff of the Department of Anthropology, University of Auckland. Special thanks to my supervisors, Peter Sheppard and Geoff Irwin, and to Rod Wallace, Dorothy Brown, Joan Lawrence and Hamish MacDonald.

Much appreciation to Moira Jackson for the maps.

Others include Lorna Scurr, Paul Purkis, Tore Kronqvist, Michael Taylor, Bev Parslow, Clem Mellick and Rod Clough.

My family – Pat and Bill Turner and Matthew Turner-Horide.

Dante Bonica – without his invaluable contribution this project would not have been possible.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Chapter One</th>
<th>Introduction</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapter Two</td>
<td>Method and Theory</td>
<td>12</td>
</tr>
<tr>
<td>Chapter Three</td>
<td>Function and Design</td>
<td>79</td>
</tr>
<tr>
<td>Chapter Four</td>
<td>Use-Life</td>
<td>231</td>
</tr>
<tr>
<td>Chapter Five</td>
<td>Context and Distribution</td>
<td>304</td>
</tr>
<tr>
<td>Chapter Six</td>
<td>Trade and Exchange</td>
<td>405</td>
</tr>
<tr>
<td>Chapter Seven</td>
<td>Conclusion</td>
<td>452</td>
</tr>
<tr>
<td>Appendix A</td>
<td>Flake Assemblages referred to in this Thesis</td>
<td>462</td>
</tr>
<tr>
<td>Appendix B</td>
<td>Location of Adze Assemblages used in the Data</td>
<td>464</td>
</tr>
<tr>
<td>Appendix C</td>
<td>List of Known New Zealand Side-Hafted Adzes</td>
<td>467</td>
</tr>
<tr>
<td>Appendix D</td>
<td>New Zealand Adze Caches</td>
<td>471</td>
</tr>
<tr>
<td>Appendix E</td>
<td>Details on Adze Figures in Chapter Three and Four</td>
<td>480</td>
</tr>
<tr>
<td>Appendix F</td>
<td>New Zealand Adzes recorded with Lugs</td>
<td>489</td>
</tr>
<tr>
<td>Bibliography</td>
<td></td>
<td>492</td>
</tr>
</tbody>
</table>
TABLE OF FIGURES

