TECHNIQUE AND PRACTICE

Shell-working in the Western Pacific and Island Southeast Asia

KATHERINE ANNE SZABÓ

Volume 2: Tables and Figures
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<table>
<thead>
<tr>
<th>Lab. code</th>
<th>Material</th>
<th>Test pit</th>
<th>Spat</th>
<th>Age bp</th>
<th>Calibrated age*</th>
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<td>Wk 7561</td>
<td>Charcoal (AMS)</td>
<td>1</td>
<td>6</td>
<td>3035 ± 45</td>
<td>3360 (3320, 3320, 3250, 3220, 3220) 3080</td>
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<td>Wk 7563</td>
<td>Charcoal (AMS)</td>
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<td>9</td>
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<td>3380 (3330, 3290, 3270) 3080</td>
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<td>Shell</td>
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<td>6</td>
<td>3260 ± 45</td>
<td>3210 (3080) 2950</td>
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<td>1</td>
<td>11</td>
<td>2765 ± 50</td>
<td>2960 (2850) 2760</td>
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**Table 5.1**


*Calibrated ages given at 2 sigma. Shell dates are $^{13}$C corrected and calibrated using Calib 4.1.2 (Stuiver and Reimer 1993) using the atmospheric decadal data set for charcoal samples and the marine calibration data for shell samples. A laboratory multiplier value of K=1.0 was used.
<table>
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<td>Cut</td>
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<tr>
<td>G</td>
<td>Ground</td>
</tr>
<tr>
<td>A</td>
<td>Abraded</td>
</tr>
<tr>
<td>P</td>
<td>Direct percussion</td>
</tr>
<tr>
<td>I/P</td>
<td>Indirect percussion / Pressure flaking</td>
</tr>
<tr>
<td>D</td>
<td>Drilled</td>
</tr>
<tr>
<td>S</td>
<td>Scratched</td>
</tr>
<tr>
<td>In</td>
<td>Incised</td>
</tr>
<tr>
<td>Co</td>
<td>Coating (resin or hematite)</td>
</tr>
<tr>
<td>W/S</td>
<td>Wedged and split</td>
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<tr>
<td>N</td>
<td>Natural (modification not cultural)</td>
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<tr>
<td>ME</td>
<td>Breakage for meat extraction</td>
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<tr>
<td>U</td>
<td>Unclear</td>
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**Table 5.2**

Table outlining codes used within appendices related to shell-working and their meaning.
<table>
<thead>
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<th>FAMILY</th>
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<td>Haliotidae</td>
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<td>Turbinidae</td>
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<td><em>Tridacna squamosa</em></td>
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<td>Nautilidae</td>
<td><em>Nautilus cf. pompilius</em></td>
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Table 5.3

Species utilised for working at Kamgot (ERA), Babase Island, New Ireland, Papua New Guinea. Asterisks represent a single occurrence only.
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<td>I-5747</td>
<td>Charcoal</td>
<td>WV-26</td>
<td>2955±95</td>
<td>2966-3214 (0.922) 3220-3245 (0.078)</td>
<td>2871-2912 (0.041) 2916-3355 (0.959)</td>
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<tr>
<td>I-5748</td>
<td>Charcoal</td>
<td>W 35-36</td>
<td>2775±100</td>
<td>2769-2972 (0.965) 2978-2989 (0.035)</td>
<td>2739-3163 (0.989) 3186-3206 (0.011)</td>
</tr>
<tr>
<td>ANU-6477</td>
<td>Charcoal</td>
<td>T-40</td>
<td>2730±120</td>
<td>2739-2998 (1.000)</td>
<td>2471-2478 (0.002) 2487-2671 (0.088) 2704-3171 (0.897) 3177-3209 (0.013)</td>
</tr>
<tr>
<td>ANU-6476</td>
<td>Charcoal</td>
<td>U-40</td>
<td>2850±130</td>
<td>2791-2826 (0.084) 2844-3081 (0.775) 3088-3115 (0.071) 3125-3141 (0.041) 3149-3159 (0.029)</td>
<td>2749-3270 (0.965) 3283-3332 (0.035)</td>
</tr>
<tr>
<td>WK-7847</td>
<td>Tridacna maxima</td>
<td>X-30/X-29</td>
<td>3100±40</td>
<td>2864-3070 (1.000)</td>
<td>2780-3175 (1.000)</td>
</tr>
<tr>
<td>WK-7848</td>
<td>Trochus niloticus</td>
<td>X-28/Y-28-29</td>
<td>3080±40</td>
<td>2846-3048 (1.000)</td>
<td>2768-3150 (1.000)</td>
</tr>
</tbody>
</table>

**Table 5.4**

Radiocarbon determinations for Nenumbo (SE-RF-2), Reef Islands, southeast Solomon Islands.
Sourced from Jones et al. in press.

*Calibrated using Calib 4.4.2 with the intcal calibration dataset for charcoal samples and the marine 98 dataset for shell samples. A ΔR value of −81±64 has been used for marine shell samples, as recommended by Jones et al. in press. Bracketed numbers after calibrated dates indicate the relative area under probability distribution.
<table>
<thead>
<tr>
<th>FAMILY</th>
<th>SPECIES</th>
<th>LAYER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cypraeidae</td>
<td><em>Cypraea mauritania</em></td>
<td>Grey layer 2</td>
</tr>
<tr>
<td>Cassidae</td>
<td><em>Cassis cornuta</em></td>
<td>Black layer 1</td>
</tr>
<tr>
<td>Conidae</td>
<td><em>Conus litteratus</em></td>
<td>Black layer 1</td>
</tr>
<tr>
<td></td>
<td><em>Conus leopardus</em></td>
<td>and</td>
</tr>
<tr>
<td></td>
<td><em>Conus marmoreus</em></td>
<td>Grey layer 2</td>
</tr>
<tr>
<td></td>
<td><em>Conus cf. virgo</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Conus spp.</em></td>
<td></td>
</tr>
<tr>
<td>Terebridae</td>
<td><em>Terebra maculata</em></td>
<td>Grey layer 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>and</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Surface</td>
</tr>
<tr>
<td>Pteriidae</td>
<td><em>Pinctada cf. maxima</em></td>
<td>Grey layer 2</td>
</tr>
<tr>
<td>Tridacnidae</td>
<td><em>Tridacna maxima</em></td>
<td>Surface,</td>
</tr>
<tr>
<td></td>
<td><em>Hippopus hippopus</em></td>
<td>Black layer 1</td>
</tr>
<tr>
<td></td>
<td><em>Tridacna spp.</em></td>
<td>and</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Grey layer 2</td>
</tr>
</tbody>
</table>

Table 5.5
Species utilised for working at Nenumbo (SE-RF-2), Reef Islands, southeast Solomon Islands. Asterisks represent a single occurrence only.
<table>
<thead>
<tr>
<th>FAMILY</th>
<th>SPECIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trochidae</td>
<td>*Trochus niloticus</td>
</tr>
<tr>
<td></td>
<td><em>Trochus maculatus</em></td>
</tr>
<tr>
<td></td>
<td><em>Tectus pyramis</em></td>
</tr>
<tr>
<td>Cypraeidae</td>
<td><em>Cypraea mappa</em></td>
</tr>
<tr>
<td>Conidae</td>
<td>*Conus marmoreus</td>
</tr>
<tr>
<td></td>
<td>*Conus litteratus/Conus leopardus/Conus ebumeus</td>
</tr>
<tr>
<td>Tridacninae: Cardiidae</td>
<td><em>Hippopus hippopus</em></td>
</tr>
<tr>
<td></td>
<td><em>Tridacna sp.</em></td>
</tr>
</tbody>
</table>

**Table 5.6**

Species utilised for working at Vao in deposits deeper than 120cm, Vao Island, northern Vanuatu. Asterisks represent a single occurrence only.
<table>
<thead>
<tr>
<th>FAMILY</th>
<th>SPECIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trochidae</td>
<td><em>Trochus niloticus</em></td>
</tr>
<tr>
<td>Conidae</td>
<td><em>Conus litteratus/Conus leopardus</em></td>
</tr>
<tr>
<td></td>
<td><em>Conus virgo</em></td>
</tr>
<tr>
<td></td>
<td><em>Conus marmoreus</em></td>
</tr>
<tr>
<td>Isognomonidae</td>
<td><em>Isognomon sp.</em></td>
</tr>
<tr>
<td>Pteriidae</td>
<td><em>Pinctada sp.</em></td>
</tr>
<tr>
<td>Cardiidae/Arcidae</td>
<td>Unknown species</td>
</tr>
</tbody>
</table>

**Table 5.7**

Species utilised for working at location 13A, Lapita, New Caledonia. Surface material not included. Asterisks represent single occurrences only.
<table>
<thead>
<tr>
<th>FAMILY</th>
<th>SPECIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trochidae</td>
<td><em>Trochus niloticus</em></td>
</tr>
<tr>
<td>Cassidae</td>
<td><em>Cassis cornuta</em>?*</td>
</tr>
<tr>
<td>Conidae</td>
<td><em>Conus eburneus</em></td>
</tr>
<tr>
<td></td>
<td><em>Conus coronatus</em></td>
</tr>
<tr>
<td></td>
<td><em>Conus literatus</em></td>
</tr>
<tr>
<td></td>
<td><em>Conus virgo</em></td>
</tr>
<tr>
<td></td>
<td><em>Conus marmoreus</em>?*</td>
</tr>
<tr>
<td></td>
<td><em>Conus litteratus/leopardus</em></td>
</tr>
<tr>
<td>Cardiidae:Tridacninae</td>
<td><em>Tridacna spp.</em></td>
</tr>
<tr>
<td>Pteriidae/Isognomonidae</td>
<td><em>Pinctada sp./Isognomon sp.</em></td>
</tr>
<tr>
<td>Spondylidae/Chamidae</td>
<td><em>Spondylus sp./Chama sp.</em></td>
</tr>
<tr>
<td>Nautilidae</td>
<td><em>Nautilus macromphalus</em></td>
</tr>
</tbody>
</table>

**Table 5.8**

Species utilised for working at St Maurice-Vatcha, Isle of Pines, New Caledonia. Asterisks represent single occurrences only.
<table>
<thead>
<tr>
<th>LAB NUMBER</th>
<th>MATERIAL</th>
<th>DATE</th>
<th>CALIBRATED DATE B.P. (2 sigma)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NZ5615</td>
<td><em>Tridacna maxima</em></td>
<td>2730±50</td>
<td>2317-2614</td>
</tr>
<tr>
<td>NZ5616</td>
<td><em>Tridacna maxima</em></td>
<td>2740±50</td>
<td>2327-2617</td>
</tr>
<tr>
<td>NZ5617</td>
<td><em>Saccostrea cucullata</em></td>
<td>2640±50</td>
<td>2174-2449</td>
</tr>
<tr>
<td>NZ5618</td>
<td><em>Trochus niloticus</em></td>
<td>2600</td>
<td>?</td>
</tr>
</tbody>
</table>

