

Appendices

Appendix A: Reference and identification data OAL Reference Collection

Family	Elements not held in collection
Acanthuridae	
Anguillidae	Ceratohyal, cleithrum, epihyal, hyomandibular, maxilla, opercular, palatine, parasphenoid, pharyngeal plate, post temporal, preopercular, scapula, vomer
Balistidae	
Belontiidae	Ceratohyal, epihyal, palatine, post temporal, vomer
Bothidae	Parasphenoid, pharyngeal plate, scapula, vomer
Carangidae	
Chaetodontidae	Articular, ceratohyal, epihyal, hyomandibular, maxilla, palatine, parasphenoid, pharyngeal plate, post temporal, scapula, vomer
Chanidae	Pharyngeal plate, scapula, vomer
Cirrhitidae	Ceratohyal, cleithrum, epihyal, hyomandibular, opercular, palatine, parasphenoid, pharyngeal plate, post temporal, preopercular, scapula, vomer
Congridae	Cleithrum, maxilla, palatine, pharyngeal plate, post temporal, preopercular, scapula
Coryphaenidae	
Diodontidae	Ceratohyal, cleithrum, epihyal, hyomandibular, opercular, palatine, parasphenoid, post temporal, preopercular, scapula, vomer
Exocoetidae	Post temporal, vomer
Fistularidae	*reference specimen provided by Dr Marshall Weisler
Gempylidae	Ceratohyal, cleithrum, epihyal, hyomandibular, opercular, palatine, parasphenoid, pharyngeal plate, post temporal, preopercular, scapula, vomer
Holocentridae	
Kyphosidae	
Labridae	
Lethrinidae	
Lutjanidae	
Monacanthidae	Palatine, pharyngeal plate, post temporal
Mugilidae	
Mullidae	
Muraenidae	Ceratohyal, cleithrum, epihyal, maxilla, opercular, palatine, pharyngeal plate, post temporal, preopercular, scapula
Pempheridae	
Pomacanthidae	Palatine, pharyngeal plate, vomer
Pomacentridae	Parasphenoid, vomer
Prichthidae	Pharyngeal plate

Continued on next page

Family	Elements not held in collection
Scaridae	
Scombridae	
Scorpanidae	
Serranidae	
Siganidae	Ceratohyal, epihyal, palatine, pharyngeal plate, post temporal, vomer
Syphraenidae	

Appendix B: Element counts and taxonomic identification of fish

Tangarutu E1/E2 Level III

Family	Element	Left	N/A	Right	Total
Acanthuridae	Palatine			1	1
	Premaxilla	1		1	2
	Preopercular	1			1
	Quadrate			1	1
	Scapula			1	1
Acanthuridae Total		2		4	6
Apode	Ceratohyal	1			1
	Epihyal	1		2	3
	Opercular	2		2	4
	Unidentified element		4		4
Apode Total		4	4	4	12
Belonidae	Articular	1			1
	Dentary	1			1
	Opercular			1	1
	Preopercular	1			1
Belonidae Total		3		1	4
cf. Aulostomidae	Articular	1		1	2
	Preopercular	1		1	2
	Quadrate	1		2	3
cf. Aulostomidae Total		3		4	7
Chaetodontidae	Cleithrum	9		9	18
	Opercular	10		6	16
	Preopercular	15		7	22
Chaetodontidae Total		34		22	56
Congridae	Articular	2		2	4
	Dentary	5		4	9
	Hyomandibular	2		1	3
	Premaxilla	3		5	8
	Quadrate	2		1	3
	Vomer		1		1
Congridae Total		14	1	13	28

Continued on next page

Tangarutu E1/E2 Level III *continued*

Family	Element	Left	N/A	Right	Total
Diodontidae	Dermal spine		4		4
Diodontidae Total			4		4
Elasmobranchii	Tooth		6		6
Elasmobranchii Total			6		6
Exocoetidae	Hyomandibular			1	1
	Inferior pharyngeal plate		1		1
	Scapula			1	1
Exocoetidae Total			1	2	3
Holocentridae	Articular	1		1	2
	Cleithrum			1	1
	Hyomandibular	1			1
	Preopercular	1			1
	Scapula			1	1
Holocentridae Total		3		3	6
Kyphosidae	Articular	1			1
	Post temporal	1			1
Kyphosidae Total		2			2
Labridae	Articular	1			1
	Cleithrum	2		1	3
	Dentary	4		1	5
	Hyomandibular	2			2
	Inferior pharyngeal plate		4		4
	Maxilla	2		1	3
	Opercular	1		4	5
	Premaxilla	12		9	21
	Preopercular	3		1	4
	Quadrate	1		1	2
	Superior pharyngeal plate			2	2
Labridae Total		28	4	20	52
Lethrinidae	Articular	1			1
	Dentary	5		1	6
	Hyomandibular			1	1
	Premaxilla			1	1
	Preopercular			1	1
	Quadrate			1	1
Lethrinidae Total		6		5	11
Mullidae	Articular			1	1
	Dentary			1	1
	Opercular			1	1
	Premaxilla	1			1
	Scapula			1	1
Mullidae Total		1		4	5

Continued on next page

Tangarutu E1/E2 Level III *continued*

Family	Element	Left	N/A	Right	Total
Muraenidae	Articular	8		7	15
	Dentary	20		24	44
	Hyomandibular	8		3	11
	Premaxilla			2	2
	Quadrate	10		4	14
	Vomer		11		11
Muraenidae Total		46	11	40	97
NIC 10	Opercular			1	1
NIC 10 Total				1	1
NIC 11	Opercular			1	1
NIC 11 Total				1	1
NIC 12	Opercular	2		1	3
NIC 12 Total		2		1	3
NIC 13	Opercular	2			2
NIC 13 Total		2			2
NIC 14	Palatine			1	1
NIC 14 Total				1	1
NIC 19	Dentary			1	1
NIC 19 Total				1	1
NIC 22	Scapula			1	1
NIC 22 Total				1	1
NIC 23	Scapula			1	1
NIC 23 Total				1	1
NIC 33	Inferior pharyngeal plate		1		1
NIC 33 Total			1		1
NIC 34	Superior pharyngeal plate		1		1
NIC 34 Total			1		1
NIC 45	Vomer		1		1
NIC 45 Total			1		1
NIC 6	Hyomandibular			2	2
NIC 6 Total				2	2
Pomacentridae	Cleithrum	7		1	8
	Opercular	2		1	3
	Post temporal			2	2
	Scapula	1		1	2
Pomacentridae Total		10		5	15
Scaridae	4th Epibranchial			3	3
	Articular	2		5	7
	Ceratohyal	2		1	3
	Cleithrum	2			2
	Dentary	7		3	10
	Epihyal	1		1	2