2.1 Adze Model .................................................................................................................. 14
2.2 Map showing Locations of Adze Stone Sources .............................................................. 40
2.3 Map showing Motutapu Island and Distribution of Stone Sources ................................. 44
2.4 Features of Adzes and Hafts .......................................................................................... 60
3.1 Experimental Type 1 and Type 2 Adzes .......................................................................... 85
3.2 Experimental Type 4 Adzes .......................................................................................... 86
3.3 Experimental Type 3 and Type 5 Adzes .......................................................................... 87
3.4 Photograph of Kauri Log used in Functional Experiment ............................................... 89
3.5 Photograph of Hafted Experimental Type 1 Adzes ............................................................ 89
3.6 Photograph showing Transverse Scarfs made by Type 4 Adze ........................................ 94
3.7 Photograph of Type 4 Adze being Used .......................................................................... 95
3.8 Photograph of Wood Shavings made by Type 4 Adze .................................................... 95
3.9 Photograph of Type 1 Adze being Used ......................................................................... 96
3.10 Photograph of Type 1 Adze splitting out wood between Scarfs .................................... 96
3.11 Photograph of Wood Chunks split out by Type 1 Adze .................................................. 97
3.12 Photograph of Type 1 Adze cleaning down Rough Surface ......................................... 98
3.13 Photograph of Kumete being used to Dye Flax Fibre .................................................... 98
3.14 Photograph of Smaller Type 1 Adze cleaning Surface .................................................. 99
3.15 Photograph of Type 2 Adze trimming Surface ............................................................... 100
3.16 Photograph of Type 2 Adze trimming Surface ............................................................... 100
3.17 Photograph of Type 5 Adze trimming Outer Surface .................................................. 101
3.18 Photograph of Kumete prior to Hollowing Out ............................................................. 101
3.19 Photograph of 4B Adze making V-Shaped Groove ....................................................... 102
3.20 Photograph of 4B Adze making V-Shaped Groove ....................................................... 102
3.21 Photograph of V-Shaped Groove at Point where Type 5 Adzes needed ....................... 107
3.22 Photograph of Type 5 Adze Hafted ............................................................................... 107
3.23 Photograph of Type 5 Adze being used in Hollowing Out ............................................ 108
3.24 Photograph of Type 3 Adze being Used ........................................................................ 109
3.25 Photograph of Type 3 Adze being Used ........................................................................ 109
3.26 Photograph of Finished Kumete ................................................................................... 110
3.27 Photograph of Wood Shavings from Steel, Pounamu and Ohana Argillite Adzes .......... 111
3.28 Type 1 Primary Adzes .................................................................................................. 133
3.29 Southland 1D Adzes .................................................................................................... 134
3.30 Southland Type 1 Adzes .............................................................................................. 135
3.31 Lugged Type 1 Adzes .................................................................................................. 136
3.32 Photograph of Basalt Lugged Adze from Ellesmere Spit, Canterbury ............................ 137
3.33 Southland Type 1 Adzes .............................................................................................. 138
3.34 Type 1 Primary Preforms ............................................................................................. 139
3.35 Tahanga Basalt Type 1 Primary Adzes ......................................................................... 140
3.36 Tahanga Basalt Type 1 Primary Adzes ......................................................................... 140
3.37 Southland Tanged Type 2 Adzes ................................................................................... 142
3.38 Photograph of Finely Flaked D'Urville Island Argillite Type 1 Preform ......................... 143
3.39 Primary Type 2 Adzes (Duff 2A) .................................................................................. 156
3.40 Primary Type 2 Adzes (Duff 2C) ................................................. 157
3.41 Tropical East Polynesian Adzes .................................................. 158
3.42 Chin-Ridge Type 2 Adzes .............................................................. 159
3.43 Large Type 2 Adzes ................................................................... 160
3.44 Large Type 2 Adzes ................................................................... 161
3.45 Very Large Type 2 Adzes .............................................................. 162
3.46 Large Southland Type 2 Adzes ...................................................... 163
3.47 Tropical East Polynesian Adzes ...................................................... 170
3.48 Primary Type 3 Adzes .................................................................. 171
3.49 Primary Type 3 Adzes and Preforms ............................................. 172
3.50 Primary Type 3 Adzes .................................................................. 173
3.51 Southland Type 3 Adzes ............................................................... 174
3.52 Large Primary Type 4 Adzes .......................................................... 181
3.53 Large Primary Type 4 Adzes .......................................................... 182
3.54 Large Primary Type 4 Adzes .......................................................... 183
3.55 Large Type 4 Adzes ..................................................................... 184
3.56 Large Primary Type 6 Adzes and Preforms .................................... 185
3.57 Type 5 Adzes .............................................................................. 191
3.58 Type 5 Preforms from the Big River Cache ................................. 192
3.59 Type 5 Adzes .............................................................................. 193
3.60 Tahanga Basalt Adzes from Bowentown, Tauranga Harbour Mouth ...................................................................................... 204
3.61 Adzes from Wairau Bar ................................................................. 205
3.62 Adzes from Waitaki River Mouth .................................................... 206
3.63 Adzes from Waitaki River Mouth .................................................... 207
4.1 Experimental Reworked Adzes ....................................................... 243
4.2 Experimental Reworked Adzes ....................................................... 244
4.3 Photograph of Whiritoa Cache 2 ..................................................... 245
4.4 Photograph of Notched Far North Adzes with Well Used and Damaged Blades ................................................................. 245
4.5 Repaired and Modified Type 1 Adzes .............................................. 248
4.6 Adzes with Badly Damaged Blades ............................................... 249
4.7 Modified Type 1 Adzes ................................................................. 252
4.8 Modified Type 2 Adzes showing Side Reduction ............................ 253
4.9 Modified Type 1 Adzes ................................................................. 254
4.10 Modified Large Type 2 Adzes ....................................................... 255
4.11 Modified and Damaged Type 4 Adzes .......................................... 256
4.12 Modified and Reworked Type 3 Adzes ......................................... 257
4.13 Modified Type 3 and Type 5 Adzes .............................................. 258
4.14 Reworked Type 1 Adzes ............................................................... 269
4.15 Reworked Type 1 Adzes ............................................................... 270
4.16 Reworked Quadrangular Adzes ..................................................... 271
4.17 Reworked Type 2 Adzes ............................................................... 281
4.18 Reworked Type 1B Adzes ............................................................. 282
4.19 Reworked Type 2 and Small Flake Adzes .................................... 283
4.20 Primary and Reworked Type 2B Adzes ........................................ 284
4.21 Reworked Type 3 Adzes ............................................................... 287
4.22 Reworked Type 4 Adzes ................................................................. 288
4.23 Chisels and Gouges .................................................................. 289
5.1 Map of New Zealand showing Major Regions ............................. 311
5.2 Map of Southern New Zealand .................................................. 312
5.3 Map showing Far North Locations .............................................. 337
5.4 Map showing Mid North Locations ............................................. 348
5.5 Map showing Auckland and Hauraki Gulf Locations.................... 353
5.6 Map showing Hauraki Plains and Coromandel Locations .............. 362
5.7 Map showing West Bay of Plenty, Waikato and Central Plateau Locations .......................... 369
5.8 Map showing East Bay of Plenty, East Cape and Hawke Bay Locations .................................. 370
5.9 Map showing Wairarapa, Taranaki, South West Coast and Cook Strait Locations .......... 378
5.10 Map showing Nelson/Marlborough and Canterbury Locations ....... 390
5.11 Map showing Distribution of Early Settlements and Dated Sites for North Island .......... 399
6.1 Map showing Adze Production Zones, Exchange Networks, Serpentine Pendant Distribution and Obsidian and Chert Source Distribution ........................................ 422
6.2 Fall-Off Curves for Tahanga Basalt and Nelson/Marlborough Argillite based on Distance. 445
6.3 Fall-Off Curves for Tahanga Basalt and Nelson/Marlborough Argillite based on Water-travel Distance .......................................................... 446
LIST OF TABLES