Table 5.9

Radiocarbon determinations from Naigani (VL21/5) after Kay (1984). Recalibrated using Calib 4.4 (Stuiver and Reimer 1993) using the Marine 98.c14 curve, a delta R of 0, and a lab error multiplier of 1. No error margin was reported for sample NZ4518.
<table>
<thead>
<tr>
<th>FAMILY</th>
<th>SPECIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trochidae</td>
<td><em>Trochus niloticus</em></td>
</tr>
<tr>
<td>Strombidae</td>
<td><em>Strombus luhuanus</em></td>
</tr>
<tr>
<td>Conidae</td>
<td><em>Conus leopardus</em></td>
</tr>
<tr>
<td></td>
<td><em>Conus litteratus</em></td>
</tr>
<tr>
<td></td>
<td><em>Conus virgo</em></td>
</tr>
<tr>
<td></td>
<td><em>Conus ebraeus</em></td>
</tr>
<tr>
<td>Terebridae</td>
<td><em>Terebra maculata</em></td>
</tr>
<tr>
<td>Pteriidae</td>
<td><em>Pinctada cf. margaritifera</em></td>
</tr>
<tr>
<td>Cardiidae: Tridacninae</td>
<td><em>Tridacna maxima</em></td>
</tr>
</tbody>
</table>

**Table 5.10**

Species utilised for working at Naigani (VL21/5), Fiji. Asterisks represent single occurrences only.
<table>
<thead>
<tr>
<th>Lab. Code</th>
<th>Material</th>
<th>Provenance</th>
<th>Age b.p.</th>
<th>Calibrated Age* B.P</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISGS-495</td>
<td>Charcoal</td>
<td>H8:70-80cm</td>
<td>2460±80</td>
<td>2353 – 2731 (1.0)</td>
</tr>
<tr>
<td>GaK-7039</td>
<td>Charcoal</td>
<td>K5/6:55cm</td>
<td>6300±1600-1300</td>
<td>Rejected (Thiel 1980:67)</td>
</tr>
<tr>
<td>GaK-7038</td>
<td>Charcoal</td>
<td>K5/6:32cm</td>
<td>2010±90</td>
<td>1728 – 2155 (0.976)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2170 – 2177 (0.004)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2267 – 2298 (0.020)</td>
</tr>
<tr>
<td>GaK-7041</td>
<td>Charcoal</td>
<td>K5/6:40cm</td>
<td>3040±130</td>
<td>2866 – 3479 (0.990)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3517 – 3532 (0.005)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3535 – 3548 (0.005)</td>
</tr>
<tr>
<td>GaK-7042</td>
<td>Charcoal</td>
<td>J4/5:40-55cm</td>
<td>2390±160</td>
<td>2011 – 2020 (0.003)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2040 – 2779 (0.997)</td>
</tr>
<tr>
<td>GaK-7040</td>
<td>Charcoal</td>
<td>H4/5:60cm</td>
<td>2740±120</td>
<td>2473 – 2475 (0.000)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2489 – 2651 (0.068)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2705 – 3211 (0.930)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3231 – 3237 (0.002)</td>
</tr>
</tbody>
</table>

Table 6.1
Radiocarbon dates presented in Thiel (1980) for Arku Cave.

*Calibrated ages given at 2 sigma. Calibrated using Calib version 4.4 with intcal calibration dataset and a laboratory multiplier of K=1.0. Bracketed numbers after calibrated dates indicate the relative area under probability distribution.
<table>
<thead>
<tr>
<th>Lab. Code</th>
<th>Material</th>
<th>Provenance</th>
<th>Accession number</th>
<th>Age b.p.</th>
<th>Calibrated Age* B.P.</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANU-11889</td>
<td><em>Conus litteratus</em> or <em>Conus leopardus</em></td>
<td>Square 47, 46cm below surface inside a <em>Melo diadema</em>* scoop</td>
<td>65-L-304</td>
<td>3450±80</td>
<td>3226 – 3413 (1.0 at 1 sigma) 3112 – 3513 (1.0 at 2 sigma)</td>
</tr>
<tr>
<td>ANU-11888</td>
<td><em>Conus litteratus</em> or <em>Conus leopardus</em></td>
<td>Chamber B, subsurface, associated with bones and sherds</td>
<td>65-L-257</td>
<td>3580±70</td>
<td>3385 – 3546 (1.0 at 1 sigma) 3323 – 3633 (1.0 at 2 sigma)</td>
</tr>
</tbody>
</table>

Table 6.2

Radiocarbon dates obtained for Leta Leta Cave, northern Palawan, Philippines.

*Calibrated using Calib 4.4 with marine98 calibration dataset and a laboratory multiplier of 1.0. A delta-R value of 0 has been used as has been recommended for this region (pers. comm. F. Petchy to A. Anderson). Bracketed numbers after calibrated dates indicate the relative area under probability distribution.

**This species name is now invalid and recognised as a junior synonym of *Melo amphora.*
<table>
<thead>
<tr>
<th>Provenance</th>
<th>Layer</th>
<th>Material</th>
<th>Lab. Code</th>
<th>Age b.p.</th>
<th>Calibrated Age* B.P. (1 sigma)</th>
<th>Calibrated Age* B.P. (2 sigma)</th>
</tr>
</thead>
<tbody>
<tr>
<td>N5W3: 10-35cm</td>
<td>Burial feature 1, mixed Metal Age layer</td>
<td>Charcoal</td>
<td>ANU-11871</td>
<td>8874±230</td>
<td>Rejected</td>
<td>Rejected</td>
</tr>
<tr>
<td>N5W3: 65-75cm</td>
<td>Midden layer – top</td>
<td>Charcoal</td>
<td>ANU-11866</td>
<td>5200±210</td>
<td>5738 – 6196 (1.0)</td>
<td>5486 – 5528 (0.010) 5578 – 6407 (0.990)</td>
</tr>
<tr>
<td>N5W3: 75-80cm</td>
<td>Midden layer – bottom</td>
<td>Charcoal</td>
<td>ANU-11869(a)</td>
<td>5720±300</td>
<td>6197 – 6811 (0.923) 6816 – 6889 (0.077)</td>
<td>5911 – 7248 (1.0)</td>
</tr>
<tr>
<td>N5W3: 75-80cm</td>
<td>Midden layer – bottom</td>
<td>Charcoal</td>
<td>ANU-11869(b)</td>
<td>5410±130</td>
<td>5996 – 6079 (0.267) 6089 – 6190 (0.203) 6166 – 6303 (0.530)</td>
<td>5913 – 6412 (0.987) 6418 – 6444 (0.013)</td>
</tr>
<tr>
<td>N5W3: 85-90cm</td>
<td>Aceramic layer A – top</td>
<td>Charcoal</td>
<td>ANU-11872</td>
<td>6020±330</td>
<td>6503 – 6512 (0.011) 6534 – 7246 (0.989)</td>
<td>6184 – 7512 (0.992) 7528 – 7567 (0.008)</td>
</tr>
<tr>
<td>N5W3: 95-100cm</td>
<td>Aceramic layer A - middle</td>
<td>Charcoal</td>
<td>ANU-11873</td>
<td>7660±260</td>
<td>8176 – 8774 (0.966) 8832 – 8849 (0.018) 8891 – 8895 (0.006) 8920 – 8929 (0.010)</td>
<td>7942 – 9092 (0.899) 9098 – 9129 (0.007) 9182 – 9185 (0.001) 9221 – 9235 (0.003)</td>
</tr>
<tr>
<td>N5W3: 105-115cm</td>
<td>Aceramic layer A – base</td>
<td>Charcoal</td>
<td>ANU-11868(a)</td>
<td>6540±250</td>
<td>7162 – 7168 (0.008) 7181 – 7190 (0.011) 7206 – 7671 (0.981)</td>
<td>6807 – 6819 (0.003) 6889 – 6881 (0.033) 6884 – 7864 (0.986) 7900 – 7923 (0.006)</td>
</tr>
<tr>
<td>N5W3: 105-115cm</td>
<td>Aceramic layer A – base</td>
<td>Charcoal</td>
<td>ANU-11868(b)</td>
<td>8580±200</td>
<td>9325 – 9340 (0.021) 9352 – 9356 (0.005) 9400 – 9810 (0.974)</td>
<td>9093 – 9096 (0.001) 9130 – 9181 (0.023) 9186 – 9221 (0.013) 9234 – 10178 (0.963)</td>
</tr>
<tr>
<td>N5W3: 115-120cm</td>
<td>Aceramic layer B</td>
<td>Charcoal</td>
<td>ANU-11867</td>
<td>8770±260</td>
<td>9548 – 9979 (0.736) 9986 – 10151 (0.264)</td>
<td>9141 – 9170 (0.005) 9213 – 9214 (0.000) 9243 – 10501 (0.995)</td>
</tr>
<tr>
<td>N5W3: 120-125cm</td>
<td>Aceramic layer B</td>
<td>Charcoal</td>
<td>ANU-11870(a)</td>
<td>1790±120</td>
<td>Rejected</td>
<td>Rejected</td>
</tr>
<tr>
<td>N5W3: 120-125</td>
<td>Aceramic layer B</td>
<td>Charcoal</td>
<td>ANU-11870(b)</td>
<td>8170±170</td>
<td>8791 – 8796 (0.007) 8809 – 8827 (0.029) 8899 – 8878 (0.012) 8902 – 8910 (0.012) 8981 – 9330 (0.792) 9337 – 9403 (0.121) 9407 – 9425 (0.028)</td>
<td>8625 – 9489 (1.0)</td>
</tr>
</tbody>
</table>

**Table 6.3**

Radiocarbon determinations for the eastern trench, Ille Cave and Rockshelter, Palawan, Philippines.

*Calibrated using Calib 4.4 with intcal calibration dataset and a laboratory error multiplier of 0. Bracketed numbers after calibrated dates indicate the relative area under probability distribution.
<table>
<thead>
<tr>
<th>FAMILY</th>
<th>SPECIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trochidae</td>
<td><em>Trochus niloticus</em></td>
</tr>
<tr>
<td>Turbinidae</td>
<td><em>Turbo marmoratus</em></td>
</tr>
<tr>
<td>Strombidae</td>
<td><em>Strombus canarium</em></td>
</tr>
<tr>
<td></td>
<td><em>Strombus luhanus</em></td>
</tr>
<tr>
<td>Cypraecidae</td>
<td><em>Cypraea annulus</em></td>
</tr>
<tr>
<td>Ranellidae</td>
<td><em>Charonia tritonis</em></td>
</tr>
<tr>
<td>Columbellidae</td>
<td><em>Pyrene scripta</em></td>
</tr>
<tr>
<td></td>
<td><em>Pictocolumbella ocellata</em></td>
</tr>
<tr>
<td>Nassariidae</td>
<td><em>Nassarius arcularius</em></td>
</tr>
<tr>
<td></td>
<td><em>Nassarius globosus</em></td>
</tr>
<tr>
<td></td>
<td><em>Nassarius albescens</em></td>
</tr>
<tr>
<td></td>
<td><em>Nassarius pullus</em></td>
</tr>
<tr>
<td>Volutidae</td>
<td><em>Melo broderipii</em></td>
</tr>
<tr>
<td>Conidae</td>
<td><em>Conus spp.</em></td>
</tr>
<tr>
<td>Isognomonidae</td>
<td><em>Isognomon sp.</em></td>
</tr>
<tr>
<td>Spondyliidae</td>
<td><em>Spondylus sp.</em></td>
</tr>
<tr>
<td>Cardiidae</td>
<td><em>Hippopus hippocus</em></td>
</tr>
<tr>
<td></td>
<td><em>Vepricardium multispinosum</em></td>
</tr>
<tr>
<td></td>
<td><em>Tridacna gigas</em></td>
</tr>
</tbody>
</table>

**Table 6.4**

Species utilised for working at Ille Cave and Shelter, Palawan Island, Philippines.