Continued on next page

Tangarutu E1/E2 Level III *continued*

Family	Element	Left	N/A	Right	Total
	Hyomandibular	6		4	10
	Inferior pharyngeal plate	1	13		14
	Maxilla	1		1	2
	Opercular	5		9	14
	Palatine	2		6	8
	Parasphenoid		4		4
	Premaxilla	14		10	24
	Preopercular	7		6	13
	Quadrate	5		1	6
	Scapula	6		5	11
	Superior pharyngeal plate	21	1	19	41
	Toothed element		6		6
Scaridae Total		82	24	74	180
Serranidae	Articular	4		11	15
	Ceratohyal	9		3	12
	Cleithrum	5		5	10
	Dentary	11		16	27
	Epihyal	6		3	9
	Hyomandibular	2		3	5
	Maxilla	14		11	25
	Opercular	12		16	28
	Palatine	4		3	7
	Parasphenoid		5		5
	Post temporal	3		5	8
	Premaxilla	12		11	23
	Preopercular	15		16	31
	Quadrate	11		7	18
	Scapula	5			5
	Vomer		2		2
Serranidae Total		113	7	110	230
Unidentified	Basioccipital		2		2
	Basipterygium	5		5	10
	Ceratohyal		1		1
	Cleithrum	1		2	3
	Coracoid	9	1	7	17
	Dorsal spine		222		222
	Dorsal spine/pterygiophore		57		57
	Ectopterygoid	8		6	14
	Epihyal		1		1
	Fragments		885		885
	Hyomandibular			1	1

Continued on next page

Tangarutu E1/E2 Level III *continued*

Family	Element	Left	N/A	Right	Total
	Hypural		4		4
	Hypural 1 and 2		13		13
	Hypural 3 and 4	2	10		12
	Hypural 5		4		4
	Identifiable		209		209
	Interopercular	4	29		33
	Maxilla		2		2
	Mesopterygoid	1			1
	Metapterygoid	6			6
	Misc spines and rays		291		291
	Opercular	1	4		5
	Parasphenoid		1		1
	Preopercular	3		5	8
	Pterygiophore		114		114
	Scale		1360		1360
	Subopercular	7	2	2	11
	Supracleithrum	10	2	4	16
	Toothed element		13		13
	Urohyal		4		4
	Vertebra		728		728
Unidentified Total		57	3959	32	4048
Grand Total		412	4023	353	4788

Tangarutu E1/E2 Level II

Family	Element	Left	N/A	Right	Total
Acanthuridae	Quadrate	1			1
Acanthuridae Total		1			1
Apode	Basihyal		1		1
	Ceratohyal	2		1	3
	Epihyal	2		5	7
	Opercular	4		5	9
	Premaxilla	1			1
	Unidentified element		5		5
Apode Total		9	6	11	26
Belonidae	Articular			1	1
	Dentary			2	2
Belonidae Total				3	3
Chaetodontidae	Cleithrum	11		10	21
	Opercular	7		9	16
	Preopercular	2		4	6
Chaetodontidae Total		20		23	43

Continued on next page

Tangarutu E1/E2 Level II *continued*

Family	Element	Left	N/A	Right	Total
Congridae	Articular	3		1	4
	Dentary	5		2	7
	Hyomandibular	1		1	2
	Premaxilla	2		3	5
	Quadrate	1		1	2
	Vomer		2		2
Congridae Total		12	2	8	22
Diodontidae	Dermal spine		1		1
Diodontidae Total			1		1
Holocentridae	Preopercular			1	1
Holocentridae Total				1	1
Kyphosidae	Cleithrum			1	1
	Maxilla	1			1
	Post temporal			1	1
	Quadrate	1			1
Kyphosidae Total		2		2	4
Labridae	Cleithrum	8		3	11
	Dentary	2		2	4
	Epihyal			1	1
	Hyomandibular	2		2	4
	Inferior pharyngeal plate		4		4
	Maxilla			1	1
	Palatine	1		1	2
	Post temporal	1			1
	Premaxilla	3		8	11
	Preopercular	2		6	8
	Quadrate	2		4	6
	Scapula	1		1	2
	Superior pharyngeal plate	1			1
Labridae Total		23	4	29	56
Lethrinidae	Dentary	1		2	3
Lethrinidae Total		1		2	3
Muraenidae	Articular	3		3	6
	Dentary	9		19	28
	Hyomandibular	5		2	7
	Parasphenoid		2		2
	Premaxilla	2		5	7
	Quadrate	2		2	4
	Toothed element		1		1
	Vomer		12		12
Muraenidae Total		21	15	31	67

Continued on next page

Tangarutu E1/E2 Level II *continued*

Family	Element	Left	N/A	Right	Total
NIC 13	Opercular	1			1
NIC 13 Total		1			1
NIC 15	Palatine		1		1
NIC 15 Total			1		1
NIC 16	Premaxilla			1	1
NIC 16 Total				1	1
NIC 17	Premaxilla	1			1
NIC 17 Total		1			1
NIC 24	Articular	1			1
NIC 24 Total		1			1
NIC 30	Ceratohyal	1			1
NIC 30 Total		1			1
NIC 4	Hyomandibular			2	2
NIC 4 Total				2	2
NIC 41	Scute		1		1
NIC 41 Total			1		1
Pomacentridae	Cleithrum			1	1
	Preopercular	1			1
	Scapula			1	1
Pomacentridae Total		1		2	3
Scaridae	4th epibranchial	3		3	6
	Articular			1	1
	Cleithrum	1			1
	Dentary	3		4	7
	Epihyal	1		2	3
	Hyomandibular	1		3	4
	Inferior pharyngeal plate		4		4
	Maxilla	1		2	3
	Opercular	1		2	3
	Palatine	2			2
	Parasphenoid		2		2
	Post temporal	2		1	3
	Premaxilla	5		1	6
	Preopercular	1		3	4
	Quadrate	2		1	3
	Scapula	2			2
	Superior pharyngeal plate	12		6	18
	Toothed element		3		3
Scaridae Total		37	9	29	75
Serranidae	Articular	2			2
	Ceratohyal			1	1
	Cleithrum	2		3	5