2.1 Relative Costs of Raw Material Quality and Manufacture and Functional Benefits… 58
3.1 Experimental Adzes used in the Function Test..................................................... 88
3.2 Functional Adze Type Frequencies for the South and North Islands.......................... 213
3.3 Functional Type by Stone Type for North Island Adzes......................................... 214
3.4 Functional Type by Stone Type for South Island Adzes......................................... 215
3.5 Length for Primary Adzes by Function and Stone Type.......................................... 216
3.6 Blade Width for Primary Adzes by Function and Stone Type.................................... 217
3.7 Maximum Thickness for Primary Adzes by Function and Stone Type......................... 218
3.8 Weight for Primary Adzes by Function and Stone Type.......................................... 219
3.9 Edge Angle for Primary Adzes by Function and Stone Type.................................... 220
3.10 Length Frequencies by Function and Stone Type.................................................. 221
3.11 Side Orientation for Four-sided Adzes by Stone Type................................. 222
3.12 Blade Width relative to Body Width................................................................ 223
3.13 Profiles for Primary Adzes and Preforms.............................................................. 224
3.14 Blade Curvature for Primary Adzes.................................................................... 225
3.15 Chins and Hollow-ground Bevels for Primary Adzes............................................. 226
3.16 Butt Modification for Primary Adzes.................................................................... 227
3.17 Flaking Quality for Primary Adzes......................................................................... 228
3.18 Hammeredressing for Primary Adzes..................................................................... 229
3.19 Grinding for Primary Adzes.................................................................................... 230
4.1 Adze States............................................................................................................ 238
4.2 Functional Adze Types for North Island and South Island Assemblages and Caches........ 239
4.3 State by Functional Type for North Island Adzes...................................................... 240
4.4 Length Data for Complete North Island Finished Adzes by State............................. 297
4.5 Blade Width Data for Complete North Island Finished Adzes by State....................... 297
4.6 Thickness Data for Complete North Island Primary Adzes........................................ 298
4.7 Weight Data for Complete North Island Finished Adzes.......................................... 298
4.8 Edge Angle Data for Complete North Island Finished Adzes..................................... 299
4.9 Blade Condition for Complete North Island Adzes.................................................. 299
4.10 Blade Symmetry for Undamaged Adze Blades only.................................................. 299
4.11 Changes in Type 1 Adzes through the Use-Life Sequence........................................ 300
4.12 Blade Condition on Broken Bevel Portions............................................................. 300
4.13 North Island Broken Adzes...................................................................................... 301
4.14 Reworked Rectangular and Quadrangular Adzes and Preforms............................... 301
4.15 State by Stone Type for North Island Adzes............................................................ 302
4.16 Reworked 2B Adze Length by Stone Type............................................................. 303
4.17 Far North Nelson/Marlborough Argillite Adzes....................................................... 303
5.1 Early Period Sites, Assemblages and Dates............................................................. 392
5.2 Late Period Sites, Assemblages and Dates............................................................... 394
5.3 Adze State and Functional Type by Region/Area...................................................... 395
5.4 Stone Type by Region/Area..................................................................................... 396
6.1 Adze Production Estimates....................................................................................... 427
6.2 Breakdown of Early Types for Finished Adzes and Primary Preforms....................... 428

VIII