* Single occurrence only

^ No evidence of working, but non-local raw material associated with working elsewhere.
<table>
<thead>
<tr>
<th>Lab. code</th>
<th>Material</th>
<th>Provenance</th>
<th>Age b.p.</th>
<th>Calibrated Age* B.P.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wk-14874</td>
<td><em>Strombus canarium</em> disc bead</td>
<td>N3W12: 96-100cm</td>
<td>3598±40</td>
<td>3441 – 3541</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(1.0 at 1 sigma)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3384 – 3584</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(1.0 at 2 sigma)</td>
</tr>
<tr>
<td>Wk-14873</td>
<td>Modified <em>Nassarius arcularius</em></td>
<td>N2W13: 70-80cm</td>
<td>2706±37</td>
<td>2337 – 2429</td>
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<td>(1.0 at 1 sigma)</td>
</tr>
<tr>
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<td></td>
<td>2310 – 2494</td>
</tr>
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<td>(1.0 at 2 sigma)</td>
</tr>
<tr>
<td>Wk-14875</td>
<td>Specialised bead of unidentified marine shell</td>
<td>N6W3: 35-50cm associated with burial</td>
<td>1325±38</td>
<td>831 – 914</td>
</tr>
<tr>
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<td></td>
<td>(1.0 at 1 sigma)</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>779 – 938</td>
</tr>
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<td>(1.0 at 2 sigma)</td>
</tr>
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</table>

Table 6.5

Direct AMS dates on shell beads from Ille Cave and Shelter, Palawan, Philippines.

*Calibrated using Calib 4.4 with marine98 calibration dataset and a laboratory multiplier of 1.0. A delta-R value of 0 has been used as has been recommended for this region (pers. comm. F. Petchy to A. Anderson). Bracketed numbers after calibrated dates indicate the relative area under probability distribution.
<table>
<thead>
<tr>
<th>Lab. Code</th>
<th>Material(^a)</th>
<th>Provenance</th>
<th>Age b.p.</th>
<th>Calibrated(^*) Age B.P. (1 sigma)</th>
<th>Calibrated(^*) Age B.P. (2 sigma)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I-5484</td>
<td>Charcoal?</td>
<td>In association with flexed neolithic burial</td>
<td>3890±95</td>
<td>4152-4209 (0.179) 4218-4421 (0.821)</td>
<td>3989-4045 (0.028) 4071-4533 (0.963) 4536-4548 (0.004) 4558-4569 (0.005)</td>
</tr>
<tr>
<td>I-5482</td>
<td>Charcoal?</td>
<td>In association with &quot;Iron Age agriculturalist&quot; material</td>
<td>935±90</td>
<td>762-929 (1.000)</td>
<td>674-975 (0.983) 977-986 (0.007) 1034-1047 (0.010)</td>
</tr>
</tbody>
</table>

**Table 6.6**


\(^a\)The type material dated is not stated but is assumed to be charcoal given the avoidance of bone and shell for dating within Philippine archaeology.

\(^*\)Calibrated using Calib 4.4 with the intcal calibration dataset and a laboratory error multiplier of 1. Bracketed numbers after calibrated dates indicate the relative area under probability distribution.
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</thead>
<tbody>
<tr>
<td>UCLA-287</td>
<td>Charcoal</td>
<td>Neolithic burial</td>
<td>4630±250</td>
<td>4973-5021 (0.063) 5027-5593 (0.937)</td>
<td>4628-4763 (0.032) 4805-5907 (0.968)</td>
</tr>
<tr>
<td>UCLA-994</td>
<td>Charcoal</td>
<td>Neolithic hearth</td>
<td>5680±80</td>
<td>6350-6368 (0.079) 6593-6595 (0.011) 6611-6616 (0.018)</td>
<td>6305-6641 (0.994) 6650-6657 (0.006)</td>
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<tr>
<td>UCLA-288</td>
<td>Charcoal</td>
<td>Small flake- and-blade assemblage</td>
<td>7000±250</td>
<td>7589-7600 (0.018) 7607-8029 (0.962) 8093-8106 (0.020)</td>
<td>7427-8221 (0.964) 8229-8330 (0.036)</td>
</tr>
</tbody>
</table>

**Table 6.7**


*Calibrated using Calib 4.4 with the intcal calibration dataset and a laboratory error multiplier of 1. Bracketed numbers after calibrated dates indicate the relative area under probability distribution.
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</thead>
<tbody>
<tr>
<td>SUA-258</td>
<td><em>Tridacna</em> sp. (same fragment run twice)</td>
<td>Not stated</td>
<td>3950±90</td>
<td>3823-4065 (1.0)</td>
<td>3685-4178 (1.0)</td>
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<td></td>
<td>4170±90</td>
<td>4127-4373 (1.0)</td>
<td>3979-4455 (0.992) 4461-4475 (0.008)</td>
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<tr>
<td>ANU-12125</td>
<td><em>Pleuropaca filamentosa</em></td>
<td>Pit A 10-20cm</td>
<td>4900±80</td>
<td>5072-5303 (1.0)</td>
<td>4973-5431 (1.0)</td>
</tr>
<tr>
<td>ANU-12123</td>
<td><em>Turbo marmoratus operculum</em></td>
<td>Pit B 10-20cm</td>
<td>6640±170</td>
<td>6949-7321 (1.0)</td>
<td>6746-7459 (1.0)</td>
</tr>
<tr>
<td>ANU-12122</td>
<td><em>Hippopus hippopus</em></td>
<td>Pit A 10-20cm</td>
<td>10,680±120</td>
<td>11415-11466 (0.053) 11630-12174 (0.824) 12211-12313 (0.123)</td>
<td>[10877]-[10931] 11156-11234 11250-12382 12782-12800</td>
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<tr>
<td>ANU-12124</td>
<td><em>Tridacna</em> sp.</td>
<td>Pit B 10-20cm</td>
<td>9350±110</td>
<td>9845-9907 (0.179) 9922-10199 (0.821)</td>
<td>9603-9673 (0.024) 9691-9754 (0.027) 9778-10310 (0.944) 10517-10533 (0.004)</td>
</tr>
</tbody>
</table>

**Table 6.8**

Radiocarbon dates obtained for Kamuanan Cave, sourced from Solheim et al. (1979:116)(SUA-258) as well as four new radiocarbon determinations (ANU-#).

* Calibrated using Calib 4.4 with the marine98 calibration dataset, a laboratory error multiplier of 1, and a ΔR value of 0 as has been recommended for this region (F. Petchy to A. Anderson, pers. comm.). Bracketed numbers after calibrated dates indicate the relative area under probability distribution. [] indicates calibrated with an uncertain region or a linear extension to the calibration curve.
<table>
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</thead>
<tbody>
<tr>
<td>ANU-9448</td>
<td>Charcoal</td>
<td>Square M5 45-55cm</td>
<td>3230±180</td>
<td>3213-3225 (0.020) 3242-3644 (0.926) 3656-3988 (0.054)</td>
<td>2963-3873 (0.997) 3876-3887 (0.003)</td>
</tr>
<tr>
<td>ANU-9449</td>
<td>Marine shell</td>
<td>Square M4 50-55cm</td>
<td>7400±110</td>
<td>7736-7950 (1.000)</td>
<td>7638-8058 (0.992) 8078-8095 (0.008)</td>
</tr>
<tr>
<td>ANU-9769</td>
<td>Marine shell</td>
<td>Square M5 135-140cm</td>
<td>10540±70</td>
<td>10870-10947 (0.052) 11113-11965 (0.901) 11978-11981 (0.001) 12027-12106 (0.033) 12233-12269 (0.013)</td>
<td></td>
</tr>
<tr>
<td>ANU-9512</td>
<td>Marine shell</td>
<td>Square M5 145-150cm</td>
<td>11480±70</td>
<td>12903-13047 (0.762) 13084-13139 (0.238)</td>
<td>12659-12731 (0.056) 12792-12804 (0.005) 12825-13169 (0.921) 13447-13461 (0.004) 13713-13745 (0.014)</td>
</tr>
<tr>
<td>ANU-9768</td>
<td>Marine shell</td>
<td>Square M5 195-200cm</td>
<td>9260±80</td>
<td>9801-10140 (0.974) 10220-10233 (0.026)</td>
<td>061-9757 (0.118) 9772-10282 (0.882)</td>
</tr>
<tr>
<td>Wk-4629</td>
<td>Marine shell</td>
<td>Square M6 210-215cm</td>
<td>32210±320</td>
<td>Beyond reliable calibration</td>
<td>Beyond reliable calibration</td>
</tr>
<tr>
<td>ANU-9447</td>
<td>Marine shell</td>
<td>Square M5 230-235cm</td>
<td>31030±400</td>
<td>Beyond reliable calibration</td>
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<tr>
<td>ANU-7772</td>
<td>Charcoal</td>
<td>A:20-25cm</td>
<td>900±100</td>
<td>735-916 (1.000)</td>
<td>659-974 (0.995)</td>
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<td>1037-1046 (0.005)</td>
</tr>
<tr>
<td>ANU-7773</td>
<td>Charcoal</td>
<td>B:0-5cm</td>
<td>1190±70</td>
<td>995-1029 (0.154)</td>
<td>969-1261 (1.000)</td>
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<td>1052-1177 (0.797)</td>
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<td></td>
<td>1212-1223 (0.049)</td>
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<tr>
<td>ANU-9322</td>
<td>Marine shell</td>
<td>B:5-10cm</td>
<td>2330±70</td>
<td>1862-2027 (1.000)</td>
<td>1787-2117 (1.000)</td>
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<tr>
<td>ANU-7774</td>
<td>Charcoal</td>
<td>B:15-20cm</td>
<td>390±190</td>
<td>4-11 (0.015)</td>
<td>0-42 (0.044)</td>
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<td>148-175 (0.053)</td>
<td>58-658 (0.956)</td>
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<td>181-186 (0.009)</td>
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<td>274-560 (0.872)</td>
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<td>600-627 (0.051)</td>
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<tr>
<td>ANU-7775</td>
<td>Charcoal</td>
<td>C:10-15cm</td>
<td>2610±170</td>
<td>2363-2370 (0.014)</td>
<td>2211-2219 (0.002)</td>
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<td></td>
<td>2377-2388 (0.020)</td>
<td>2311-3082 (0.977)</td>
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<td>2399-2412 (0.022)</td>
<td>3087-3142 (0.016)</td>
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<td></td>
<td>2434-2435 (0.004)</td>
<td>3147-3161 (0.004)</td>
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<td></td>
<td>2464-2869 (0.941)</td>
<td>3193-3201 (0.002)</td>
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<tr>
<td>ANU-9323</td>
<td>Marine shell</td>
<td>D:0-15cm</td>
<td>3260±70</td>
<td>2980-3181 (1.000)</td>
<td>2879-3265 (1.000)</td>
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<tr>
<td>ANU-9320</td>
<td>Charcoal</td>
<td>D:10-15cm</td>
<td>650±180</td>
<td>498-788 (1.000)</td>
<td>307-933 (1.000)</td>
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<tr>
<td>ANU-7776</td>
<td>Marine shell</td>
<td>D:15-20cm</td>
<td>3440±110</td>
<td>3174-3441 (1.000)</td>
<td>3007-3567 (1.000)</td>
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<tr>
<td>ANU-9321</td>
<td>Marine shell</td>
<td>E: underlying beach</td>
<td>3530±70</td>
<td>3330-3484 (1.000)</td>
<td>3251-3579 (1.000)</td>
</tr>
</tbody>
</table>

Table 6.10

Radiocarbon dates obtained for Uattamdi, Kayoa Island, northern Moluccas, Indonesia, sourced from Bellwood et al. (1998: Table 1).