Continued on next page

Tangarutu E1/E2 Level II *continued*

Family	Element	Left	N/A	Right	Total
	Dentary	3		3	6
	Epihyal	1		3	4
	Hyomandibular	4		2	6
	Maxilla	2		1	3
	Opercular	2		1	3
	Palatine	1		1	2
	Parasphenoid		2		2
	Post temporal	2		3	5
	Premaxilla	3		2	5
	Preopercular	4		2	6
	Quadrate	3		1	4
	Scapula	2		1	3
Serranidae Total		31	2	24	57
Siganidae	Preopercular			1	1
Siganidae Total				1	1
Unidentified	Basipterygium	1	2		3
	Ceratohyal			1	1
	Coracoid	3		3	6
	Dorsal spine		158		158
	Dorsal spine/pterygiophore		35		35
	Ectopterygoid	2	1	2	5
	Fragments		670		670
	Hypural 1 and 2		1		1
	Hypural 3 and 4		2		2
	Hypural 5		1		1
	Identifiable		134		134
	Interopercular		12		12
	Maxilla	1		1	2
	Misc spines and rays		340		340
	Parasphenoid		2		2
	Preopercular			1	1
	Pterygiophore		109		109
	Scale		709		709
	Scapula		1		1
	Subopercular	5		6	11
	Supracleithrum	9	1	7	17
	Toothed element		4		4
	Urohyal		3		3
	Vertebra		478		478
Unidentified Total		21	2663	21	2705
Grand Total		183	2704	190	3077

Tangarutu E1/E2 Level I					
Family	Element	Left	N/A	Right	Total
Acanthuridae	Cleithrum	1			1
	Dorsal spine		1		1
	Opercular			1	1
	Pterygiophore		1		1
	Scapula	1		1	2
Acanthuridae Total		2	2	2	6
Apode	Epihyal	1		1	2
	Opercular	2		2	4
	Premaxilla			1	1
	Unidentified element		3		3
Apode Total		3	3	4	10
Belonidae	Hyomandibular	1			1
	Metapterygoid	1			1
	Preopercular	1		1	2
	Quadrate	1			1
Belonidae Total		4	1	5	
Carangidae	Scapula			1	1
Carangidae Total				1	1
Chaetodontidae	Cleithrum	6		8	14
	Opercular	7		2	9
	Preopercular			3	3
Chaetodontidae Total		13		13	26
Congridae	Articular			2	2
	Dentary			2	2
	Hyomandibular	1			1
	Parasphenoid		2		2
	Premaxilla	1			1
Congridae Total		2	2	4	8
Diodontidae	Dermal spine		3		3
Diodontidae Total			3		3
Kyphosidae	Preopercular			1	1
Kyphosidae Total				1	1
Labridae	Articular	1			1
	Cleithrum	1		1	2
	Hyomandibular	1		4	5
	Inferior pharyngeal plate		2		2
	Maxilla			1	1
	Premaxilla	2		8	10
	Preopercular			1	1
	Quadrate			1	1
	Scapula	1		2	3
Superior pharyngeal plate	1			1	

Continued on next page

Tangarutu E1/E2 Level I *continued*

Family	Element	Left	N/A	Right	Total
Labridae Total		7	2	18	27
Monacanthidae	Cleithrum	1			1
Monacanthidae Total		1			1
Mugilidae	Premaxilla	2			2
Mugilidae Total		2			2
Mullidae	Dentary			1	1
	Hyomandibular	1			1
Mullidae Total		1		1	2
Muraenidae	Articular	2		2	4
	Dentary	13		9	22
	Hyomandibular	3		2	5
	Parasphenoid		1		1
	Premaxilla	3		1	4
	Quadrate	3		2	5
	Toothed element		2		2
	Vomer		9		9
Muraenidae Total		24	12	16	52
NIC 12	Opercular			2	2
NIC 12 Total				2	2
NIC 18	Premaxilla			1	1
NIC 18 Total				1	1
NIC 21	Scapula	1			1
NIC 21 Total		1			1
NIC 25	Articular	1			1
NIC 25 Total		1			1
NIC 27	Epihyal	1			1
NIC 27 Total		1			1
NIC 28	Epihyal			1	1
NIC 28 Total				1	1
NIC 31	Ceratohyal			1	1
NIC 31 Total				1	1
NIC 35	Superior pharyngeal plate		1		1
NIC 35 Total			1		1
NIC 38	Quadrate	1			1
NIC 38 Total		1			1
NIC 4	Hyomandibular			2	2
NIC 4 Total				2	2
NIC 42	Hyomandibular	1			1
NIC 42 Total		1			1
NIC 43	Opercular			1	1
NIC 43 Total				1	1

Continued on next page

Tangarutu E1/E2 Level I *continued*

Family	Element	Left	N/A	Right	Total
NIC 44	Vomer		1		1
NIC 44 Total			1		1
NIC 45	Vomer		1		1
NIC 45 Total			1		1
NIC 9	Preopercular			1	1
NIC 9 Total				1	1
Pomacentridae	Cleithrum			1	1
	Inferior pharyngeal plate		1		1
	Preopercular	1			1
	Scapula	1			1
Pomacentridae Total		2	1	1	4
Scaridae	4th epibranchial	4		8	12
	Articular	12		9	21
	Ceratohyal			1	1
	Cleithrum	5		2	7
	Dentary	19		18	37
	Hyomandibular	9		10	19
	Inferior pharyngeal plate		29		29
	Maxilla	3		4	7
	Opercular	10		8	18
	Palatine	6		5	11
	Post temporal			1	1
	Premaxilla	20		13	33
	Preopercular	3		7	10
	Quadrate	9		9	18
	Scapula	5		5	10
	Superior pharyngeal plate	33		30	63
	Toothed element		4		4
	Vomer		2		2
Scaridae Total		138	35	130	303
Serranidae	Articular	3		3	6
	Ceratohyal	2		1	3
	Cleithrum	3		2	5
	Dentary			3	3
	Epihyal			2	2
	Hyomandibular	2		3	5
	Maxilla	1		7	8
	Opercular	1		1	2
	Parasphenoid		1		1
	Post temporal	2		3	5
	Premaxilla	5			5
	Preopercular			1	1

Continued on next page

Tangarutu E1/E2 Level I *continued*

Family	Element	Left	N/A	Right	Total
	Quadrate	6		2	8
	Scapula	1			1
	Vomer		2		2
Serranidae Total		26	3	28	57
Siganidae	Hyomandibular	1		1	2
	Maxilla			1	1
	Premaxilla	1		1	2
	Preopercular	1			1
	Scapula	1			1
Siganidae Total		4		3	7
Unidentified	Basioccipital		1		1
	Basipterygium	9		4	13
	Ceratohyal		4		4
	Cleithrum	1			1
	Coracoid	2		2	4
	Dorsal spine		92		92
	Dorsal spine/pterygiophore		25		25
	Ectopterygoid	2		2	4
	Epihyal		1		1
	Fragments		1155		1155
	Hypural 1 and 2		6		6
	Hypural 3 and 4		11		11
	Hypural 5		1		1
	Identifiable		163		163
	Interopercular		21		21
	Maxilla		1		1
	Misc spines and rays		279		279
	Opercular		6	1	7
	Parasphenoid		2		2
	Preopercular			2	2
	Pterygiophore		123		123
	Quadrate	1		1	2
	Scale		547		547
	Subopercular	2	2	1	5
	Superior pharyngeal plate		4		4
	Supracleithrum	13		10	23
	Toothed element		2		2
	Urohyal		1		1
	Ventral hypohyal			1	1
	Vertebra		519		519
Unidentified Total		30	2966	24	3020
Grand Total		264	3032	256	3552

Tangarutu R1 Level III

Family	Element	Left	N/A	Right	Total
Acanthuridae	Cleithrum	1			1
Acanthuridae Total		1			1
Apode	Ceratohyal	1		1	2
	Ceratohyal			1	1
	Dentary			1	1
	Epihyal			2	2
	Opercular			1	1
	Unidentified element		4		4
Apode Total		1	4	6	11
Chaetodontidae	Cleithrum	3		13	16
	Opercular	2		2	4
	Preopercular	1		3	4
Chaetodontidae Total		6		18	24
Congridae	Articular	3		5	8
	Dentary	4		3	7
	Hyomandibular	2		2	4
	Premaxilla	5		1	6
	Quadrate	2		1	3
	Vomer		3		3
Congridae Total		16	3	12	31
Diodontidae	Dermal spine		2		2
Diodontidae Total			2		2
Elasmobranchii	Vertebra		1		1
Elasmobranchii Total			1		1
Holocentridae	Ceratohyal	1			1
Holocentridae Total		1			1
Labridae	Cleithrum	2		3	5
	Dentary	2			2
	Hyomandibular			1	1
	Inferior pharyngeal plate		7		7
	Maxilla	3		2	5
	Premaxilla	5		8	13
	Preopercular	3		2	5
	Quadrate	3			3
	Vomer		1		1
Labridae Total		18	8	16	42
Mullidae	Dentary			1	1
	Post temporal	1			1
	Premaxilla			1	1
Mullidae Total		1		2	3
Muraenidae	Articular	4		3	7
	Dentary	19		8	27

Continued on next page

Tangarutu R1 Level III *continued*

Family	Element	Left	N/A	Right	Total
	Hyomandibular	2		4	6
	Parasphenoid		2		2
	Premaxilla			4	4
	Quadrate	2		2	4
	Toothed element		1		1
	Vomer		5		5
Muraenidae Total		27	8	21	56
NIC 13	Opercular	1		4	5
NIC 13 Total		1		4	5
NIC 17	Premaxilla			1	1
NIC 17 Total				1	1
NIC 37	Quadrate	1		1	2
NIC 37 Total		1		1	2
NIC 39	Quadrate	1			1
NIC 39 Total		1			1
NIC 4	Hyomandibular			1	1
NIC 4 Total				1	1
NIC 40	Quadrate	1			1
NIC 40 Total		1			1
Pomacentridae	Cleithrum	1		1	2
Pomacentridae Total		1		1	2
Scaridae	4th epibranchial	3		1	4
	Articular	4		3	7
	Ceratohyal			2	2
	Cleithrum			1	1
	Dentary	3		2	5
	Epihyal	1			1
	Hyomandibular	1		1	2
	Inferior pharyngeal plate		4		4
	Maxilla	2		4	6
	Opercular	2		1	3
	Palatine	2			2
	Parasphenoid		1		1
	Post temporal	2		1	3
	Post temporal	1			1
	Premaxilla	3		6	9
	Preopercular	3		3	6
	Quadrate	3		1	4
	Scapula	1		2	3
	Superior pharyngeal plate	4		5	9
Scaridae Total		35	5	33	73

Continued on next page

Tangarutu R1 Level III *continued*

Family	Element	Left	N/A	Right	Total
Serranidae	Articular	3		2	5
	Cleithrum	5		4	9
	Dentary	5		4	9
	Epihyal	2		3	5
	Hyomandibular	2		2	4
	Maxilla	5			5
	Opercular			1	1
	Palatine			2	2
	Parasphenoid		1		1
	Post temporal	1		1	2
	Premaxilla	2		2	4
	Preopercular	2		1	3
	Scapula	1			1
	Vomer		1		1
Serranidae Total		28	2	22	52
Unidentified	Basioccipital		3		3
	Basipterygium	2		1	3
	Cleithrum	5			5
	Coracoid	3		4	7
	Dermal spine		1		1
	Dorsal spine		73		73
	Dorsal spine/pterygiophore		31		31
	Ectopterygoid	1	3	2	6
	Fragments		953		953
	Hyomandibular		1		1
	Hypural		1		1
	Hypural 1 and 2		5		5
	Hypural 3 and 4		5		5
	Identifiable		46		46
	Interopercular		6		6
	Misc spines and rays		138		138
	Opercular	1	1		2
	Parasphenoid		2		2
	Post temporal		1		1
	Preopercular	1			1
	Pterygiophore		32		32
	Scale		202		202
	Subopercular	3		2	5
	Supracleithrum	3		4	7
Toothed element		1		1	
Urohyal		1		1	
Vertebra		233		233	
Unidentified Total		19	1739	13	1771
Grand Total		158	1772	151	2081