*Calibrated here using Calib 4.4 with the marine98 calibration dataset for shell and the intcal98 dataset for charcoal. A laboratory multiplier of 1 has been used and a ΔR value of 0 has been used for shell samples as has been recommended for this region (F. Petchy to A. Anderson, pers. comm.). Bracketed areas after calibrated dates indicate the relative area under probability distribution.
<table>
<thead>
<tr>
<th>Lab. Code</th>
<th>Material</th>
<th>Provenance</th>
<th>Age b.p.*</th>
<th>Calibrated** Age B.P. (1 sigma)</th>
<th>Calibrated** Age B.P. (2 sigma)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANU-6757</td>
<td>Charcoal</td>
<td>Testpit 1, Layer IA/2</td>
<td>4680±140</td>
<td>5084-5103 (0.033)</td>
<td>4888-4896 (0.002)</td>
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<td>5139-5160 (0.041)</td>
<td>4919-4916 (0.002)</td>
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<td></td>
<td>5283-5592 (0.029)</td>
<td>4966-5561 (0.991)</td>
</tr>
<tr>
<td>Beta-25617</td>
<td>Charcoal</td>
<td>Testpit 1, Layer IA/4</td>
<td>6700±80</td>
<td>7484-7499 (0.077)</td>
<td>7432-7452 (0.048)</td>
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<td>7505-7542 (0.291)</td>
<td>7456-7673 (0.952)</td>
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<tr>
<td>Beta-25618</td>
<td>Charcoal</td>
<td>Testpit 1, Layer IC/9</td>
<td>7900±110</td>
<td>8593-8785 (0.604)</td>
<td>8450-9012 (1.000)</td>
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<td>8800-8807 (0.018)</td>
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<td>8828-8888 (0.121)</td>
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<td>8878-8901 (0.063)</td>
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<td>8912-8980 (0.194)</td>
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<tr>
<td>ANU-6178</td>
<td>Charcoal</td>
<td>Weighted average</td>
<td>9264±130</td>
<td>10253-10348 (0.246)</td>
<td>10190-10778 (0.960)</td>
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<tr>
<td>and</td>
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<td></td>
<td></td>
<td>10358-10580 (0.695)</td>
<td>10831-10838 (0.002)</td>
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<tr>
<td>Beta-25619</td>
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<td></td>
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<td>10614-10636 (0.060)</td>
<td>10944-10947 (0.001)</td>
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<td>10956-11009 (0.020)</td>
<td>11016-11061 (0.017)</td>
</tr>
<tr>
<td>Beta-25619</td>
<td>Charcoal</td>
<td>Testpit 1, Layer IC/13</td>
<td>9430±150</td>
<td>10428-10441 (0.022)</td>
<td>10277-10302 (0.016)</td>
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<td>10484-10792 (0.675)</td>
<td>10306-10321 (0.010)</td>
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<td>10798-10807 (0.014)</td>
<td>10328-10345 (0.011)</td>
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<td></td>
<td>10825-10857 (0.052)</td>
<td>10366-11141 (0.057)</td>
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<td></td>
<td>10940-11057 (0.237)</td>
<td>11145-11157 (0.007)</td>
</tr>
<tr>
<td>ANU-6178</td>
<td>Charcoal</td>
<td>Testpit 1, Layer IC/15</td>
<td>8950±230</td>
<td>9633-9637 (0.005)</td>
<td>9498-9508 (0.002)</td>
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<td>9685-10269 (0.974)</td>
<td>9524-10583 (0.989)</td>
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<td>10303-10345 (0.002)</td>
<td>10589-10596 (0.001)</td>
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<td>10322-10336 (0.005)</td>
<td>10611-10638 (0.006)</td>
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<td></td>
<td>10346-10359 (0.015)</td>
<td>10660-10667 (0.001)</td>
</tr>
<tr>
<td>Beta-26149</td>
<td>Nerita sp.</td>
<td>Testpit 3, Layer II/15</td>
<td>20,140±300</td>
<td>Beyond reliable calibration</td>
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<tr>
<td>Beta-26150</td>
<td>Turbo sp.</td>
<td>Testpit 3, Layer II/18</td>
<td>23,820±290</td>
<td>Beyond reliable calibration</td>
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<tr>
<td>ANU-5990</td>
<td>Nerita sp.</td>
<td>Testpit 1, Layer II/21</td>
<td>28,340±280</td>
<td>Beyond reliable calibration</td>
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</tr>
</tbody>
</table>

Table 7.1
Radiocarbon dates obtained for Kulu Cave, Buka Island, Northern Solomons Province, Papua New Guinea, sourced from Wickler (2001:Table 3.27).

*Adjusted for isotope fractionation using measured or estimated values.

**Calibrated here using Calib 4.4.2 with the intcal98 calibration dataset. A laboratory multiplier of 1 has been used. Bracketed numbers after calibrated dates indicate the relative area under probability distribution.
<table>
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<tbody>
<tr>
<td>ANU-6110</td>
<td>Turbo sp.</td>
<td>Testpit 1 VI/13</td>
<td>4740±80</td>
<td>4846-5075 (0.989) 5106-5110 (0.011)</td>
<td>4820-5237 (1.000)</td>
</tr>
<tr>
<td>Beta-25824</td>
<td>Turbo sp.</td>
<td>Testpit 1 V/8</td>
<td>5250±90</td>
<td>5518-5711 (1.000)</td>
<td>5434-5847 (1.000)</td>
</tr>
</tbody>
</table>

**Table 7.2**

Radiocarbon dates obtained for the preceramic layer at Palandraku Cave, Buka Island, Northern Solomons Province, Papua New Guinea, sourced from Wickler (2001: Table 3.27).

*Calibrated here using Calib 4.4.2 with the marine98 calibration dataset. A laboratory multiplier of 1 has been used along with a ΔR of 0. Bracketed numbers after calibrated dates indicate the relative area under probability distribution.
Table 7.3

<table>
<thead>
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<tbody>
<tr>
<td>ANU-7761</td>
<td>Celtis</td>
<td>Square 4, layer 2, spit 2A, sw quadrant.</td>
<td>4830±230</td>
<td>5306-5767 (0.876)</td>
<td>4872-4946 (0.018)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5792-5799 (0.007)</td>
<td>4954-5996 (0.976)</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td>5805-5889 (0.117)</td>
<td>6079-6088 (0.002)</td>
</tr>
<tr>
<td>ANU-8246</td>
<td>Charcoal</td>
<td>Square 4, layer 2, spit 4A, nw quadrant</td>
<td>8190±250</td>
<td>8777-8831 (0.069)</td>
<td>8427-9601 (0.997)</td>
</tr>
<tr>
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*Calibrated ages are based on the SHCal13 calibration curve.
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*Calibrated using Calib 4.4.2 with the intcal98 dataset for charcoal and *Celtis* dates, and the marine98 dataset for shell. A laboratory multiplier of 1 has been use and a ΔR value of 0 for marine shell samples. Bracketed numbers after calibrated dates indicate the relative area under probability distribution.
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<td>A disturbed dark, friable soil with scattered shell (mainly freshwater), pottery, bottle glass, small amounts of flaked stone and obsidian, and some trade beads.</td>
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<tr>
<td>2</td>
<td>A dense shell midden also including obsidian flakes, flaked chert and other stone, and oven stone fragments.</td>
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<tr>
<td>3</td>
<td>A mixed deposit consisting of shell midden and dark grey sediment.</td>
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<tr>
<td>4</td>
<td>A brown, fine-textured sediment with scattered shell fragments in the upper few spits and flaked obsidian and other stone throughout.</td>
</tr>
<tr>
<td>5</td>
<td>A dark grey to brown sediment containing flaked stone (predominantly chert) with smaller amounts of obsidian.</td>
</tr>
<tr>
<td>6</td>
<td>A light brown sediment characterised by numerous indistinct lenses and virtually no obsidian among the flake debitage.</td>
</tr>
<tr>
<td>7</td>
<td>A dense, compacted orange-brown clay containing flaked stone, but little organic matter.</td>
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Table 7.4

Figure 1.1

Map of Southeast Asia and the western Pacific area showing the location of worked shell assemblages studied in this thesis.
Figure 4.1

Diagram to show parts of a gastropod and associated terminology. Adapted after Abbot and Dance (1982:8)

Figure 4.2

Diagram to show parts of a bivalve and associated terminology. Adapted after Abbot and Dance (1982:9)
**Figure 4.3**

External view of a *Tridacna squamosa* showing parts of the shell and associated terminology.

**Figure 4.4**

Internal view of a *Tridacna squamosa* showing parts of the shell and associated terminology.
Figure 4.5

Section view of *Nautilus pompilius* showing parts of the shell and associated terminology.
Figure 4.6

Polished, etched surface of a *Turbo marmoratus*. A crack has travelled easily through the prismatic layer (below), but has been brought to a halt 80μm into the nacreous layer (above). From Currey (1988:189).

Figure 4.7

Face view of a fracture surface of the nacreous layer of *Turbo marmoratus*. The sheets are ~0.3μm across. From Currey (1988:187).
Figure 4.8

Vertical fracture across the columnar nacreous layer of *Amphalius rusticus*. Bar, 20µm.
From Watabe (1988:80)

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Figure 4.9

Diagram to show fracture path in nacre when the crack travels (a) normally to the large dimensions of the plates and (b) between the plates.
Redrawn after Currey 1988:188
Figure 4.10
Schematic drawing of crossed-lamellar structure. 'L' and 'R' indicate laths oriented at approximately right angles in alternate layers. From Currey and Kohn (1976: Figure 2).

Figure 4.11
Fracture in crossed-lamellar structure. The crack first travelled between the sheets, from right to left, but after the change in orientation of the sheets it had to break across them. Width of field $\sim 350\mu m$. After Currey (1988:191)
**Figure 4.12**
Polished and etched section of *Strombus gigas* showing crossed-lamellar layers. Scale µm.
From Dauphin and Denis (2000:370).

**Figure 4.13**
Polished and etched section of *Strombus gigas* showing growth lines (arrows) and first and second order lamellae. Scale µm.
From Dauphin and Denis (2000:370).

**Figure 4.14**
Polished and etched section of *Tridacna* sp. showing the inner structure of the first-order lamellae. No scale provided.
From Dauphin and Denis (2000:370).

**Figure 4.15**
Polished and etched section of *Tridacna* sp. showing third-order lamellae.
From Dauphin and Denis (2000:370).
**Figure 4.16**


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**Figure 4.17**

Deposition of crystals in step arrangement in growing nacreous shell of *Pinctada radiata*. Shell edge at upper left. Bar, 10μm. Inset: screw dislocation in newly deposited crystal of nacreous shell of same species. From Wilbur and Saleuddin (1983:264)

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**Figure 4.18**

Figure 4.19

Scanning electron micrograph (SEM) of calcereous shell and overlying periostracal layer from *Nautilus macromphalus*. Bar, 50 µm
From Ward (1988:146)
Figure 4.20
Crack indicating a repaired break in a *Strombus luhuanus*. Specimen from the collection of K. Szabó. Bar, cm. Photograph by S. Garling.