Tangarutu R1 Level II

Family	Element	Left	N/A	Right	Total
Apode	Basihyal		1		1
	Ceratohyal	1			1
	Epihyal			1	1
	Opercular	1		1	2
Apode Total		2	1	2	5
cf. Aulostomidae	Opercular			1	1
cf. Aulostomidae Total				1	1
Chaetodontidae	Cleithrum	1		1	2
Chaetodontidae Total		1		1	2
Congridae	Parasphenoid		2		2
	Premaxilla	1			1
	Vomer		3		3
Congridae Total		1	5		6
Kyphosidae	Articular			1	1
Kyphosidae Total				1	1
Labridae	Cleithrum	1		1	2
	Opercular	1			1
	Premaxilla	1			1
	Preopercular	1			1
Labridae Total		4		1	5
Lethrinidae	Dentary			1	1
Lethrinidae Total				1	1
Mullidae	Articular	1			1
Family	Element	Left	N/A	Right	Total
	Premaxilla	1			1
Mullidae Total		2			2
Muraenidae	Articular			2	2
	Dentary	6		9	15
	Hyomandibular			3	3
	Premaxilla			3	3
	Quadrate			1	1
	Vomer		2		2
Muraenidae Total		6	2	18	26
NIC 15	Palatine			1	1
NIC 15 Total				1	1
Scaridae	Ceratohyal	1			1
	Dentary	1		1	2
	Hyomandibular	1		2	3
	Inferior pharyngeal plate		7		7
	Maxilla	1			1
	Opercular			3	3
	Palatine	1			1

Continued on next page

Tangarutu R1 Level II *continued*

Family	Element	Left	N/A	Right	Total
	Premaxilla	3		2	5
	Quadrate			2	2
	Scapula	1		1	2
	Superior pharyngeal plate	2		3	5
Scaridae Total		11	7	14	32
Serranidae	Articular			1	1
	Cleithrum	1		1	2
	Dentary	2			2
	Hyomandibular			1	1
	Opercular	2			2
	Palatine			1	1
	Parasphenoid		1		1
	Premaxilla	2		1	3
Serranidae Total		7	1	5	13
Unidentified	Coracoid	2		3	5
	Dorsal spine		19		19
	Dorsal spine/pterygiophore		5		5
	Ectopterygoid	3		1	4
	Fragments		398		398
	Hypural 3 and 4		3		3
	Identifiable		32		32
	Maxilla	1			1
	Misc spines and rays		57		57
	Pterygiophore		8		8
	Scale		55		55
	Subopercular			2	2
	Supracleithrum	1		1	2
	Vertebra		53		53
Unidentified Total		7	630	7	644
Grand Total		41	646	52	739

Tangarutu T1

Family	Element	Left	N/A	Right	Total
Holocentridae	Dentary	1			1
Holocentridae Total		1			1
NIC 36	Quadrate			2	2
NIC 36 Total				2	2
Serranidae	Maxilla			1	1
Serranidae Total				1	1
Unidentified	Dorsal spine		1		1
	Fragments		15		15

Continued on next page

Tangarutu T1 *continued*

Family	Element	Left	N/A	Right	Total
	Misc spines and rays		1		1
	Pterygiophore		1		1
	Scale		22		22
	Vertebra		5		5
Unidentified Total			45		45
Grand Total		1	45	3	49

Tangarutu T3

Family	Element	Left	N/A	Right	Total
Unidentified	Dorsal spine		3		3
	Dorsal spine/pterygiophore		2		2
	Fragments		13		13
	Identifiable		1		1
	Interopercular		1		1
	Misc spines and rays		3		3
	Pterygiophore		2		2
	Scale		72		72
	Supracleithrum	1		1	2
	Vertebra		9		9
Unidentified Total		1	106	1	108
Grand Total		1	106	1	108

Akatanui 1

Family	Element	Left	N/A	Right	Total
Acanthuridae	Parasphenoid		1		1
Acanthuridae Total			1		1
Congridae	Parasphenoid		1		1
Congridae Total			1		1
Elasmobranchii	Vertebra		2		2
Elasmobranchii Total			2		2
Labridae	Inferior pharyngeal plate		1		1
Labridae Total			1		1
NIC 17	Premaxilla	1			1
NIC 17 Total		1			1
NIC 20	Scapula			1	1
NIC 20 Total				1	1
NIC 26	Ceratohyal	1			1
	Epihyal	1			1
NIC 26 Total		2			2
NIC 5	Hyomandibular			2	2
NIC 5 Total				2	2

Continued on next page

Akatanui 1 continued

Family	Element	Left	N/A	Right	Total
NIC 7	Hyomandibular	1			1
NIC 7 Total		1			1
NIC 8	Hyomandibular	1			1
NIC 8 Total		1			1
Scaridae	4th epibranchial	1			1
	Dentary	1		3	4
	Inferior pharyngeal plate		1		1
	Maxilla	1			1
	Opercular			1	1
	Parasphenoid		1		1
	Premaxilla	4		5	9
	Quadrate			1	1
	Scapula	1		1	2
	Superior pharyngeal plate	1		3	4
	Toothed element		3		3
Scaridae Total		9	5	14	28
Serranidae	Articular			1	1
	Ceratohyal			3	3
	Dentary			1	1
	Opercular	1			1
	Palatine	1			1
	Post temporal	2		1	3
	Premaxilla			1	1
	Preopercular			2	2
	Quadrate	1			1
Serranidae Total		5		9	14
Unidentified	Basioccipital		1		1
	Basipterygium	2			2
	Coracoid			1	1
	Dorsal spine		1		1
	Fragments		116		116
	Hypural 1 and 2		3		3
	Hypural 3 and 4		3		3
	Identifiable		25		25
	Interopercular		2		2
	Misc spines and rays		24		24
	Opercular		1		1
	Pterygiophore		12		12
	Scale		33		33
	Subopercular	1			1
	Supracleithrum	2		1	3

Continued on next page

Akatanui 1 continued

Family	Element	Left	N/A	Right	Total
	Urohyal		1		1
	Vertebra		54		54
Unidentified Total		5	276	2	283
Grand Total		24	286	28	338

Akatanui 3 C1

Family	Element	Left	N/A	Right	Total
Acanthuridae	Dorsal spine		1		1
Acanthuridae Total			1		1
Apode	Epihyal	1		1	2
	Opercular	2			2
	Unidentified element		4		4
Apode Total		3	4	1	8
Bothidae	Ceratohyal			1	1
	Epihyal			1	1
Bothidae Total				2	2
Carangidae	Articular	1			1
	Opercular			1	1
Carangidae Total		1		1	2
cf. Aulostomidae	Articular	1			1
cf. Aulostomidae Total		1			1
Chaetodontidae	Cleithrum	2			2
	Opercular	2		1	3
Chaetodontidae Total		4		1	5
Congridae	Articular	5		4	9
	Dentary	4		8	12
	Hyomandibular	2		1	3
	Parasphenoid		3		3
	Premaxilla	3			3
	Quadrate	1		1	2
	Vomer		1		1
Congridae Total		15	4	14	33
Diodontidae	Dermal spine		1		1
Diodontidae Total			1		1
Elasmobranchii	Vertebra		13		13
Elasmobranchii Total			13		13
Exocoetidae	Inferior pharyngeal plate		1		1
	Quadrate	1			1
Exocoetidae Total		1	1		2
Holocentridae	Cleithrum	1			1
	Hyomandibular	1			1
Holocentridae Total		2			2