Figure 4.21
Crack indicating a repaired break in a *Strombus canarium*. Specimen from the collection of K. Szabó. Bar, cm. Photograph by S. Garling.
Dorsal and ventral views of a *Turbo marmoratus*. The specimen is covered in various species of coralline algae. Point A (dorsal view) shows the cast of (what is probably) a serpulid tubeworm. Point B (ventral view) shows scars left by the parasitic gastropod *Sabia conica*. None of these organisms would harm the mollusc, and often serve to strengthen (in the case of coralline algae) and camouflage the shell. Scale, cm.

Figure 4.23

Shell of a *Strombus gibberulus* that has been 'peeled' by the crab *Calappa hepatica*.
No scale, but average adult length is 30-35mm.
From Vermeij (1993:134)

Figure 4.24

*Trochus niloticus* shell that has been broken by the crushing crab *Carpilius maculatus*.
No scale, but average length is 100mm.
From Vermeij (1993:132)
Note the notches indicated by the arrows.

Figure 4.25

*Cyprea caputserpentis* with the dorsum broken off by a crab (species unknown). Such damage is frequent in cowrie shells.
Specimen is 31mm long.
From Vermeij (1993:94)
Examples of coenobitid hermit crab damage in two species of *Nerita*. On the left are two examples of *Nerita costata*, with the one on the far left being an undamaged specimen. Note the difference in aperture shape. The two examples on the right are *Nerita polita*; the one on the left being undamaged and the one on the right heavily abraded. Unworn specimens from the collection of K. Szabó. Worn specimens from the site of Ugaga, Fiji. Photo by Darren Boyd.

Examples of coenobitid hermit crab damage in *Thais* spp. and *Planaxis sulcatus*. The top row shows an undamaged *Thais armigera* (left), a hermit-crabbed *Thais armigera* with medium-level damage (middle), and a *Thais tuberosa* with extensive damage (right). The bottom row shows two specimens of *Planaxis sulcatus*; one undamaged (left) and the other with apertural abrasion caused by a coenobitid (right). All specimens from the site of Ugaga, Fiji. Photo by Darren Boyd.
Figure 4.28

Complete (right) and incomplete (left) drillholes made by a naticid in the valves of *Mactra chinensis*. No scale, but average length of 7cm. From Vermeij (1993:107)

Figure 4.29

*Turbo setosus* collected from the reef before any processing. Tanga Island Group, New Ireland, Papua New Guinea. Photograph courtesy of Stephanie Garling.
Figure 4.30

The *Turbo setosus* shells on the fire.
Tanga Island Group, New Ireland, Papua New Guinea.
Photograph courtesy of Stephanie Garling.

Figure 4.31

Hammering the dorsal surface of a *Turbo setosus* with a limestone nodule in order to extract the animal.
Tanga Island Group, New Ireland, Papua New Guinea.
Photograph courtesy of Stephanie Garling.

Figure 4.32

Broken shells of *Turbo setosus* after meat extraction and consumption.
Tanga Island Group, New Ireland, Papua New Guinea.
Photograph courtesy of Stephanie Garling.
Figure 5.1

Map of Ambitle and Babase Islands, Anir Group, New Ireland, Papua New Guinea, showing the location of the early Lapita site Kamgot (ERA).
Figure 5.2

Schematic rendering of layout of test-pits at Kamgot (ERA), Babase Island. Adapted from an original drawing by Glenn Summerhayes.
Figure 5.3
Graph to show thirty most abundant mollusc species (MNI) within the Kamgot archaeological deposits.
Schematic representation of reef flat/coastal fringe zonation, showing the zones of occurrence for the three major species present in the Kamo'o shell assemblage. The gradient shows density of occupation within each zone.
Figure 5.5

Pie chart to show relative contributions (mni) of mollusc niches represented in the Kamgot deposits.
Figure 5.6

Picture of a *Trochus niloticus* showing the areas of the shell from which preforms derive. Area a is related to ring production, whereas Area b is related to fishhook production.
Figure 5.7

a. *Trochus niloticus* showing evidence of direct percussion at 1 and possibly 2. Kamgot TP2 Unit II spit 8
b. *Tectus pyramis* reduced through direct percussion. Kamgot TP1 Unit II/III spit 9.
Figure 5.8

a. Fragment of a portion of the ventral surface and posterior edge of the body whorl of a *Trochus niloticus*. The outer ventral face is ground on two facets (1 and 2). The edge of the inner surface is also ground (3). Edge of body whorl shows signs of chipping with a sharp point (4). Kamgot TP17 Unit III spit 11.

b. Broken *Trochus niloticus* fishhook preform. Has been ground on the ventral (1) and body whorl (2) faces. Chipping away of the ventral surface to fashion the inner part of the hook has begun (3). Kamgot TP20 Unit II spit 12.
Figure 5.9

d. Broken *Trochus niloticus* fishhook preform. Kamgot TP1 Unit II spit 7.
Figure 5.10

a. Point leg of a finished *Trochus niloticus* fishhook. Fully abraded. Kamgot TP2 Unit II spit 5.


c. *Trochus niloticus* 'tattooing chisel'. Ground, abraded and 'scratched'. Kamgot TP20 Unit II spit unknown.
Figure 5.11

Photograph of a *Turbo marmoratus* showing the area of the shell used for working. Scale, cm.
Figure 5.12

a. Cut and notched fragment of *Turbo marmoratus*. Cut edge at 1 and chipped notch at 2.  
   Kamgot TP 17 Unit III spit 12

b. Cut fragment of *Turbo marmoratus*. Cut edge at 1 and chipped edge at 2.  
   Kamgot TP2 Unit II spit 12.

c. Preform of a *Turbo marmoratus* rotating fishhook. Cut edge at 1, and chipped out interior at 2.  
   Kamgot TP1 Unit II spit 6.

d. *Turbo marmoratus* rotating fishhook. Abraded on all edges. TP2 Unit II spit 5.
Figure 5.13

Pie chart to show proportions of species (nisp) of *Conus* utilised for working at Kamgot, New Ireland, Papua New Guinea. The 'other identified species' include *Conus marmoreus*, *Conus virgo*, *Conus stercusmuscarum*, *Conus eburneus* and *Conus cf. distans*. 
Figure 5.14

Picture of a *Conus leopardus* showing the area of the shell from which rings are produced. The darker part of the gradient fill shows the area utilised by 'narrow' and 'broad' rings alike, while the lighter part of the fill is only utilised in the production of broad rings. Scale, cm.
Figure 5.15

a. *Conus leopardus* reduced through successive percussive blows to the body whorl. Kamgot TP1 Unit III spit 10.

b. Detached lip and body fragment of a *Conus litteratus* or *Conus leopardus*. The lip margin is indicated at 1. Kamgot TP2 Unit II spit 4.

c. Lip and body fragment of an unidentified species of *Conus*. The lip margin is indicated at 1. A 'flap' of shell caused by a change in direction of the fracture path is indicated at 2. The fracture travelling along the surface of the first-order lamellae is shown at 3. The bold arrow indicates an area of crushing probably indicating the location of impact. Kamgot TP2B Unit II spit 6.
Figure 5.16

a. Lip and body fragment of a *Conus litteratus* or *Conus leopardus*. The arrow shows an area of crushing that represents the probable point of percussive impact. Kamgot TP2 Unit II spit 5.

b. Body fragment of a *Conus litteratus* or *Conus leopardus*. Bold arrow indicates crushing at point of impact. The flap of shell left by a change in the path of a fracture is shown at 1. A section where the fracture has travelled along the line of the first-order lamellae is shown at 2. Kamgot 2B Unit II spit 8.

c. Body fragment of a *Conus litteratus* or *Conus leopardus* TP17 Unit III spit 13.

d. Body fragment of a *Conus litteratus* or *Conus leopardus*. Kamgot TP 2B Unit II spit 3.

3. Fragment of the posterior end of the body whorl along with the outer whorls of the spire of a *Conus eburneus*. Kamgot TP2B Unit III spit 11.
Figure 5.17

a. Fragment of a ground spire of a *Conus* sp. shell. Kamgat TP1 Unit II spit 3.
b. Inner whorls of a ground spire of a *Conus* sp. shell. Kamgat TP21 Unit III spit 8.
c. Fragment of a ground spire of a *Conus* sp. shell. Kamgat TP17 Unit III spit 12.
d. Ground spire of a *Conus* sp. shell. Both faces have been ground and removal of the central whorls using a chipping technique has begun. Kamgat TP23 Unit II spit 5.
Figure 5.18

Schematic renderings of ring cross-section types and associated terminology.
Figure 5.19

a. Fragment from an unfinished ring of *Conus litteratus* or *Conus leopardus*. Kamgot TP2 Unit II spit 5.

b. *Conus* sp. ring fragment. Kamgot TP21B Unit III spit 8.

c. *Conus* sp. ring fragment. Kamgot TP17 Unit II spit 7.

Figure 5.20

a. Conus sp. ring fragment. Kamgot TP17 Unit II spit 7.
b. Conus sp. ring fragment. Kamgot TP17 Unit II spit 8.
c. Grooved Conus sp. ring fragment. Kamgot TP23 Unit II spit 2.
d. Grooved Conus sp. ring fragment. Kamgot TP28 Unit II spit 10.
Kamgot

Graph to show frequencies of Conus spp. ring widths

Figure 5.21

Graph to show frequencies of Conus spp. ring widths present within the Kamgot assemblage.
Figure 5.22

Graph to show frequencies of different estimated internal diameters of *Conus* spp. rings present within the Kamgot assemblage.
Figure 5.23

a. 'Rectangular' or 'broad' unit of *Conus* sp. Kamgot TP23 Unit II spit 4.

b. *Conus* sp. 'adze'. Kamgot TP1 Unit II spit 7.

c. *Conus* sp. 'adze'. Kamgot TP23 Unit II spit 5.
Figure 5.24

a. Ground and perforated Conus sp. disc. Kamgot TP21B Unit II spit unknown.
b. Conus sp. bead. Kamgot TP22 Unit II/III spit 8.
c. Conus sp. bead. Kamgot TP21B Unit III spit 8.
d. Conus sp. bead. Kamgot TP2B Unit III spit 11.
e. Conus sp. bead. Kamgot TP2 Unit II spit 7.
g and h. Conus spp. beads. Kamgot TP23 Unit II spit 3.
i. Double-perforated Conus sp. ground spire. Kamgot TP22 Unit II spit 3.
Figure 5.25

a. *Tridacna maxima* adze. Kamgot TP21 Unit I spit 2
b. *Tridacna* sp. adze. Kamgot TP15 Unit I spit 1
**Figure 5.26**