Continued on next page

Akatanui 3 C1 *continued*

Family	Element	Left	N/A	Right	Total
Kyphosidae	Ceratohyal	1			1
	Cleithrum			1	1
	Quadrate			1	1
Kyphosidae Total		1		2	3
Labridae	Articular			2	2
	Cleithrum	2		3	5
	Dentary			3	3
	Hyomandibular			1	1
	Inferior pharyngeal plate		5		5
	Opercular	2			2
	Premaxilla	8		2	10
	Preopercular			1	1
	Quadrate			1	1
Superior pharyngeal plate			1	1	
Labridae Total		12	5	14	31
Mullidae	Hyomandibular	1		1	2
	Opercular			1	1
	Palatine			1	1
Mullidae Total		1		3	4
Muraenidae	Articular	1		5	6
	Dentary	6		9	15
	Parasphenoid		2		2
	Toothed element		1		1
	Vomer		7		7
Muraenidae Total		7	10	14	31
NIC 13	Opercular	1			1
NIC 13 Total		1			1
NIC 32	Ceratohyal	1			1
NIC 32 Total		1			1
NIC 4	Hyomandibular			1	1
NIC 4 Total				1	1
NIC 45	Vomer		1		1
NIC 45 Total			1		1
Pomacentridae	Cleithrum	23		19	42
	Opercular	11		5	16
	Post temporal			2	2
	Preopercular	1		4	5
	Scapula	4		6	10
Pomacentridae Total		39		36	75
Scaridae	4th epibranchial	1		2	3
	Articular	1		1	2
	Ceratohyal			1	1

Continued on next page

Akatanui 3 C1 continued

Family	Element	Left	N/A	Right	Total
	Cleithrum	4		3	7
	Dentary	11		4	15
	Hyomandibular	4		5	9
	Inferior pharyngeal plate		26		26
	Opercular	9		8	17
	Palatine	7		6	13
	Parasphenoid		1		1
	Post temporal			2	2
	Premaxilla	2		5	7
	Preopercular	15		6	21
	Quadrate	6		2	8
	Scapula	1			1
	Superior pharyngeal plate	23		10	33
Scaridae Total		84	27	55	166
Serranidae	Articular	4		1	5
	Ceratohyal	4		1	5
	Cleithrum	1		6	7
	Dentary	7		5	12
	Epihyal	3		1	4
	Hyomandibular	2		2	4
	Opercular	1			1
	Palatine	2		3	5
	Parasphenoid		1		1
	Post temporal			2	2
	Premaxilla	5		4	9
	Preopercular	2		4	6
	Quadrate	5		5	10
	Scapula			2	2
	Vomer		2		2
Serranidae Total		36	3	36	75
Unidentified	Basipterygium	5		3	8
	Ceratohyal			1	1
	Cleithrum	1		3	4
	Coracoid	4		8	12
	Dorsal spine		117		117
	Dorsal spine/pterygiophore		57		57
	Ectopterygoid	3		1	4
	Fragments		388		388
	Hyomandibular			2	2
	Hypural		3		3
	Hypural 1 and 2		10		10
	Hypural 3 and 4		10		10

Continued on next page

Akatanui 3 C1 *continued*

Family	Element	Left	N/A	Right	Total
	Hypural 5		1		1
	Identifiable		166		166
	Interopercular		32		32
	Metapterygoid		1	1	2
	Misc spines and rays		178		178
	Opercular		2		2
	Parasphenoid		2		2
	Post temporal			2	2
	Preopercular	1			1
	Pterygiophore		69		69
	Scale		792		792
	Subopercular	4	2	5	11
	Supracleithrum	3	2	4	9
	Toothed element		2		2
	Urohyal		2		2
	Vertebra		144		144
Unidentified Total		21	1980	30	2031
Grand Total		230	2050	210	2490

Akatanui 3 E1

Family	Element	Left	N/A	Right	Total
Acanthuridae	Opercular			1	1
	Parasphenoid		1		1
Acanthuridae Total			1	1	2
Scaridae	Dentary	1			1
	Hyomandibular	1		1	2
	Inferior pharyngeal plate		3		3
	Parasphenoid		1		1
	Post temporal			1	1
	Premaxilla	2		1	3
	Quadrate			1	1
	Superior pharyngeal plate	2		1	3
Scaridae Total		6	4	5	15
Serranidae	Hyomandibular	2			2
	Preopercular	1			1
Serranidae Total		3			3
Unidentified	Dorsal spine		1		1
	Fragments		59		59
	Hypural		1		1
	Identifiable		5		5
	Interopercular		4		4
	Misc spines and rays		3		3

Continued on next page

Akatanui 3 E1 *continued*

Family	Element	Left	N/A	Right	Total
	Parasphenoid		1		1
	Pterygiophore		5		5
	Scale		13		13
	Supracleithrum			1	1
	Vertebra		9		9
Unidentified Total			101	1	102
Grand Total		9	106	7	122

Akatanui 3 A1

Family	Element	Left	N/A	Right	Total
Scaridae	Articular			1	1
	Palatine			1	1
	Premaxilla			1	1
	Preopercular	1			1
Scaridae Total		1		3	4
Serranidae	Hyomandibular			1	1
	Preopercular			1	1
Serranidae Total				2	2
Unidentified	Fragments		2		2
	Identifiable		1		1
Unidentified Total			3		3
Grand Total		1	3	5	9

Angairao C

Family	Element	Left	N/A	Right	Total
Labridae	Premaxilla	2			2
Labridae Total		2			2
Muraenidae	Dentary	1		1	2
Muraenidae Total		1		1	2
Scaridae	Inferior pharyngeal plate		1		1
Scaridae Total			1		1
Siganidae	Preopercular			1	1
Siganidae Total				1	1
Unidentified	Dorsal spine		2		2
	Fragments		17		17
	Identifiable		1		1
	Misc spines and rays		1		1
	Pterygiophore		1		1
	Vertebra		2		2
Unidentified Total			24		24
Grand Total		3	25	2	30