- **a.** Tridacna sp. hinge-section adze. Kamgot Area 'E' surface.
- **b.** Tridacna sp. body-section adze. Kamgot TP22 Unit I spit 1.
Figure 5.27

a. Ring fragment of *Tridacna* sp. Kamgot TP17 Unit II spit 3.
b. Grooved ring fragment of *Tridacna* sp. Kamgot TP10 Unit II spit 2.
Figure 5.28

a. Spondylus sp. perforated disc. Kamgot TP21B Unit II spit 2.
b. Ground Cypraea annulus. Kamgot TP20 Unit II spit 3.
c. Hewn Ostrea sp. disc. Kamgot TP20 Unit II spit 4.
d. Perforated piece, Cassis cornuta? Kamgot TP 20 Unit II spit unknown.
e. Hewn and abraded Haliotis diversicolor. Kamgot TP21 Unit III spit 8.
Figure 5.29

Map of the Southeast Solomon Islands, showing the location of the Nenumbo site, SE-RF-2
Figure 5.30

Graph to show twenty most abundant mollusc species (MNI) from Black layer 1 and Grey layer 2 of the Nenumbo site (SE-RF-2).
Figure 5.31
Pie chart to show relative contributions of mollusc-bearing niches in Black layer 1, Nenumbo (SE-RF-2)

Figure 5.32
Pie chart to show relative contribution of mollusc-bearing niches in Grey layer 2, Nenumbo (SE-RF-2)
Figure 5.33

a. Body of a *Conus leopardus*, detached from the spire by direct percussion.
   Nenumbo SqX, pt 28, Grey layer 2, post hole 3.

b. Body of a *Conus* sp. specimen, detached from the spire by cutting.
   Nenumbo SqYZ-23, base of Grey layer 2.
Figure 5.35

a. Fragment of *Conus litteratus/Conus leopardus* ring. Nenumbo Y26, lower part of Black layer.
b. Fragment of *Conus* sp. ring. Nenumbo U40, base of Black layer.
c. Fragment of *Conus* sp. ring. Nenumbo Y26, lower part of Black layer.
Figure 5.36

a. Fragment of a *Conus* sp. ring. Nenumbo T40, first 10cm of Grey layer.
b. Fragment of a *Conus* sp. ring. Nenumbo W or V26, Grey layer in association with firepit.
c. Fragment of a *Conus* sp. ring. Nenumbo W26, Grey layer in association with firepit ash.
d. Fragment of a *Conus* sp. ring. Nenumbo B30, Grey layer, fill in base at clean-up.
e. Fragment of a grooved *Conus* sp. ring. Nenumbo T40, Grey layer, pit feature.
Figure 5.37

a. Fragment of a broad *Conus litteratus/Conus leopardus* ring. Nenumbo T-S 32-33, first 10cm of Grey layer.
b. Fragment of a broad *Conus* sp. ring. Nenumbo W26, Grey layer around fireplace, second level and into base.
Figure 5.38

a. Broken and perforated broad Conus sp. ring. Nenumbo V41, Grey layer, second 10cm to base.

b. Conus sp. 'bead'. Nenumbo Z23, Grey layer towards base of second spit.

c. Conus sp. 'bead'. Nenumbo X21, base of Black layer.

d. Conus sp. 'bead'. Nenumbo X21, 22, base of Black layer.

e. Broken and perforated Conus sp. ring. Nenumbo W39, Black layer second level and into base.
Figure 5.39

Graph to show frequencies of *Conus* spp. ring widths present within the Nenumbo assemblage.
Figure 5.40

Graph to show frequencies of different estimated internal diameters of Conus spp. rings present within the Nenumbo assemblage.
Figure 5.41

Figure 5.42

Figure 5.43

Figure 5.44

Figure 5.45

b. Shaped lip of a *Cassis cornuta* - adze? Nenumbo QP41-2, Black layer 0-10cm.
Figure 5.46


Figure 5.47

Map of northeast Malekula, Vanuatu, showing the location of the Vao site
Figure 5.48


b. *Trochus niloticus* ring fragment. Vao TP7, 140-150cm.
Figure 5.49

a. Broken ring preform of *Conus litteratus*, *Conus leopardus* or *Conus eburneus*. Vao TP3, 120-130.


Figure 5.50

Graph to show frequencies of Conus spp. ring widths present within the Vao assemblage.
Figure 5.52

Graph to show frequencies of different estimated internal diameters of *Conus* spp. rings present within the Vao assemblage.
Figure 5.53


b. Whole *Conus marmoreus* with the apex removed. Vao ST11, 200-210.
Figure 5.54

b. Shaped and drilled *Conus* sp. 'pendant'. Vao ST11, 140-150.
Figure 5.55

Conus sp. bead. Vao ST11, 140-150.
Figure 5.56

a. Ground *Tridacna* sp. hinge fragment. Vao TP6, 120-130.
b. *Tridacna* sp. ring fragment. Vao A2, 130-140.
Figure 5.57

a. *Tridacna* sp. ring fragment. Vao A5, 130-140.
Figure 5.58

Map of Grande Terre, New Caledonia, showing the location of site 13A
Figure 5.59


Figure 5.60

Figure 5.61

*Conus litteratus*/*Conus leopards* reduced by direct percussion. Part of the spire has come away during working. Site 13A, surface collection 1995.
Figure 5.62

a. *Conus litteratus/Conus leopardus* body with spire removed by direct percussion. 13A Zone II, H4:30-40.
Figure 5.63

a. *Conus* sp. body fragment. 13A Zone II, H4:30-40.
Figure 5.64


d. Ground *Conus* sp. spire fragment. 13A Zone II, H4:30-40.
Figure 5.65

c. Grooved *Conus* sp. ring fragment. 13A Zone IV, 45Y5:25.
Figure 5.66

b. Unfinished *Conus* sp. ring fragment, 13A Zone IV, 34J22:5-10.
c. Incised *Conus* sp. ring fragment, 13A Zone II, H4:30-40.
Figure 5.67

b. Ground *Conus* sp. disc. 13A Zone IV, 17U25:50-55.
c. *Conus* sp. bead. 13A Zone IV, G7:structure.
Figure 5.68

Graph to show frequencies of *Conus* spp. ring widths present within the 13A assemblage.
Graph to show frequencies of different estimated internal diameters of *Conus* spp. rings present within the 13A assemblage.
Figure 5.70

Figure 5.71

b. Bead of unidentified species. 13A Zone I, C4:30-40.
c. Bead of unidentified species. 13A Zone I, C4:30-40.
d. Bead of species of Cardiidae/Arcidae. 13A Zone I, C4:30-40.
Figure 5.72

Map of the Isle of Pines, New Caledonia, showing the location of the St Maurice-Vatcha site (KVO003). Adapted after Sand (1999).
Figure 5.73

Plan of the site of St Maurice-Vatcha, Isle of Pines, New Caledonia, showing location of test-pits. Adapted from Sand (1999).
Figure 5.74

a. Chipped piece of *Trochus niloticus* body whorl at the suture line.
   St Maurice-Vatcha A1, II:30-40.
b. Ground piece of the ventral surface of a *Trochus niloticus*.
   St Maurice-Vatcha A1, I:40-50.
Figure 5.75

c. Ground and abraded piece of *Trochus niloticus*. St Maurice-Vatcha B1, l:30-40.
Figure 5.76

a. Body of a *Conus* sp. shell reduced by cutting. St Maurice-Vatcha B:40-50.
b. Body of a *Conus litteratus* detached by percussion.
   St Maurice-Vatcha A1, l60-70.
Figure 5.77

b. Reduced *Conus eburneus*. St Maurice -Vatcha B:40-50.
Figure 5.78

Figure 5.79

a. Detached and partially ground *Conus eburneus*. St Maurice-Vatcha A:30-40.
Figure 5.80

c. Conus sp. spire fragment ground on multiple facets. St Maurice-Vatcha B1, l:10-20.
e. Conus sp. spire fragment ground on multiple facets.
St Maurice-Vatcha A2, l:60-70 Fosse 1 Angle sud.
Figure 5.81

b. *Conus* sp. ring fragment. St Maurice-Vatcha B1, II:50-60.
Figure 5.82

Figure 5.83

d. Perforated broad Conus sp. ring fragment. St Maurice-Vatcha, surface.
Figure 5.84

Graph to show frequencies of Conus spp. ring widths present within the St Maurice-Vatcha assemblage.
Figure 5.85

Graph to show frequencies of different estimated internal diameters of *Conus* spp. rings present within the St Maurice-Vatcha assemblage.
Figure 5.86

d. Conus sp. bead. St Maurice-Vatcha C:30-40.
e. Conus sp. bead. St Maurice-Vatcha A1, II:30-40.
g. Conus sp. bead. St Maurice-Vatcha A2, I:30-40.
Figure 5.87

a. Abraded and drilled Conus sp. fragment. St Maurice-Vatcha A2, IB40-50
b. Tridacna sp. ring fragment. St Maurice-Vatcha A30-40.
Figure 5.88

a. Squat, drilled bead of *Spondylus* sp. or *Chama* sp. St Maurice-Vatcha B1, l1:40-50.
d. Drilled disc bead of *Spondylus* sp. or *Chama* sp. St Maurice-Vatcha A2, l1:20-30.
e. Drilled disc bead of *?Nautilus* sp. St Maurice-Vatcha A1, l1:30-40.
Figure 5.89

Map of Naigani Island, Fiji, showing the location of the Naigani site (VL 21/5). Adapted after Best (1981)
Figure 5.90

Site excavation plan of Naigani (VL21/S) after Best (1981)
Figure 5.91

Graph to show species represented by three or more individuals within the total shell assemblage at Naigani (VL21/5), Fiji.
Figure 5.92

Pie chart to show relative importance of niches utilised for shell gathering at Naigani (VL21/5), Fiji.
Figure 5.93

b. Body of a *Conus litteratus* detached by direct percussion. Naigani 3(ext), Level A4.
Figure 5.94

a. Body of a *Conus* sp. detached by percussion. Naigani 3(ext), Level A4.

b. Body fragment of a *Conus* sp. Naigani 2, Level B3.

c. Body fragment of a *Conus* sp. Naigani 2, Level B3.

Figure 5.95

a. Detached and ground *Conus litteratus*/*leopardus* spire. Naigani east-west hole 3, Level B2 45cm.

b. Detached and ground *Conus litteratus*/*leopardus* spire. Naigani 3(elt), Level B1.
Figure 5.96

a. *Conus litteratus*/*leopardus* ring preform. Naigani 4, B2(a)
Figure 5.97

Figure 5.98

Figure 5.99

c. *Conus* sp. ring fragment. Naigani 7, Level C1.
d. *Conus* sp. ring fragment. Naigani 3(ext), B1.
e. *Conus* sp. ring fragment. Naigani 9, B4.
Figure 5.100

a. Ground and perforated *Conus* sp. spire. Naigani 4(c)ext., Level B3 '46 area.'
Naigani
Graph to show frequencies of Conus spp. ring widths

Figure 5.101

Graph to show frequency of Conus spp. ring widths at Naigani (VL21/5), Fiji.
Figure 5.102

Graph to show frequencies of different estimated internal diameters of *Conus* spp. rings present within the Naigani assemblage.
Figure 5.103

a. Conus sp. bead - outer spire face. Naigani 2, Level B3 16 area.
b. Conus sp. bead - inner spire face. Naigani 2, Level B3 16 area.
c. Conus sp. bead - inner spire face. Naigani 2, Level B3 1+3 area.
d. Conus sp. bead - outer spire face. Naigani 2, Level B3 1+3 area.
**Figure 5.104**

a. *Conus* sp. bead - inner spire face. Naigani 2, Level B3.
b. *Conus* sp. bead - outer spire face. Naigani 2, Level B3.
c. *Conus* sp. bead - outer spire face. Naigani 2, Level B3.
d. *Conus* sp. bead - inner spire face. Naigani 2, Level B3.
Figure 5.105

b. Ground *Tridacna* sp. fragment. Naigani 2, Level B3.
d. Unfinished long *Tridacna* sp. bead. Naigani 3(ext), Feature 1.
e. Unfinished long *Tridacna* sp. bead. Naigani 2, Level B3.
Figure 5.106

Figure 6.1

Map of northeastern Luzon, Philippines, showing the location of Arku Cave. Modified after Thiel (1980) Figure 4.
Figure 6.2

Plan of excavations at Arku Cave, northern Luzon, Philippines adapted from Thiel (1980) Figure 5.
Figure 6.3

e. Ring fragment of unidentified shell. Arku Cave H4/5, Layer l:1.
Figure 6.4

Map of northern Palawan Island, Philippines, showing the location of Leta Leta Cave.
Figure 6.5

a. Spire of a *Conus litteratus/Conus leopardus* detached by direct percussion.  
   Leta Leta Cave, Square 53, 35cm below surface (accession: 65-L-311)

b. Spire of a *Conus litteratus/Conus leopardus* detached by direct percussion.  
   Leta Leta Cave, no accession number/provenance details.

c. Detached spire of a *Conus* sp. shell showing extreme damage from clionid sponges.  
   Leta Leta Cave, no accession number/provenance details.
Figure 6.6

a. *Conus litteratus/Conus leopardus* spire ground on the body whorl surface.
Leta Leta Cave, Chamber B subsurface (accession: 65-L-257).
This specimen was radiocarbon dated (ANU-11888).

b. *Conus litteratus/Conus leopardus* spire ground on the body whorl surface.

c. *Conus litteratus/Conus leopardus* spire partially ground on both faces.
Leta Leta Cave, 'shale' subsurface (accession: 65-L-222).
Figure 6.7

a. Ground and perforated Conus sp. spire.
Leta Leta Cave, provenance unknown (accession 65-L-39).
b. Ground and perforated Conus sp. spire.
Leta Leta Cave, Grave 5 (square 52) found by the skull (accession: 65-L-340).
Figure 6.8

a. Ground and perforated *Conus* sp. spire. Leta Leta Cave, no provenance details.
b. Water-rolled, ground and perforated *Conus* sp. spire. Leta Leta Cave, no provenance details.
**Figure 6.9**

a. Narrow *Conus* sp. ring. Leta Leta Cave, on top of rock shelf in square 18a (accession 65-L-121).

b. Narrow *Conus* sp. ring. Leta Leta Cave, square 24: 0-20cm (accession 65-L-16).
Figure 6.10

Broad Conus sp. ring with perforation at aperture. Leta Leta Cave, Square 18 on arm of burial #1.
Figure 6.11

Broad Conus sp. ring with perforation at aperture. Leta Leta Cave, square 18 on arm of burial #1.
Figure 6.12

Broad *Conus* sp. ring with perforation by aperture. Leta Leta Cave, square 18 on arm of burial #1.
Figure 6.13

Graph to show frequencies of Conus spp. ring widths present within samples from Palawan Island, Philippines.
Figure 6.14

Graph to show frequencies of different estimated internal diameters of *Conus* spp. rings present within samples from Palawan Island, Philippines.
Figure 6.15

a-e. Ground beads of *Strombus* spp. Leta Leta Cave, screened from sediments throughout cave.
Figure 6.16

Map of northern Palawan Island, Philippines, showing the location of Ille Cave and Rockshelter.
Figure 6.17

Plan of Ille Shelter and cave entrance showing location of excavated testpits as of May 2002. Adapted after de la Torre 1999.
Figure 6.18

Histogram to show mollusc species represented by more than twenty individuals within the Ille Cave and Rockshelter archaeological deposits.
Figure 6.19

Graph to show relative contributions of mollusc-bearing niches represented in the Ille Cave and Shelter assemblage.
Figure 6.20

*Cyprea annulus* with dorsum removed.
Illie Cave and Shelter N2W12: 40-50cm.
Figure 6.21

a. *Strombus canarium* with the spire removed by cutting then punching. Ille Cave and Shelter N2W12: 75-102cm
b. *Strombus luhuanus* spire with apical whorls hewn away. Ille Cave and Shelter N2W12: 40-50cm
Figure 6.22

a. *Strombus* spp. beads. Ille Cave and Shelter N2W13: 70-80cm
b. *Strombus* sp. bead. Ille Cave and Shelter N2W12: 40-50cm.
Figure 6.23

a. Modified *Nassarius arcularis* (left) and *Nassarius globosus* (right). Evidence of wear in indicated region. Ille Cave and Shelter NSW3: 15-20 cm.

Figure 6.24

a. Dorsal view of a double-pierced *Pictocolumbella ocellata*. Ille Cave and Shelter N2W12: 0-30 cm.
b. Ventral view of the same specimen showing the second perforation.
**Figure 6.25**

a. Ground and perforated *Conus* sp., inner spire surface. Ille Cave and Shelter N4W12: 130-135cm.

b. Same artefact, outer spire surface.
Figure 6.26

Perforated *Conus* spp. discs from Ille Cave and Shelter.
Left: N3W12: 21cm
Middle: N4W13: 130-135cm
Right: N4W12: 138cm
Figure 6.27

Shell 'fingling-o'. Ille Cave and Shelter N2W12: 40-50cm.
Figure 6.28

a. 'Specialised' annular metal age beads. Ille Cave and Shelter N5W3: 15-20cm.
b. Two 'specialised' annular metal age beads stuck together as strung. Ille Cave and Shelter N5W3: 20-25cm.
Figure 6.29

Four long, slender ellipsoid beads drilled end-to-end. The specimen on the left shows evidence of a thick coating of an unknown substance. Ille Cave and Shelter N6W3: 10-15cm.
**Figure 6.30**

b. Convex rectangular bead with remnants of an unidentified coating. Ille Cave and Shelter N6W3: 10-15cm.
Figure 6.31

Map of northern Palawan Island, Philippines, showing the location of Langen Island. The location of the Paredes site on the island is not described in known reports and publications.
Figure 6.32

a. Ground and perforated *Conus* sp. spire. Paredes Shelter, square D subsurface. (accession: 65-W-1-23)

b. Ground and perforated *Conus* sp. spire. Paredes Shelter. No accession number.

c. Ground and perforated *Conus* sp. spire. Paredes Shelter. No accession number.
a. Ground and perforated Conus sp. spire. Paredes Shelter. No accession number.
Figure 6.34


Figure 6.35

Map of central Palawan, Philippines, showing the location of Sa'gung Shelter. Modified after Kress (2000) Figure 2.
Figure 6.36

Plan of excavations at Sa’gung Shelter, central Palawan, Philippines. Modified after Kress (2000) Figure 4.
Figure 5.37

a. Ground and perforated Conus sp. spire. Sa'gung Shelter, square 16E, 58cm.
b. Ground and perforated Conus sp. spire. Sa'gung Shelter, square 16E, 46cm.
Figure 6.38

a. Ground and perforated *Conus* sp. spire. Sa’gung Shelter, square 8E, layer 1(?).
b. Ground and perforated *Conus* sp. spire. Sa’gung Shelter, square 9E, depth?
c. Ground and perforated *Conus* sp. spire. Sa’gung Shelter, square 6D, 120cm.
Figure 6.39

a. *Conus* sp. ring fragment. Sa’gung Shelter, square F16, 9-10cm.
b. *Conus* sp. ring fragment. Sa’gung Shelter, square 6C, 73cm.
c. *Conus* sp. ring. Sa’gung Shelter, square 8E, 35cm.
Figure 6.40

a. *Placuna placenta* with two cut edges and a hewn hole. Sa’gung Shelter, square 5D, 95cm.

b. Bivalve perforated disc. Sa’gung Shelter, square 6D, 38cm.

c. Ground and perforated central whorls of a *Conus* sp. spire. Sa’gung Shelter, square 6D, 92cm.

d. *Geloina coxans* with hewn hole. Sa’gung Shelter, square 21-22E, 100cm.
Figure 6.41

Map of central Palawan Island, Philippines, showing the location of Batu Puti Cave. Adapted after Kress (2000) Figure 2 and Fox (1970) Figure 5.
Figure 6.42

a. Ground and perforated *Conus* sp. spire. Batu Puti Cave, square 1A(III), 57cm.
b. Ground and perforated *Conus* sp. spire. Batu Puti Cave, square 6, 8cm.
Figure 6.43

a. *Conus* sp. ring. Batu Puti Cave, square 45, on surface of rock ledge.
b. Broken *Turbo marmoratus* spoon. Batu Puti Cave, square 2, 60cm.
Figure 6.44

Map of central Palawan Island, Philippines, showing the location of Duyong Cave.
Adapted after Fox (1970) Figure 5 and Kress (2000) Figure 2.
Figure 6.46

Schematic plan of Duyong Cave, Palawan Island, Philippines.
After Fox (1970) Figure 16.
Figure 6.47

Profile diagram of the Duyong Cave deposits after Fox (1970) Figure 17.
Figure 6.48

a. Ground and perforated Conus sp. spire. Duyong Cave, square 2 surface (accession: P-l-PBP-497).
b. Ground and perforated Conus sp. spire. Duyong Cave, square 28:0-20cm (accession: P-l-PBP-158).
c. Ground and perforated Conus sp. spire. Duyong Cave, square 12:25cm (accession: P-l-PBP-177).
Figure 6.49

*Tridacna* sp. adze found in association with the neolithic burial, Duyong Cave.
Figure 6.50

Tridacna sp. adze found in association with the neolithic burial, Duyong Cave.
Figure 6.51

Map of southern Mindanao, Philippines, showing the location of Kamuanan Cave.
**Figure 6.52**

Graph to show mollusc species represented by five or more fragments within the Kamuanan Cave deposits.
Kamuanan Cave
Pie chart to show relative importance of mollusc niches represented

Figure 6.53
Pie chart to show relative contributions of mollusc-bearing niches represented in the Kamuanan Cave deposits.
Figure 6.54

Outer and inner views of a fragment of Trochus niloticus showing evidence of chipping with a sharp point, using either an indirect percussion or pressure flaking method.
Kamuanan Cave, Pit A/0-10cm.
Figure 6.55

Reduced *Trochus niloticus*. Small arrows indicate either indirect percussion or pressure flaking while the larger arrows indicate crushing and the removal of lamellae as a result of direct freehand percussion.