Angairao E Level III					
Family	Element	Left	N/A	Right	Total
Kyphosidae	Ceratohyal			1	1
Kyphosidae Total				1	1
Labridae	Cleithrum	1			1
Labridae Total				1	1
Muraenidae	Articular			1	1
	Dentary	1		1	2
Muraenidae Total				2	3
Scaridae	Cleithrum	1			1
	Dentary			1	1
	Inferior pharyngeal plate		5		5
	Opcular	1			1
	Palatine			1	1
	Premaxilla	2		1	3
	Preopercular			1	1
	Quadrate	1		1	2
	Superior pharyngeal plate	3		1	4
Scaridae Total				6	19
Serranidae	Cleithrum			1	1
	Hyomandibular			1	1
	Preopercular	2			2
	Quadrate			1	1
Serranidae Total				3	5
Unidentified	Basipterygium			1	1
	Dorsal spine		2		2
	Ectopterygoid			1	1
	Entopterygoid			1	1
	Fragments		67		67
	Hypural		1		1
	Hypural 1 and 2		1		1
	Identifiable		1		1
	Metapterygoid	1			1
	Misc spines and rays		15		15
	Pterygiophore		1		1
	Scale		3		3
	Supracleithrum	1		2	3
	Vertebra		9		9
Unidentified Total				5	107
Grand Total		14	105	17	136

Angairao E Level II

Family	Element	Left	N/A	Right	Total
Acanthuridae	Scapula			1	1
Acanthuridae Total				1	1
Congridae	Articular			1	1
Congridae Total				1	1
Labridae	Quadrate	1			1
Labridae Total		1			1
Muraenidae	Dentary	1			1
	Vomer		1		1
Muraenidae Total		1	1		2
Serranidae	Epihyal	1			1
Serranidae Total		1			1
Unidentified	Dorsal spine		2		2
	Fragments		23		23
	Interopercular		1		1
	Misc spines and rays		3		3
	Scale		10		10
	Vertebra		5		5
Unidentified Total			44		44
Grand Total		3	45	2	50

Angairao E Level I

Family	Element	Left	N/A	Right	Total
Elasmobranchii	Vertebra		1		1
Elasmobranchii Total			1		1
Labridae	Parasphenoid		1		1
Labridae Total			1		1
Mullidae	Premaxilla			1	1
Mullidae Total				1	1
Muraenidae	Articular	1			1
	Dentary	2			2
Muraenidae Total		3			3
NIC 29	Epihyal			1	1
NIC 29 Total				1	1
Scaridae	Inferior pharyngeal plate		1		1
	Opercular			1	1
	Preopercular	1			1
	Superior pharyngeal plate	1		1	2
Scaridae Total		2	1	2	5
Serranidae	Post temporal	1			1
Serranidae Total		1			1

Continued on next page

Angairao E Level I *continued*

Unidentified	Dorsal spine		2		2
	Dorsal spine/pterygiophore		1		1
	Ectopterygoid	1			1
	Fragments		42		42
	Misc spines and rays		12		12
	Scale		4		4
	Supracleithrum	3		1	4
	Toothed element		1		1
	Vertebra		3		3
Unidentified Total		4	65	1	70
Grand Total		10	68	5	83

Angairao N (Noogoriki)

Family	Element	Left	N/A	Right	Total
Carangidae	Dentary	1			1
Carangidae Total		1			1
Muraenidae	Dentary	1			1
Muraenidae Total		1			1
Scaridae	Hyomandibular			1	1
	Preopercular			1	1
	Superior pharyngeal plate	3		1	4
Scaridae Total		3		3	6
Serranidae	Ceratohyal	1			1
	Cleithrum	1			1
	Hyomandibular	1			1
	Opercular			1	1
Serranidae Total		3		1	4
Unidentified	Dorsal spine		1		1
	Dorsal spine/pterygiophore		1		1
	Fragments		3		3
	Misc spines and rays		3		3
	Scale		7		7
Unidentified Total			15		15
Grand Total		8	15	4	27

Appendix C: Analysis of faunal remains from upland fortifications sites

Virginia L. Butler

Department of Anthropology, Portland State University

This report summarises the faunal remains recovered during excavation at six upland fortification sites tested in July/August 2002 on Rapa, French Polynesia (Table A). Remains were recovered during field screening (1/8" mesh) and flotation of bulk samples. Materials were identified to the finest taxon possible, using reference materials in Butler's possession at Portland State University. The "probable turtle" specimens were eroded, tabular fragments with porous structure that did not resemble the texture of other large to medium-size vertebrates. These specimens could be from any of the three marine turtles known for the Pacific (leatherback *Dermochelys coriacea*, green turtle *Chelonia mydas*, hawksbill *Eretmochelys imbricata*). All of the bones and teeth collected during field screening were documented and tallied. Unidentified vertebrate specimens – nonfish, include materials which were clearly not from fish, but which could be from other vertebrates, including turtle, marine mammal, pig, dog, or possibly human. None of the remains appear to be from bird, based on texture and robusticity. These remains were extremely fragmentary and poorly preserved. The flotation sample specimens tended to be extremely small (many less than 2 mm in linear dimension) and many could not be distinguished as fish or other vertebrate class. Thus, I only recorded those specimens from flotation samples that could be identified below vertebrate class (e.g. family). Number of Identified Specimens (NISP; Grayson 1984) was used to quantify the specimens.

Results

A total of 400 specimens were documented from the sites. Ten different vertebrate taxa were identified altogether (Table A), including eight fish taxa, rat and probable turtle. Parrotfish far and away dominates the fish fauna. This species was recovered at most sites and has the highest frequency in individual sites. The prominence is partially due to bias in identification, given that parrotfish teeth are more distinctive than those from other taxa. When teeth are excluded from the tallies, the overall frequency (and ubiquity) of parrotfish is reduced (Table A), though it still ranks highest of the fishes.

Method of sample collection needs to be considered in interpreting results. Overall, the flotation samples provided many more identified specimens, especially of fish, than field screening. At Tevaitau (R-18), where both field screening and flotation samples were used, the flot samples generated 36 NISP (21 with teeth excluded); whereas the field screening provided only four NISP (three when teeth were excluded). Fish faunal recovery was especially affected by collection method. At R-18, only two fish taxa were identified in the field screening, whereas seven were identified in the flot samples.