Kamuanan Cave, 12-18* testpit unknown.
Figure 6.56

a. Worked fragment of *Tectus pyramis*. Arrows indicate notches evidencing indirect percussion or pressure flaking. Kamuanan Cave, no provenance details.

b. Worked columella of a *Tectus pyramis*. Arrows indicate notches evidencing indirect percussion or pressure flaking. Kamuanan Cave, Pit B, no depth given.
Figure 6.57

a. Worked fragment of *Turbo marmoratus* - outer surface. Arrows indicate notches evidencing either indirect percussion or pressure flaking. Kamuanan Cave, no provenance details.

b. Worked fragment of *Turbo marmoratus* - inner surface. Arrows indicate notches evidencing either indirect percussion or pressure flaking. Kamuanan Cave, no provenance details.
Figure 6.58

a. Reduced *Tridacna crocea* valve. Arrow indicates where a sharp point was driven into the valve to force it to split. Kamuanan Cave, Pit B:10-20 cm.
b. Dorsal margin fragment of a *Tridacna gigas*. Arrow indicates where a sharp point was driven into the valve to force it to split. Kamuanan Cave, Pit A:10-20 cm.
Figure 6.59

a. Fragment of a *Tridacna squamosa* valve. Arrow indicates where a sharp point was driven into the valve forcing it to split. Kamuanan Cave, no provenance details.


c. Same artefact as (b), ventral view.
Figure 6.60

Map of Gebe Island, northern Moluccas, Indonesia, showing the location of Golo Cave. Adapted after Irwin et al. (1998) figure 4.
Figure 6.61

a. *Cassis comuta* adze/gouge. Golo Cave, Square M90-5cm.
b. *Cassis comuta* adze/gouge. Golo Cave, Square M650-55cm.
Figure 6.62

*Cassis cornuta* adze/gouge. Golo Cave, Square H4: 65-70cm.
Figure 6.63

Graph to show the relationship between size and level of abrasion in the *Cassis cornuta* adze/gouge sample from Golo Cave. Minimal abrasion has been assigned the value of 1, while abrasion of the bevel area as well as sections of the ventral face has been assigned the value of 2.
Figure 6.63

*Hippopus hippocus* adze/gouge. Golo Cave, square M6: 145-150cm.
Figure 6.64

*Tridacna gigas* adze. Golo Cave, Square MS:135-140cm.
Figure 6.65

b. Artefact as above; dorsal surface.
d. Artefact as above; part of dorsal surface. Rest of dorsal surface coincides with the ventral surface of the operculum.
f. Artefact as above; dorsal surface including a section of the natural, ventral surface of the operculum.

All arrows indicate relict outer operculum surfaces.
Figure 6.66

a. Ventral view of a flaked *Turbo marmoratus* operculum. Arrows indicate older surfaces that have been exposed by, and guided, fracture. Golo Cave, M6: 200-205 cm.

b. Dorsal view of the same artefact.
Figure 6.67

a. Ventral view of a fragment of *Turbo marmoratus* operculum. No clear signs of working. Arrows indicate relict outer surface of shell which has influenced fracture. Golo Cave, LM6: 205-210cm.
b. Dorsal face of above artefact.
d. Opposite side of above artefact.
Figure 6.68

Map of the northern Moluccas showing the location of the Uattamdi site. Adapted after Bellwood (1992) Figure 1.
Figure 6.69

b. *Trochus niloticus* ring fragment. Uattamdi, Square D8, Unit C: 30-35cm.
c. *Trochus niloticus* ring fragment. Uattamdi, Square D8, Unit C: 30-35cm.
Figure 6.70

a. Edge-ground dorsum of a *Cypraea cf. tigris*. Uattamdi, Square C7, Unit D: 10-15 cm.

b. *Cypraea tigris* dorsum with two perforations. Uattamdi, Square D1, spoil.
Figure 6.71

a. Ground and perforated bead of *Cassis cornuta*. Uattamdi, Square G4C5, Unit C20-25cm.
b. Abraded and perforated bead of *Cassis cornuta*. Uattamdi, Square G4C5, Unit C20-25cm.
c. *Conus* sp. ring fragment. Uattamdi, Square D9, Unit C:20-25cm.
d. Shaped piece of an *Isognomon isognomon* valve. Uattamdi, Square D4, Unit C:5-10cm.
Figure 6.72

a. Worked *Tridacna* sp. Uattamdi, Square C7, Unit D: 15-20cm.
b. Shaped *Nautilus* sp. septal wall. Uattamdi, Square D4, Unit C: 10-15cm.
Figure 7.1

Map of Buka Island, North Solomons Province, Papua New Guinea, showing the location of Kilu Cave and Palandraku Cave. Adapted after Wickler (2001) Figure 3.1
Figure 7.2

b. Same artefact as above, opposite view.
c. Worked *Trochus niloticus* fragment. Kilu Cave, testpit 3 layer 1:2
Figure 7.3

a. Ventral view of three detached pieces of *Turbo marmoratus* shoulder keel. Kilu Cave, testpit 2 layer L2.
b. Dorsal view of above.
Figure 7.4

a. Worked *Turbo marmoratus* body whorl fragment. Arrows show notches indicating chipping with a sharp point. Kilu Cave, testpit 2 layer t:17.
b. Ventral view of above.
Figure 7.5

a. Two abraded *Terebralia palustris* spires. Both abraded on two opposing surfaces. Kilu Cave, testpit 3 layer l:11.
b. Abraded, burnt and structurally-altered *Terebralia palustris* spire. Damage coincides with that produced by coenobitid hermit crabs.
   Kilu Cave, testpit 3 layer l:11.
c. and d. Two views of an abraded *Terebralia palustris* spire. Abraded on two opposing surfaces. Kilu Cave, testpit 3 layer l:11.
Figure 7.6

a. Ground inner whorls of a *Conus* sp. shell; inner spire surface (unground). Kiliu Cave, testpit 1 layer L5.
b. Outer spire view of above (ground).
Figure 7.7

Outer and inner views of a dorsal margin piece of *Tridacna maxima*. Arrows indicate grinding facets.
Kilu Cave, provenance unknown.
Figure 7.8

Outer and inner views of a cut piece of the septal wall of a *Nautilus* sp. shell. The perforation is the natural siphon hole. Kilu Cave, testpit 1 layer I:2.
Figure 7.9

a. Inner view of a potentially-worked fragment of *Turbo marmoratus*. The edges are rounded and worn, though probably cut. The notches represent fresh damage. Palandraku Cave, testpit 1 layer V/VI:13.

b. Outer view of same artefact.
Figure 7.10

b. same artefact, external view.
Figure 7.11

b. Cut *Nautilus* sp. shell. Palandraku Cave, testpit 2, layer V:13.
c. Cut *Nautilus* sp. shell, internal view. Palandraku Cave, testpit 2, layer V:13.
d. External view of c.
Figure 7.12

Map to show the location of Pamwak Rockshelter on Manus Island, Admiralty Islands, Papua New Guinea. Adapted after Fredericksen et al. (1993: figure 2).
Figure 7.13

Map to show location of mollusc-bearing niches relative to the present location of the Pamwak site. Adapted after Fredericksen et al. (1993: figure 3).
Figure 7.14

a. Cut fragment of *Nautilus* sp. Pamwak, square 3, northwest quadrant, spit 3a.
b. Same artefact, outer valve view.
Figure 7.15

_Tridacna gigas_ adze. Pamwak, square 2 (baulk), south half, spit 3b.
Dorsal and ventral views.
Figure 7.16

*Tridacna gigas* adze. Pamwak, square 2 (baulk), north half, spit 7a.
Dorsal and ventral views.
Figure 7.17

*Tridacna gigas* adze. Pamwak, square 2, southeast quadrant, spit 4. Dorsal and ventral views.
Figure 7.18

*Tridacna gigas* adze. Pamwak, square 2, southeast quadrant, spit 4. Dorsal and ventral views.
Figure 7.19

*Tridacna gigas* adze. Pamwak, square 4 (baulk), southern half, spit 4a.
Dorsal and ventral views.
Figure 7.20

*Tridacna gigas* adze. Pamwak, square 4, northern half, spit 8b. Dorsal and ventral views.
Figure 7.21

*Tridacna gigas* adze. Pamwak, square 4, southwest quadrant, spit 5a. Dorsal and ventral views.
Figure 7.22

Burnt, shattered and reconstructed *Tridacna gigas* adze.
Panwak, square 2, northeast quadrant, spit 6b.
Dorsal and ventral views.
Figure 7.23

Water-rolled *Tridacna gigas* adze showing extensive damage caused by clionid sponges and other bio-eroders.
Pamwak, square 4, northeast quadrant, spit 2a.
Dorsal and ventral views.
Figure 7.24

*Tridacna gigas* adze. Pamwak, square 4, northwest quadrant, spit 2b. Dorsal and ventral views.
Figure 7.25

Fully ground hinge-section *Tridacna gigas* adze. Pamwak, square 4, northwest quadrant, spit 2b.
Dorsal and ventral views.
Figure 7.26

*Tridacna gigas* adze. Pamwak, square 4, northwest quadrant, spit 4a.
Figure 7.27

Tridacna gigas adze. Pamwak, square 4, northwest quadrant, spit 2a.
Figure 7.28

*Tridacna gigas* adze. Pamwak, square 2, southeast quadrant, spit 9b.
Figure 7.29

*Tridacna gigas* adze. Pamwak, square 2, northwest quadrant, spit Sb.
Figure 7.30

*Tridacna gigas* adze. Pamwak, square 1, spit 7.
Figure 7.31

Tridacna gigas adze. Pamwak, square 4, northwest quadrant, spit 4b.
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**Figure 7.32**

Table to show provenances of pottery, *Tridacna gigas* adzes, and dated samples at Pamwak, Manus Island, Papua New Guinea. The light grey fill indicates pottery-bearing provenances, while the dark grey fill indicates locations of recovered *Tridacna gigas* adzes. Dates are calibrated following Table 7.3 and given at 2 sigma rounded to the nearest 100 years. Adapted after Fredericksen (1994:table 4.2).
**Figure 8.1**

Map showing the distribution and approximate chronological position of evidence for the working of *Trochus niloticus* identified within this research.
Figure 8.2

Map showing the distribution of formal artefact types utilising *Trochus niloticus* as a raw material identified within this research.
Figure 8.3

Map showing the distribution and approximate chronological position of evidence for the working of *Turbo marmoratus* identified within this research.
Figure 8.4

Map showing the distribution of formal artefact types and worked fragments utilising Turbo marmoratus as a raw material identified within this research.
Figure 8.5

Map showing the distribution and approximate chronological positioning of evidence for the working of Tridacna spp. identified within this research.
Figure 8.6

Map showing the distribution of formal artefact types and worked pieces utilising Tridacna spp. as a raw material identified within this research.
Figure 8.7

Map showing the distribution and approximate chronological position of evidence for the working of Conus spp. identified within this research.
Figure 8.8

Map showing the distribution of formal artefact types and worked fragments utilising Conus spp. as a raw material identified within this research.
Figure 8.9

Map showing the distribution and approximate chronological position of evidence for the working of *Pinctada* spp. and *Isognomon* spp. identified within this research.
Figure 8.10

Map showing the distribution worked pieces utilising *Pinctada* spp. or *Isognomon* spp. identified within this research.
Figure 8.11

Map showing the distribution and approximate chronological position of evidence for the working of *Nautilus* spp. identified within this research.
Figure 8.12

Map showing the distribution of worked fragments utilising *Nautilus* spp. as a raw material identified within this research.
Figure 8.13

Map showing the distribution and approximate chronological position of evidence for the working of Cypraea spp. identified within this research.
Figure 8.14

Map showing the distribution of worked pieces utilising *Cypraea* spp. as a raw material identified within this research.
Figure 8.15

Map showing the distribution and approximate chronological position of evidence for the working of *Nassarius* spp. and *Strombus* spp. identified within this research.
Map showing the distribution of artefact types utilising Nassarius spp. and Strombus spp as a raw material identified within this research.