All of the fish could have been taken nearshore. They represent a variety of feeding ecologies and would have likely been taken using different methods (e.g. Leach and Intoh 1984; Leach et al. 1984; Allen 1992; Butler 1994, 2001). Thus the carnivores (groupers, snappers, moray eels) were more apt to be taken with hook and line and the herbivores (parrotfishes, damselfishes, puffers) were more likely taken with nets or traps.

Faunal representation greatly differs across sites. Turtle was only identified at Tapitanga (R-4). Fish is also very scarce at this site, although the scarcity may be due to the fact that flotation samples were not taken from this site. Tevaitau has the richest assemblage, with eight taxa present. This may be an artefact of sampling, however, given the relatively large sample size at the site and the commonly found association between sample size and richness (Grayson 1984).

Table A. Frequency of taxa by site and recovery method. Values in parenthesis are with teeth excluded.

Taxon	R-2		R-4		R-18		R-20		R2002-49		R-17	
	flot	1/8	flot	1/8	flot	1/8	flot	1/8	flot	1/8	flot	1/8
Carangidae (k, pompano)					1							
Elasmobranch (shark, ray)							1 (0)					
Labridae (wrasse)					2						1	
Muraenidae (moray eel)					2							
Pomacentridae (damselfishes)					2							
Scaridae (parrotfishes)	5 (0)			30 (15)	21 (6)	1 (0)	15 (0)				13 (4)	
Serranidae (grouper, sea bass)					2	2						1
Tetraodontidae (pufferfishes)					1							
Unid Fish						48						
Rattus sp. (rat)					5	1						2
Probable Turtle				46								
Unidentified Vertebrate (nonfish)				196		1				1		
Total NISP (excludes unid fish, unid vertebrate)	5			76	36	4	16			1		17

References

- Allen, M.S. 1992. Temporal variation in Polynesian fishing strategies: the southern Cooks in regional perspective. *Asian Perspectives* 31:183–204.
- Butler, V.L. 1994. Fish feeding behaviour and fish capture: the case for variation in Lapita fishing strategies. *Archaeology in Oceania* 29:81–90.
- Butler, V.L. 2001. Changing fish use on Mangaia, Southern Cook Islands: resource depression and the prey choice model. *International Journal of Osteoarchaeology* 11:88–100.
- Grayson, D.K. 1984. *Quantitative Zooarchaeology*, New York: Academic.
- Leach, B.F. and Intoh, M. 1984. An archaeological fishbone assemblage from the Vitaria Site, Rurutu, Austral Islands. *Journal de la Societe des Oceanistes* 78:75–77.
- Leach, B.F., Intoh, M. and Smith, I.W.G. 1984. Fishing, turtle hunting, and mammal exploitation at Fa'ahia, Huahine, French Polynesia. *Journal de la Societe des Oceanistes* 79:183–197.

Appendix D: UTM locations of archaeological sites investigated in the current project

ID	Description	Northing	Easting
R-1 (Morongo Uta)	Fortification	6942536.95	761078.43
R-2 (Potaketake)	Fortification	6944304.05	763395.96
R-3 (Vairu)	Fortification	6945589.85	762849.25
R-4 (Tapitanga)	Fortification	6943851.50	763427.89
R-5 (Kapitangi)	Fortification	6945400.86	760810.75
R-17 (Ruatarā)	Fortification	6945695.10	761746.92
R-18 (Tevaitau)	Fortification	6941795.40	761995.49
R-19 (Pukutai)	Secondary fortification	6943757.85	764180.76
R-20 (Ororangi)	Fortification	6941628.88	763452.88
R2002-1	Lithic scatter	6944363.89	761417.44
R2002-2	Domestic terrace	6944922.56	761844.26
R2002-3	Oven	6942355.87	762266.74
R2002-4	Garden soil	6942357.15	762265.81
R2002-5	Oven	6942428.79	762301.56
R2002-6	Garden soil	6943206.33	761630.33
R2002-7	Oven	6943084.84	761772.44
R2002-8	Oven	6942388.64	762239.62
R2002-9	Oven	6942405.36	762231.16
R2002-10	Oven	6944033.31	761177.57
R2002-11	Oven	6944201.57	761149.69
R2002-12	Oven	6944203.04	761197.14
R2002-13	Oven	6944416.30	761145.78
R2002-14	Oven	6944398.69	761180.51
R2002-15	Oven	6944370.32	761299.86
R2002-16	Sectioned terrace	6944429.01	761594.31
R2002-17	Oven	6944478.21	762623.15
R2002-18	Sectioned terrace	6944467.49	762626.94
R2002-19	Oven	6944275.28	762616.22
R2002-20	Oven	6943802.31	762648.68
R2002-21	Domestic terrace	6944360.04	761604.74
R2002-22	Oven	6944565.47	761832.53
R2002-23	Rockshelter	6944563.61	761829.85
R2002-24	Garden soil	6944549.62	761751.07
R2002-25	Garden soil	6943792.39	762655.15
R2002-26	Rockshelter	6944255.20	764831.75
R2002-27	Rockshelter	6944308.95	764914.98
R2002-28	Rockshelter	6944394.56	765075.74
R2002-29	Rockshelter	6943591.20	758682.53
R2002-30	Rockshelter	6942754.43	764938.23

Continued on next page

ID	Description	Northing	Easting
R2002-31	Rockshelter	6940906.57	765096.11
R2002-32	Rockshelter	6940902.14	765124.29
R2002-33	Rockshelter	6941880.04	760167.66
R2002-34	Rockshelter	6947459.35	763650.47
R2002-35	Rockshelter	6947407.65	763668.50
R2002-36	Rockshelter	6946949.59	763755.07
R2002-37	Rockart	6946947.42	763754.02
R2002-38	Rockshelter	6946870.82	764780.06
R2002-39 (Pukumia)	Secondary Fortification	6944769.45	764576.54
R2002-40 (Taua)	Secondary Fortification	6945846.76	764947.42
R2002-41	Lithic Scatter	6943973.67	761677.78
R2002-42 (Pukutaketake)	Fortification	6942940.46	760071.27
R2002-43 (Noogurope)	Fortification	6944219.02	759897.79
R2002-44	Rockshelter	6943923.78	763326.62
R2002-45	Domestic Terrace	6944702.88	761837.02
R2002-46	Rockshelter	6945162.28	765532.68
R2002-47 (Taugatu Cave)	Rockshelter	6944950.65	765466.75
R2002-48	Agricultural Terrace	6943577.40	761368.96
R2002-49	Domestic Terrace	6944068.24	759446.83
R2002-50 (Ngapiri)	Secondary Fortification	6941622.07	762001.34